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ANURANAN

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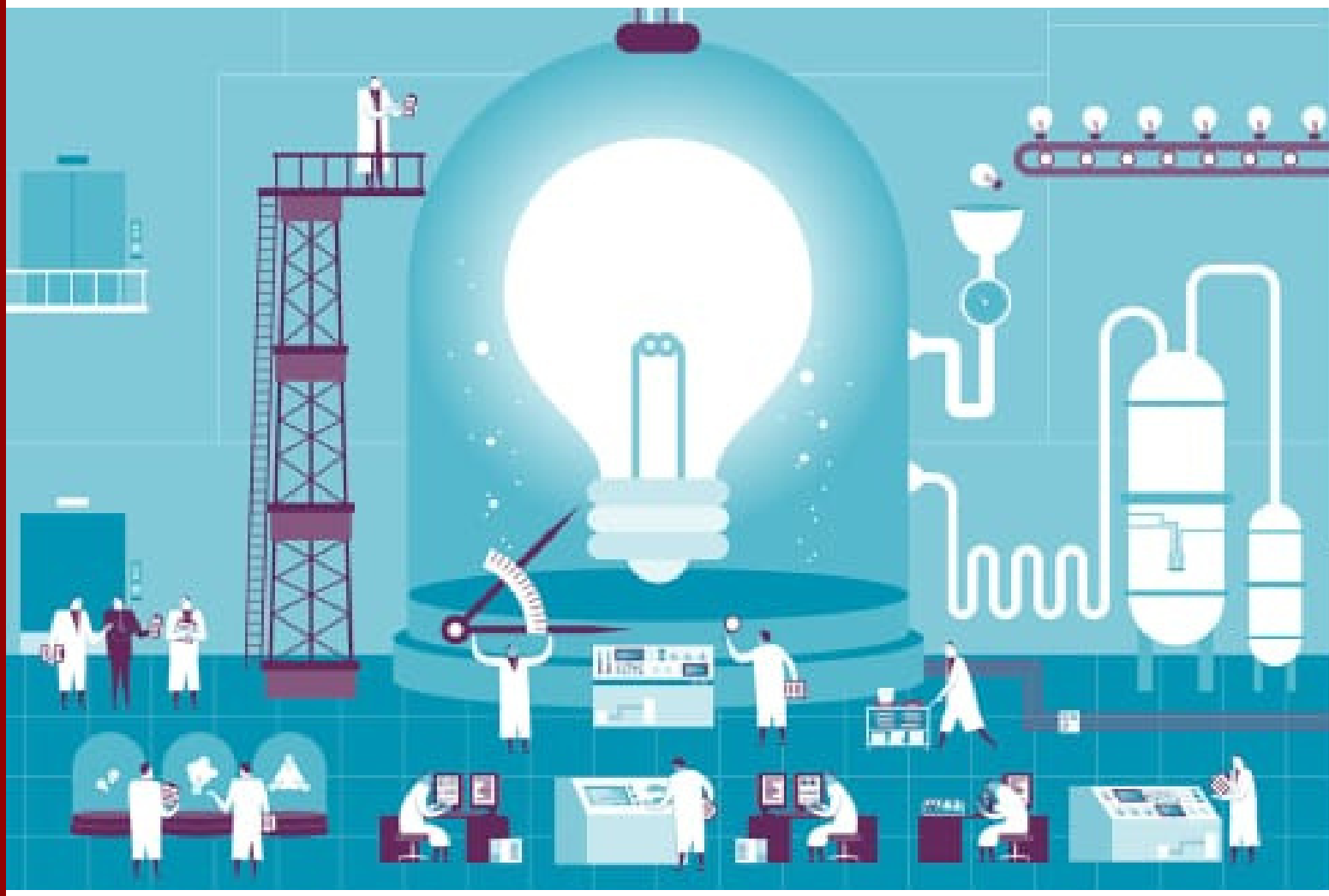

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FOREWORDS

It is my great privilege to share the perceptions and thoughts in developing human resources in the field and Science and Technology at the eve of the **'Azadi Ka Amrit Mahotsav (AKAM)'**, in our e-magazine **'Anuranan'**. The AKAM is the weeklong celebration of our 75 years of the Independence Day to illuminate all homes and houses with our national flag, the nations' pride and value.

In fact, there are three dimensional axes for measurements and one virtual axis for evaluation. The time is the evaluation axis and it is represented by ict, where i is (-1)^1/2, imaginary quantity, c is the velocity of light and t is the time. Multiplication of ct is a dimension of length. Thus, ict is an imaginary length, past is hazy, future is dark and present is light. We want to reduce the darkness of future from learning of the past. The advancement of science and technology and even some of the societal advancement took its path from the learning of limitations in past.

The science education and its advanced studies for proper translation into technology was started in long back. It occurred depending upon the emergence of universal knowledge wave and the need. The initial three tier education systems have transformed into four tier due to the need of day and new education policy, **'National Education Policy-2020' (NEP-20)** has been introduced for this purpose.

The education system was of three tier systems; the tier I is primary education from class I to IV. In this four years' duration the children are trained on learning of vernacular for developing literacy, societal ethical and moral components, mathematical systems for counting, games for health and hygiene. The tier II is of secondary education with the duration of six and later on seven years' starting from class VI to XI and later to class XII to liberalize the subject and initiate the thought process. The tier III is of professional program and directed towards the exploration of knowledge in building up professional career.

However, it was observed that tier II has very meager role in building up professional expertise due to the non-liberalization of mind and thought process. The subject choice in tier II was done looking at the job availability after completion of tier III. These introduced limitations on the expansion of mind map.

The NEP-20 has planned to overcome this situation. The NEP-20 introduced four tier system. The tier I is from class I to V, tier II from class VI to VIII, tier III from class IX to XI and tier IV is of four years graduate program. In tier IV one can explore in job market in completing one year of studies and s/he is entitled to have a certificate. Completion of two years can have a diploma degree and completion of four years be a graduate. The advanced studies and research can be explored after completion of graduate program.

The NEP-20 require development of course curriculum of the specific program of studies to amalgamate both fundamental, strategic, applied and adoptive mode of education in enhancing the skill of the students such that new avenues can open up for their involvement in developing economy, ecology and empowerment.

The possible articles in our e-magazine **'Anuranan'** will generate vibration in forming resonance in the thought process of students, faculty members and the entire community in finding out the paths for serving the nation.

I personally thank our Dean, editor, all the faculty members and students for their untiring efforts in publishing this 2nd issue of e-magazine. It is further hoped that this e-magazine will help in updating the knowledge of the aspiring students in building up their career.

Prof. B. Ghosh, D.Sc.(Engg.)
Vice Chancellor
The Neotia University

CHIEF-EDITOR'S MESSAGE

PROF. PARTHA KUMAR MUKHERJEE
Dean
School of Science & Technology
The Neotia University

On behalf of our editorial team, I would like to offer a word of thanks to our readers, contributors, authors, editors and anonymous reviewers, all of whom have volunteered to contribute to the success of the release of the 2nd Issue of our e-magazine "Anuranan" and also for its mission to improve the quality of the contents. It gives me immense pleasure to ensure that "Anuranan" has successfully accomplished its objective. The reflection of the rich contents, ideas, creativity and achievements is the epitome of this e-magazine. Each and every contributors have put forth their ideas and thoughts that are too deep to be expressed and too strong to be suppressed.

Initially, it has been planned that the e-magazine will have both academic and non-academic sections and will be quarterly in nature. Going forward we are planning to release our e-Magazine twice a year with a particular emphasis on quality contents and better outcomes of upcoming research areas and other non-academic topics. In the academic section we welcome contributions that can demonstrate near-term practical usefulness of the technical topics, particularly contributions that take a multidisciplinary /convergent approach because many of the real world problems are complex in nature across various technologies and domains under cross functional areas. This will encourage the team spirit and enrich the quality of the contents in both Technical and Non-Technical terms.

Finally, we encourage contributions to ensure a continuity of a successful releases of "Anuranan" twice a year. Authors, reviewers and guest editors are always welcome. We also welcome comments and suggestions that could improve the quality of the e-Magazine. I expect full cooperation from my faculty members, students and peers.

We hope to find "Anuranan" with more informative in the future endeavour.

Again, my sincere thanks to all the contributors for their support and interest.

EDITOR'S MESSAGE

"Science advances, not by the accumulation of new facts, but by the continuous development of new concepts."

-James Bryant Conant

It is a proud moment for School of Science and Technology (SST), The Neotia University (TNU) & Neotia Institute of Technology Management and Science (NITMAS) to bring out the 2nd Volume of the e-Magazine **'Anuranan'** on the occasion of **'Azadi Ka Amrit Mahotsav (AKAM)'** to celebrate and commemorate 75 years of Indian Independence and the glorious history of its people, culture and achievements.

The role of Science and Technology is not only to peruse the academic excellence but also to motivate and empower the students to lifelong learners, critical thinkers, and productive members of an everchanging global society. Converting every individual into a self-reliant and independent citizen, **'Anuranan'** provides an amalgam of scholastic and co-scholastic activities.

'Anuranan' is a platform for our students, staff and faculty members to showcase their creative hidden dreams and appreciations for writing. Our e-Magazine aims towards bringing out the talents of the members of SST through articles, poems, painting, photographs etc. We, the members of **'Anuranan'** encourage our students, staff and faculty members to put on their thinking caps and create their imaginations and experiences in various forms some of which are covered in this issue. This issue of **'Anuranan'** is a glimpse of the talents and wonderful skills of our young minds with the able guidance of dedicated team of faculty members.

With the able guidance of TNU authorities, we have able to cover up with not only the academic syllabus but also involved our faculty, staff and students to contribute for successful completion of the e-Magazine.

Kudos to the members of editorial and design team for their wholehearted involvement and contributions in the making of the **'Anuranan'**. We express our heartfelt thanks to each and every member of the SST for their cooperation in making the e-Magazine success.

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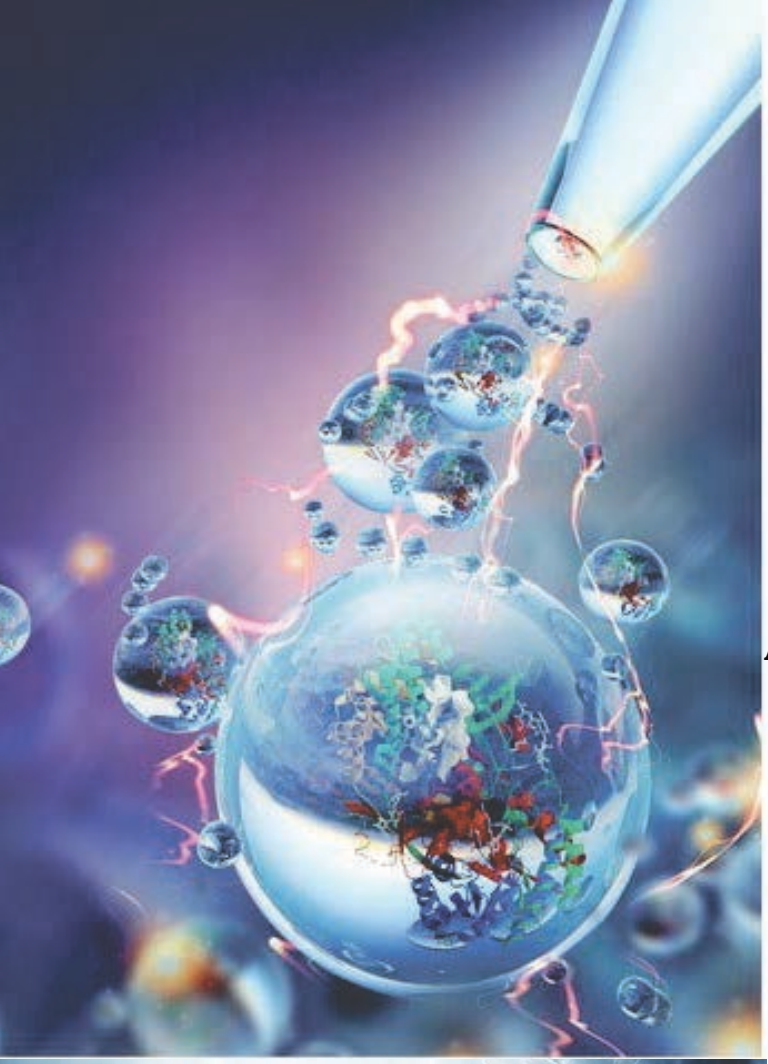

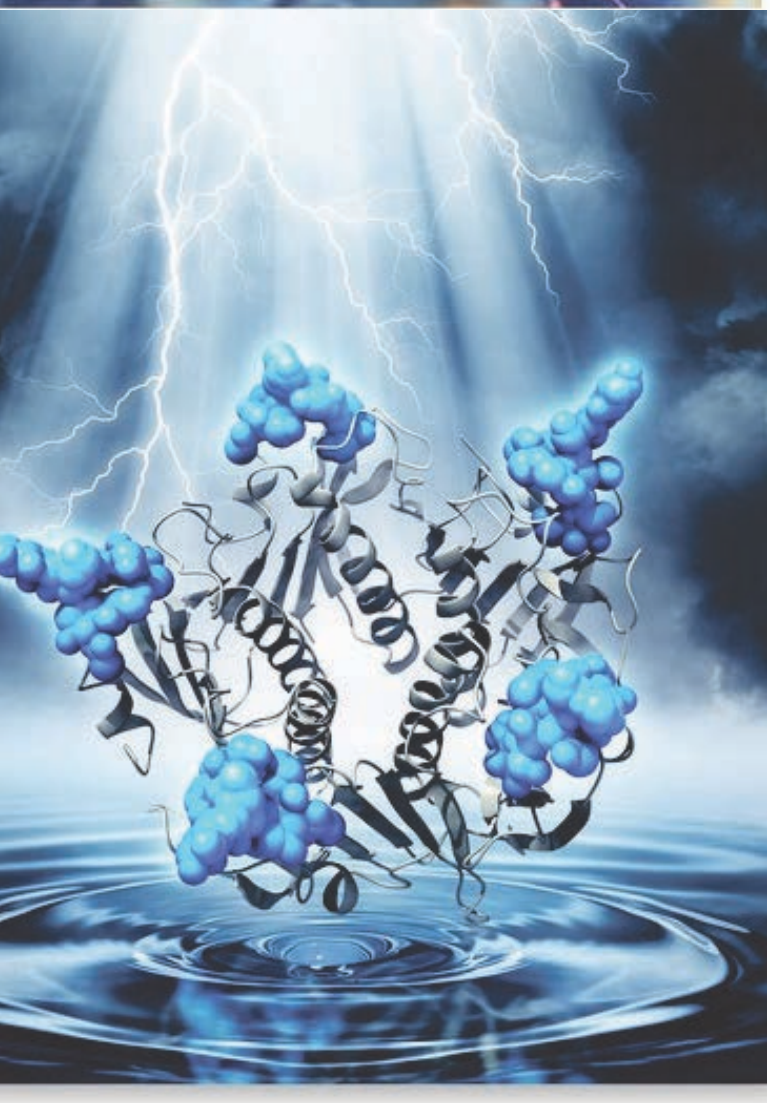

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Dark Energy and Expansion of The Universe

Suchandra Goswami
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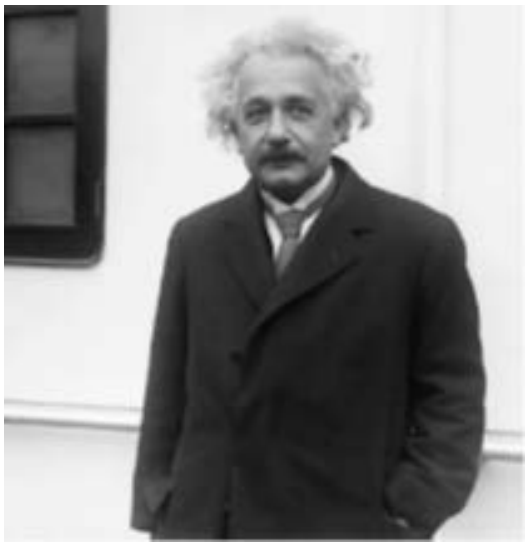
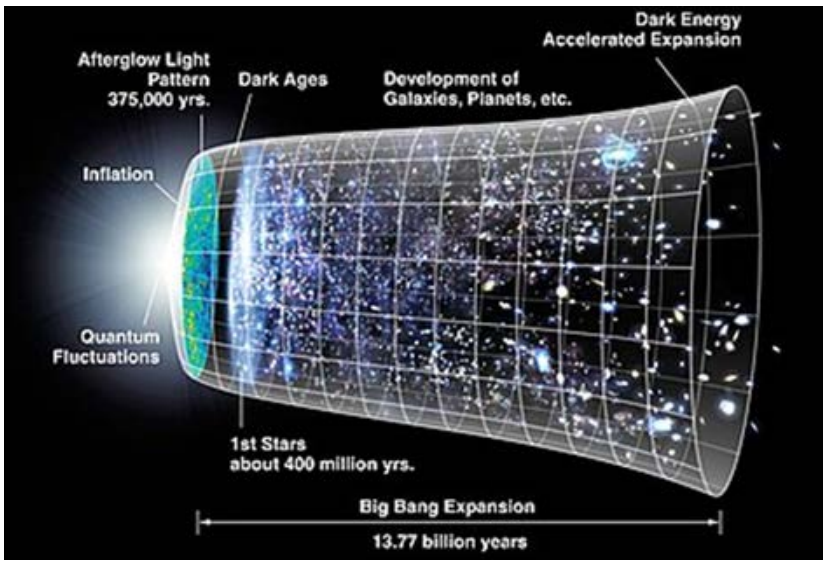
Introduction

The terms dark energy, dark matter still sounds like the stuff of science fiction movies but the expansion of our universe currently resides on quantities like these. From ancient Greeks to modern astronomers tried to understand the universe, how does it begin and where is the edge of this universe? While searching for the edge of the universe first paradox arises with the discovery of gravity by Sir Isaac Newton. Since gravity generate an attractive pull between objects, according to his theory, universe should be collapsing, which is obviously not the case. When Sir Albert Einstein developed his general theory of relativity, he thought he ran into the same problem as Newton, since his equation described that, the universe should either be expanding or collapsing. But in his theory, Einstein consider that the universe is static and the solution of general relativity contains a constant term, which he named as **cosmological constant.**



Prof. Albert Einstein



(Acknowledgement: https://en.wikipedia.org/wiki/Expansion_of_the_universehttps://en.wikipedia.org/wiki/Expansion_of_the_universe)

In 1929 Edwin Hubble, working at the Carnegie Observatories in Pasadena, California, measured the redshifts of a number of distant galaxies. He also measured their relative distances by measuring the apparent brightness of a class of variable stars called Cepheids in each galaxy. When he plotted redshift against relative distance, he found that the red shift of distant galaxies increased as a linear function of their distance. The only explanation for this observation is that the universe was expanding. After Hubble's discovery Einstein called his cosmological constant his "greatest blunder". Once the expansion of the universe is established, it become evident that, our entire universe must have started from a singular point, which was later named as the big bang- the beginning of the universe as we understood today.

Even though Einstein consider universe to be static, his theory of gravity had some solutions that described an expanding universe as discovered by other scientists later. In these solutions, the light coming from distant objects would be redshifted as it travelled through the expanding universe. The redshift would increase with increasing distance of the object [1].

Prof. Edwin Hubble

Expanding universe and its properties

The equation that describes the expansion of the universe have three possible solutions and each of these solutions describe different fate for our expanding universe. The fate of the universe can be understood by calculating the accurate expansion rate of the universe and how much matter the universe contains.

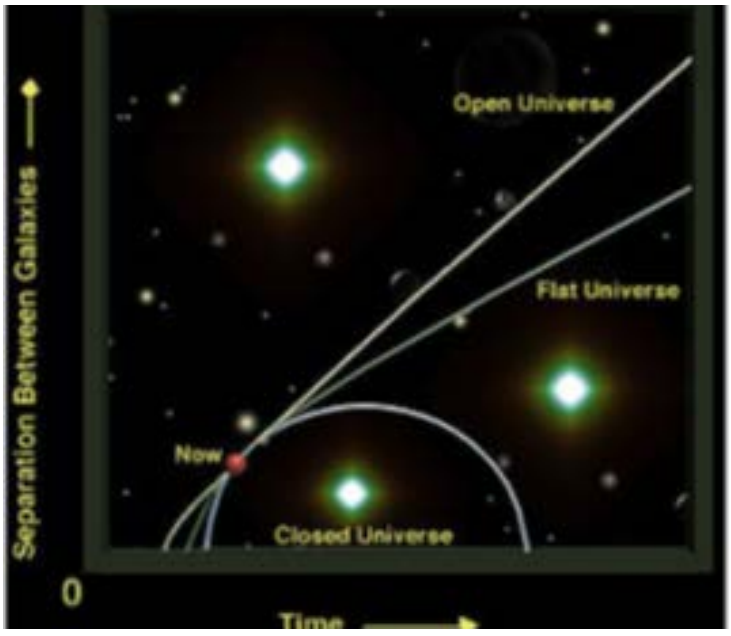


Fig. 2. Three possible scenarios of expanding universe

Three possible types of expansion of the universe are shown in Fig. 2- closed universe, flat universe and open universe. Closed universe is one scenario, where the universe will eventually stop expanding and possibly recollapses back to another big bang. In case of flat universe, the universe will expand forever and expansion rate will eventually become zero after infinite time. In case of open universe, it will expand forever. To understand, let us consider a simple example of a space ship. If the space ship does not have sufficient energy to escape from earth's gravity it will fall back to earth, like the closed universe. If it is given just enough energy to escape earth's gravitational pull, it will escape the earth and after going a certain distance it will eventually stop, resonating with the flat universe. Lastly, if the space ship is given more than sufficient energy to escape the earth, it will always have enough speed even after crossing infinite distance, which is similar to the open universe. For the last decade astronomers are trying to find the most accurate result of two parameters- H0, which is the rate of the expansion of the universe and ω0, which is the density of the universe. By understanding these two parameters it will be possible to understand the expansion of the universe [1].

The cosmic microwave radiation

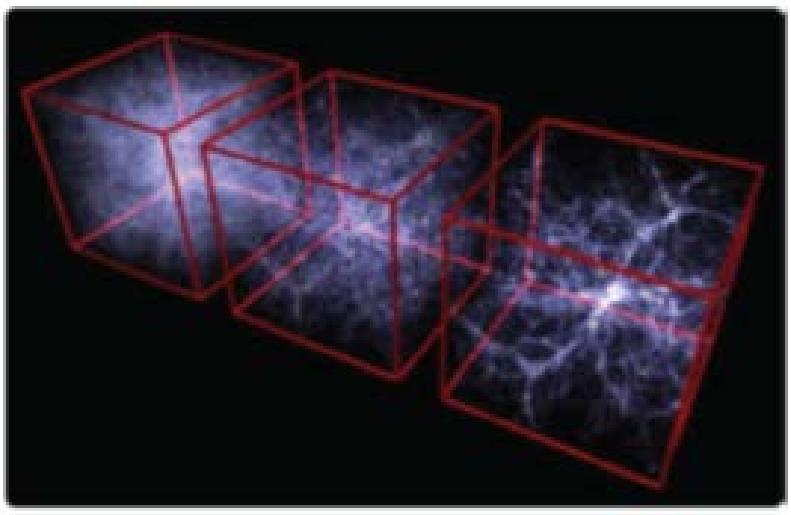
Cosmologists are not only interested to know about the fate of the universe they are also interested to know about the present state of the universe. They have tried to understand why there is an abundance of hydrogen and helium in universe and a very small concentration of the heavier elements. In 1940 with the rise of nuclear physics, American physicists George Gamow, Robert Herman, and Ralph Alpher tried to find out whether nuclear reactions that took place at higher temperatures during the early stage of the universe could have created the heavy elements. They found that, with the exception of helium, it was impossible to form heavier elements in any appreciable quantity. Now, we understand that heavy elements were synthesized in the cores of stars during supernovae, when a large dying star implodes. Apart from investigating about the elements of the universe, during their research they understood that, if the universe were hotter and denser in the past, a specific radiation should still be left over from the early universe. This radiation would have a well-defined spectrum-

known as bablackbody spectrum, which will depend on its temperature. As the universe expanded, the spectrum of this radiation would have been redshifted to longer wavelengths, and the temperature associated with the spectrum would have decreased by a factor of over one thousand as the universe cooled.

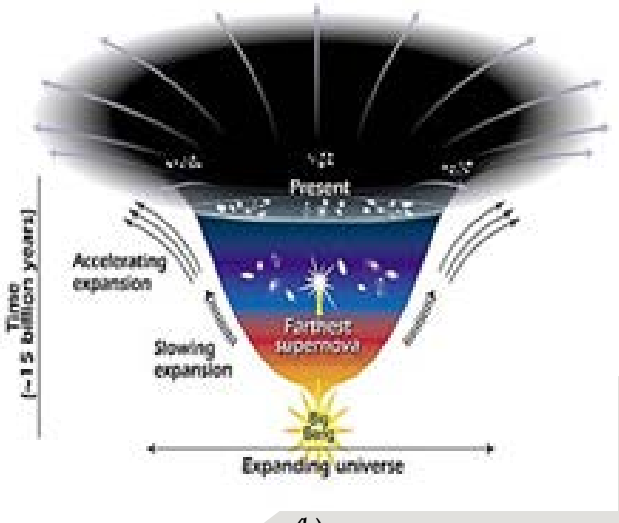
Two decades after the prediction of this blackbody spectrum from early universe, Arno Penzias and Robert Wilson, two scientists in Holmdale, New Jersey, discovered Cosmic Microwave Background Radiation in 1963. They were working on a satellite designed to measure microwaves. During testing satellite's antenna, they found a mysterious microwaves coming equally from all directions. At first, they thought there was something wrong with the antenna. But after checking several times, they realized that they had discovered something real. What they discovered was the radiation predicted years earlier by Gamow, Herman, and Alpher, later named as Cosmic Microwave Background Radiation, convinced most astronomers that the Big Bang theory was correct. For discovering the Cosmic Microwave Background Radiation, Penzias and Wilson were awarded the 1978 Nobel Prize in Physics. Study of this radiation now help understand astronomers about the density variation of the present universe and how it is different from the initial stages of the big bang [1].

Dark energy

Up until this point in history it was understood that the universe is expanding at a constant rate and fate of the universe depends on that rate. Up to 1967 Zeldovich considered the cosmological constant problem as a fine-tuning problem. This is known as the old cosmological constant problem. In 1998, supernovae observations eventually shed light on something slightly different and changes the course of cosmology. Studying the redshift data from the light coming from Type Ia supernovae suggested the existence of a mysterious force called Dark Energy. These massive explosions of dying giant stars which are generally known as supernovae are extremely useful to astronomers. These objects always output the same amount of light, and can therefore be used as a “standard candle” to calculate distances in the cosmos. This is a very simple idea. Consider fireflies at night, which all shine with the same intrinsic brightness. By measuring their brightness from where you are, you can calculate their distance. In 1998 two groups of astronomers including Americans Adam Riess and Saul Perlmutter, and Brian Schmidt in Australia carried out an experiment using eight telescope word wide and measured the distance of Type Ia supernovae [2]. .



(a)



(b)

Fig. 3 (a) Illustration showing a simulation by astrophysicist Volker Springel of the Max Planck Institute in Germany. It represents the growth of cosmic structure, i.e., galaxies and voids when the universe was 0.9 billion, 3.2 billion and 13.7 billion years old (present day). (b) This diagram reveals changes in the rate of expansion since the universe's birth 15 billion years ago. The shallower the curve, the faster the rate of expansion. Astronomers theorize that the faster expansion rate is due to a mysterious, dark force known as dark energy [3,4].

They found out from their calculation that, Hubble constant, which define the rate of expansion of the universe is accelerating with time. Even though this result first met with scepticism, but later on this was verified by other groups and different followed experiments. Thus, opposing to the idea that after big bang the expansion of the universe will slow down at some point, an antigravity element appears in the scenario which overcome the effect of gravity and become responsible for accelerating universe. Scientists named this mysterious component as Dark Energy. It is a probable energy component coming from the cosmological constant of the Einstein's equation. The percentage of dark energy density in this entire universe is calculated to be 68 % which is not too small nor too large. All the matters that can be seen with our naked eyes consists only 5 % of the universe and the rest consisting of something ever more mysterious called Dark Matter.

The physics behind the Dark energy is highly speculative and there are several theoretical models which tried to explain this mysterious energy. One of the most popular models associate this energy with a force known as "quintessence" which is related with 'Higgs Field'. But there is no experimental observation found yet to support this theory [2].

Conclusion

The fate of the universe currently resides on this mysterious dark energy and cosmologists have no idea if the universe will continue to expand with an accelerating rate or not. If the former case is true then, far in the future, this acceleration will overcome the forces that holds our universe and everything in it together. Thus, literally tearing all matter in the cosmos apart. This nightmare scenario is named as Big Rip. Since the beginning mankind has tried to understand the universe. It is hoped that, soon we will better understand this mysterious force called Dark Energy which have such a gigantic effect on this universe.

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SUBHAM JANA
EE (2019-23)
The Neotia University

Utility Computing

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School of Science & Technology
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Utility computing plays a significant role in business models and gives a unique service provider to the customer IT services according to pay-per-use methods. A few IT services are provided to customer storage, software applications, and computing power. So for any questions and advice required for deployment in the business model, the service providers provide the unit divisions to the company. As the term "Utility" refers to basic amenities like electricity, water, gas, the basic software requirements for a business model are provided by utility computing. The working, components, properties, and use cases are explained in this article.

How Does Utility Work?

Utility computing is the same as virtualization because the cumulative amount of web storage space along with calculating power is available to the resources is much the larger amount when compared to the one time-sharing computer. The backend servers are available in multiple amounts which are used to do this kind of possible web server. The concerned web servers are applied in the cluster forms which are developed and then given to lease to end-users. The technique of using one unit computation on the multi web server is known as distributed computing. The working of utility computing is easy and simple. The company pays to other companies for its usage of computing services. It includes usage of a particular computer application or some confidential access to computer processing power, rental of hardware components, and data storage space. It is based on the client requirements and the things which can be offered by utility computing. Utility computing is also offered as a package or bundle of resources.

Components of Utility Computing

The few components that are included in the package of utility computing is computer hardware component, software applications, internet access, and cloud systems.

- The computer hardware such as monitors, input devices, servers, CPU and network cables.

- The browsing software and web servers provide internet access.
- The software applications that execute the huge amount of computer mandatory programs such as communication tools, mailbox, report generation, CRM and other project and process-oriented applications and everything that lies in between the client, company and the end-users. The experts from the industries call this process as software as a service.
- Enabling the confidential access to a few processes of a supercomputer. Because few enterprises have substantial computational requirements. The status of the financial company keeps on changing rapidly concerning the updating cycle of the stock market. The normal computers take maximum processing time to retrieve or process the data whereas the supercomputer takes only minimum time to process and execute the information and complete the task as quickly as possible.
- The usage of the grid computing system runs on a unique software is known as middleware. It finds the ideal processing power of CPU and enables an application executing on another computer to retrieve the benefits of it. The bunk of a larger computational system is divided into smaller chunks which makes the user access easily.

- Cloud storage is the offsite data storage that provides reasons for companies to store and handle the data. If the company has to process higher dimensional data, but it doesn't have the space to hold such huge data. so it looks for any third party to save the data offsite. An off-site backup is a smart way to protect the data in terms of catastrophe. Or in case of fire accident to any organization, if the data is stored in some other location it will be helpful to retrieve and use the data.

The price of utility computing varies upon the usage of the company and its requested service. The company charges the client depending on the service they use instead of giving it as a flat fee. The more the client use the services, the more they should pay. Few companies opt for the packing of services at a reduced rate.

Use Case of Utility Computing

The application of utility computing is popular and diverse in many areas from petty shops to large scale industries. The men tailor shop can update his business by providing many web services and online sales and delivery and he can also customize a mobile app for customers to track their orders. The transportation company in Russia deployed a new system to make instant ticket reservations for passengers. The holiday packages and gifts are offered by IBM to manage the traffic surge at thanksgiving time are managed by utility computing and it reached a grand success in that year by enabling the pay as you go policy.

Properties of Utility Computing

The important properties of utility computing are its scalability, demand pricing, standardized utility computing services, utility computing on virtualization and automation.

- Scalability is an important metric that should be ensured in utility computing to provide sufficient IT resources available at any time. If the demand gets extended, the response time and quality should not get impacted.
- Demand pricing is scheduled effectively to pay for both hardware and software components as per the usage.
- The catalog is produced with standardized services with different service level agreements to the customers. So the consumer has no influence on the behind technology on the computer platform.

The web services and other resources are shared by the pool of machines which is used in automation and virtualization technologies. It segregates the network into many logical resources instead of the available physical resources. An application is allotted with no specific predefined servers or storage space of any severs with more memory or free server runtime from the resource pool. The deployment and installation of a new server can be done easily and repetitive tasks and jobs can be automated according to SLA.

Utility computing is a bundle of advantage and treats to any type of business because of their variety of services and the pay per use policy. Therefore all arms open to Utility computing as it will be a key enabler and a possible differentiator when integrated with core cloud services.

Source: https://www.educba.com/what-is-utility-computing/

Transfer Learning - Generalization of Experience

Dr. Deep Suman Dev
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Neotia Institute of Technology, Management and Science

Vision recognition is one of the challenging tasks in computer vision. Vision Recognition can be categorized as Object Detection, Object Classification and Object Localization. Object detection is used to quest for the existence of some pre-learned unique object (e.g. 'cat', 'mango', 'biscuit', 'car', etc.) in the query image. It is also possible that the detected object may be present in the query image for more than one number of times – then those appearances also have to be detected and counted. If the object is present, then it is necessary to actuate the probable class (e.g. 'animal', 'fruit', 'food', 'vehicle', etc.) of the detected object. This is Object Classification. Object localization is a vital step to figure out the actual location of the detected object in the query image, which is to be done very accurately. Object Localization often suffers when the object is not visible fully due to partial occlusion. However, for full occlusion, the work becomes very challenging to predict the appearance of an object in the image.

To detect, classify and localize an object accurately, training data plays a vital role. If the training data is not so informative or impertinent or modest in count, then prediction may not be accurate on contemporary data. The extracted features from the training data, used for detection and classification tasks, must be informative and distinct. So, this will help for better classification pursuance on target domain by gathering knowledge from source domain. In general, traditional methods like SIFT (Scale Invariant Feature Transform), Canny Edge Detector, HOG (Histogram of Oriented Gradients) etc. and local graph structure based methods like LBP, LTP, MBLBP, MVLBP, LGS, SLGS, MVSLGS, AdSLGS, SNLP etc. are used to extract the features. SIFT is used to extract local features or 'key points' on the image. These key points are rotation and scale invariant. HOG is basically used to count occurrences of gradient orientation. Local graph structure based methods are used to extract local features on the basis of close association between image pixels within a fixed image grid area. Size of the image grid area varies for different local descriptors. They extract features both from source and target training samples as input to project a predictive model for target domain. In addition to this, while learning the new domain, novel information can be learnt and training time can be reduced as well. However, it is harder to get ground-truth explications for object detection and object localization in comparison with object classification, just because of the requirement to pin-point the actual area of the object in the image. This can be solved using borrowed knowledge acquired from pre-learned detection and classification tasks and reusing that to train a neoteric object detection and classification task. This transfer of knowledge is known as Transfer Learning.

Challenges in computer vision are often created for the quality and quantity of data available for training to achieve good accuracy. As the knowledge discovery solely depends on raw data, the raw data must be informative, associative and relevant to the context of the problem. Often it has been seen that either data size is huge just because of many redundant appearances of data and presence of irrelevant data or data size is less which is not enough to capture knowledge. This issue can be addressed by transfer learning.

Concept of transfer learning originated from educational psychology. Following the generalization theory of transfer, famous psychologist C. H. Judd proposed that learning to transfer is the outcome when experience is generalized. Transfer of experience can only be done if some commonalities persist between two learning activities. Just like, a person, who has learned how to ride a cycle, can learn to ride a bike faster in comparison to others, because riding of cycle and bike share some common knowledge of riding.

Transfer learning is based on the idea of data sharing. Data sharing does not mean that data will be shared itself, it means, the sharing of knowledge gathered from the data through a model which has already gone through similar or different data earlier.

The main objective of Transfer Learning is to restraint learned knowledge and reusing it for contemporary learning tasks, where domains of pre-learned knowledge and domains of novel learning tasks may share the same feature space or different feature space. Transfer learning reuse the learned knowledge from outputs or parameters of pre-learned models. Knowledge captured from different source domains are literally transferred to the defined target domain. Just like, by solving a couple of mathematical problems we can gather ideas or knowledge and that can be applied for new problems where gathered knowledge may be used entirely or partially. It is eventually seen that to solve a task in the target domain, knowledge can be gathered from completed source tasks of different domains. So, the mapping of captured knowledge from different source domains to target domains needed to be done accurately.

The effectiveness of learned knowledge depends on adaptation of data, which means, how the knowledge is gained from the raw data. Therefore, different possibilities can be raised due to reusability of raw data with different perspectives. Initially, raw data is used by a pre-learned model to capture knowledge. The learned knowledge can be used to predict the target task. However, the target task may adapt the same raw data to gain additional knowledge either before or during feature extraction phase due to the factor of dissimilarity between source and target task.

Knowledge Distillation and Meta Learning are two basic modes of knowledge transfer from source task to target task. Knowledge distillation suggests that outcomes of a large model are reused to train a small model which can be able to confer similar performance like a large model by compact representation of gathered knowledge with smaller number of parameters. Gathered knowledge from a large model is saved in a small model by compressing the knowledge. Dimensionality reduction is achieved by storing captured knowledge from a large model in a minimal number of required parameters used for a small model. In effect, small models can run faster with similar performance. On the other hand, Meta Learning stands for learning to learn. In Meta learning, an algorithm tries to learn by encoding the outcomes of formerly learned source models. This means, the algorithm tries to discover meta knowledge from learned models in a more generalized form to improve the performance on new tasks.

Transfer learning performs well when the source domain and target domain share a significant amount of similarity. However, if the amount of common knowledge between the domains is on the lesser side, then knowledge transfer can be unsuccessful and bring negative impact on upcoming tasks.For instance, learning how to ride a cycle cannot help to know the mechanism to play chess. Sometimes, the similarities between source and target domain may be evasive, which affect the target learner in a negative way. This is known as negative knowledge transfer. This happens because of inefficiency of the learner to find the informative, beneficial and transferable part of the knowledge beyond the domains and lack of congruity between source domain and target domain.

Based on the assumptions for learning method and data association between the domains, transfer learning can be categorized in six major groups: (1) Sample Based Learning method – This method needs a higher rate of affinity between domains. Inter-domain differences are reduced by adjusting weights and these re-weighted instances help to learn target tasks, (2) Feature Based Learning method – In this

method, data similarity between domains are not required. Informative features are extracted to lessen the domain differences and the features help to enhance the performance of regression models and classification, (3) Model Based Learning method – In this method, estimation of data congruence between domains are not enforced. However, sharing of hyper parameters by the domains are checked, (4) Relationship Based Learning method – Presence of analogical relation between the domains is a much needed factor in this method. Also, this method implements knowledge mapping between source domain and target domain, (5) Inductive Learning method – This method assumes that source and target tasks are different from each other. Couple of labelled target training elements are imparted to actuate target task and (6) Unsupervised Learning method – This method assumes both source and target tasks are unsupervised, such as, dimensionality reduction, clustering, density estimation etc.

Further, with respect to discrepancy between domains, transfer learning can be of two types: Homogeneous and Heterogeneous transfer learning. In Homogeneous transfer learning, domains are assumed to be in the same feature space, may or may not be with marginal distributions. When the domains are in the same feature space without distributions, then related data samples from source training set or related source sets from assorted source sets are selected. For having some marginal distributions, source samples are re-weighted to make them fit in the target data distribution. Alternatively, a feature descriptor / extractor can be shared, which will project both source and target data in prevailing feature space to align feature distributions of source and target data. However, this may not work for the problem of sentiment classification, where a word may pose a different meaning in different domains. On the other hand, when domains are from different feature spaces, Heterogeneous Transfer Learning is coming into the picture which requires distribution adaptation, domain adaptation and feature space adaptation. In this type of learning, models can be deployed with symmetric and asymmetric transformations for domain adaptation. In addition to this, the source data is projected in the target data space in such a way the two data distributions become close to each other.

To implement the concept of Transfer Learning, Convolutional Neural Network (CNN) structure is the best choice. The idea, behind the transfer learning in the context of CNN, is to use maximum layers of the pre-trained model (where weights are fixed), gain knowledge from those layers and transfer acquired knowledge to retrain the last few layers with respect to the requirement of the novel task (where the weights are adjustable). In the CNN structure, apart from the input and output layers, the hidden layers of CNN can be designed with a couple of sub-layers, such as, lower layers, middle layers and last layers. Within these sub layers, depending on the need of the model, convolutional operation, max-pooling, min-pooling, average-pooling, normalization and feature extraction operations are framed. For the instance of Face Object detection, the lower layers detect patterns which are formed with lines, edges, dark spots, bright spots. Once the model is trained, the middle layers can detect unique parts of the object like nose, eyes, mouth etc. and by using the captured knowledge in the middle layers, the last layers are able to learn the full face objects with different shape, size, positions and even with partial occlusion. Image areas with different pixel grids are used to extract image features by CNN. Local graph structure based feature extractors are the best candidate to be used for feature extraction in the CNN model. With respect to grid size, features are extracted and extracted features are used to find close proximity. While calculating the features, the close-correspondence between the pixels is evaluated or pixel having maximum or minimum intensity is chosen or even average of all pixels within the grid is calculated. Performance of the CNN models are evaluated with respect to accuracy, precision, recall, confusion matrix, ROC curve etc.

Quite a few well known neural network models such as, AlexNet, Inception, Xception, VGG -19, DenseNet, ResNet, use transfer learning concept for prediction on target task with unseen data. Performance of CNN models is congruous and transcending in comparison with other models with gentle increase in number of

relevant data. The types of data, used to train the CNN model, are primarily categorized into: Real Time Data, Structured Data, Semi-Structured Data, Spatiotemporal Data, Dark Data, Time-Stamped Data, Unstructured Data.

Accurate generalization of experience helps to reuse the gathered knowledge for providing solutions to many real-life problems. Transfer learning can be used for (1) Face Recognition, (2) Fingerprint Recognition (where Intersected or parallel or terminated ridge lines are the main components), (3) Iris Recognition (Iris features become more distinctive by forming different complex and random structures for instance rings, ridges, furrows, freckles, crypts, corona), (4) Health Care Biometrics (Patient Identification, Bio-Medical Image Analysis and Classification), (5) Gesture Recognition, (6) Human Activity Recognition, (7) Melanoma Thickness prediction, (8) Anomaly Detection, (9) Securing Electronic Medical Records with Biometric Authentication, (10) Palm Print Recognition (palm print contains: life line, head line, heart line, girdle of Venus, sun line, mercury line, and fate line), (11) signal processing, (12) Natural Language Processing and many more application areas.

Careers in Artificial Intelligence and Machine Learning

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1. What is Artificial Intelligence ?

The term Artificial Intelligence (AI) speaks for its own meaning Intelligence built artificially. It is all about making intelligent machines that can act similar to human. To build this intelligence into machines requires learning algorithms. This process is called Machine Learning (ML). AI and ML complement each other and form the base of building your career in Data Science domain.

But why do we need other intelligent machines when we already have US-The Human? In this competitive and fast-paced world, automation is the key and is central to the ongoing tech revolution. With automation, organizations save on human hours and increase productivity, throughput, and also reduces human errors.

2. Career options in AI/ML:

It's no surprise that the AI field is an open world of opportunities but too few qualified candidates to fit into the career roles.

2.1. Prerequisites:

The first step towards building a career in AI/ML is to gain the below skills:

- Computer Science: Coding expertise with popular programming languages such as Python, Java, Julia, Lisp etc.
- Physics, engineering, and robotics
- Mathematics: Algebra, calculus, logic and algorithms, probability, statistics
- Bayesian networking (including neural nets)
- Cognitive science theory

The quickest way to comprehend the basics and get started, one can opt for courses on Data Science and Artificial Intelligence. This will help to understand the tools and techniques used, and in no time develop the skills to apply those in solving real-world problems. The training provides the basic understanding of information theory, deep learning, machine learning, neural networks, reinforcement learning, inference, learning algorithms, representation, problem-solving, computer vision, image analysis and many more.

Being from computer science or mathematics background is not a mandatory requirement to start your career in this domain. One can gain those knowledge if one opts for a career in AI/ML. But it is highly recommended to choose the related subjects like AI, ML, Natural language processing, deep learning etc. during their graduation, if one is already clear on selecting the data science path.

2.2. Roles in AI and ML domain:

- **Big Data Engineer:** Responsible for creating an ecosystem to effectively administer big data and to efficiently interact with big data to obtain outcomes in a robust manner.

- **Business Intelligence Developer:** Responsible for assessing the complicated dataset to recognize different business trends. Also responsible for optimizing different processes and workflow to swell the profit of a company.

- **Data Scientist:** Responsible for gathering relevant data to interpret constructive inference to tackle various business issues.

- **Machine Learning Engineer:** Responsible for creating programs and algorithms that enable machines to take actions without any direction.

- **Research Scientist:** Responsible for designing, undertaking, and analyzing information from controlled laboratory-based investigations, experiments and trials.

- **Robotic Scientist:** Skilled professionals who carry out research, design, and development of robotic systems.

- **AI Engineer:** Responsible for solving problems by developing, testing, and applying different artificial intelligence models.

3. Online Resources and training to do the Certification

If you are looking for a certified and structured course, below are a few learning sites that provide ample of them:

- Udemy
- Pluralsight
- upGrad
- SimpliLearn.com
- Udacity
- Edureka etc.

To just get started, and get slight idea for this domain and to build your interest on, sharing few free training links below:

Free courses:
https://courses.analyticsvidhya.com/courses/introduction-to-ai-ml

Coursera:
https://www.coursera.org/learn/ai-for-everyone
https://www.coursera.org/learn/machine-learning?action=enroll

Threads .....Demystified

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"The world has changed . It has changed far too fast in the last decade or so than ever before", said my friend while sipping over a cup of coffee early Sunday Morning. He was there at my place for a day or two before departing for Bangalore. As I reflected on the wonderful moments that we shared since a long time, a simple fact kept on humming into my mind. The speed of change that we have been through. Change… change in technology, the TV, Cable, Pager, Cell phones , Satellite TV, smartphone, ahhh!!!Digital world , the i in Internet. Did you say Alexa?? Ahh!! Why not?

Guys, stop treating Internet as some information library or bible as if the internet is some statue in a museum that amuses us. No, we wanted Internet to be active not passive . We want us to shop, buy, browse at stuff ,pass comments , chat , in other words interact , be dynamic. Internet and static info only. Gulp!!

Assuming that we do a little time travel to the early nineties, it would be hard to perceive how internet would even be possible. Why? Imagine, Silly , Billy , John and Joe and my worthy self all want to access a site,(apologies) web-site all at the same time. Making a request to such a page with every request being processed independently and completely before another request is processed !!

Imagine the delay in response!!!! Ufff !! Frustrating … well that's process based architecture. Its disciplined , does one task at a time but makes people wait for far too long. This was to be the future of Internet ???!!!

Something's wrong thought Sun(..ahem Sun Microsytems) . Sun wonders on this problem while deciding to buy some veggies. As he visits the vendor, he observes that the vendor is ever smiling , catering to the needs of not any one customer but to all. He patiently listens to the needs of one customer than switches over to the next and to the next and to the next and cycles back to the first customer. Wallah!! that's it, thinks Sun. If we could divide the requests or processes into tasks and align the tasks in a manner such that each task of each process gets a chance to execute in the first pass, followed by a second pass and a third, then this could well cater to everyones needs and everyone would be happy. Imagine task1 of process1 connected by an invisible thread to task1 of process 2 and connected by the same thread to task3 of process3.

Well , Sun found the Thread , yes, Threads as we know in Java.
Its lightweight, improves performance , generates faster response per request and is efficient as threads share the same address space.

Do threads have a life cycle ?
Yes , they do !!

- New àLike a child is born so is a thread born and inherits the properties of the Thread class or the runnable interface
- RunnableàThe parent of the child are enthusiasts and wants the kid to participate in a 100 m dash. So do many parents and their kids. Well we have a problem. The number of racing tracks is 8 . So only 8 kids can run at a time. Well, count the number of kids please ?? 24 says the count. So the kids are grouped into 3 groups with 8 in each. Threads are grouped in a similar fashion and put into a pool called the runnable pool.
- Running à Time to test their Stamina…. Well here go the kids at the shot of a gun. They are running. Threads also are made to run inside the run() until interrupted.

- Interrupted/Sleep à While the kids are running , one of the kids come out of the track seeing his favourite ice-cream vendor on the field. The kids got interrupted . Threads can also be interrupted or put to sleep (lie dormant) before they are invoked. Once invoked they need to get back to the runnable pool.
- Dead à The kids are almost near the finishing line…. Done. They have finished running and cannot run another event. A thread once executed is dead and cannot relive to execute again.

But can two threads be serviced at the same time?

More than one thread should not be serviced at the same time. Why?

That's why we have a Thread Monitor. Imagine a railway station with a single platform only and a single track as our Thread monitor. Only one train can halt at the station to be serviced and replenished at a time. So only one thread can be serviced or locked once it enters into the monitor.

Assume three tracks that converge into one track at the station and diverge out into three tracks. Given all signalling systems in place , assume that three trains arrive on three tracks almost at parallel . All three trains would be made to halt and only one train allowed to pass into the station to be serviced . Assuming that the trains are threads , three threads lie in wait with only one thread being allowed to enter into the station for a specific time period. It is important to note that the train that has waited for the least time may be allowed first (flip side of threads) or otherwise, the discretion of which depends on the signal man and on many other factors.

While two trains lie waiting , three things can happen

- The trains that lie in waiting honk the life out of the train being serviced and want it to move (release the lock) out of the platform.

- The train that has finished servicing notify to any one train that is waiting to be ready to get into the station.
- a.The train that has finished servicing notify to all trains to be prepared to enter the station.

If trains are Threads, then a thread unlocks or releases hold over the resources as it exits the thread monitor(Railway station).

Making threads Wait(block) while servicing a thread is the key to success in real life commercial transactions. Assuming that there is only one seat empty for a given show and there are many users wanting to book that one seat, an asynchronous thread would lead to the possible sale of one ticket to many customers. Therefore, Synchronizing Threads will lead to blocking many threads while allowing a thread to service. This means that while the user who is locked with the resource does not commit or abort the transaction, other requests / users have to wait their turn until the locked on user commits or aborts. This guarantees only one transaction even if there are multiple requests.

Well, hope to meet you guys in our next edition!! Till then …

Business Model of UBER

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Nowadays it has become quite common in booking a cab from the UBER app in our android devices, it has several advantages such as -

- We can get a reduced cab fare due to competitive pricing from other few cab booking applications.
- It is convenient and cashless.The passengers can get a no-refusal cab ride, while the drivers can work throughout the day with more flexibility.
- It has now become quite easy in travelling even outstations just by booking a cab through this Uber application. Just by selecting a few options from our android device, a car will be ready at our doorstep.

But we hardly know how this branded company Uber runs its services. For those who don't know much about Uber, they think that they have called a taxi through the Uber app from their smartphone, and soon the cab arrives for pick up. They think that the Uber company must have sent that cab. But actually, it doesn't happen that way. The company does not own any cars on their own.

Uber is merely a technology company, who's application we have on our smartphone and it works by connecting drivers and riders. It builds a communication channel between a person who wishes to use their car as a taxi and another person who wishes to travel to a particular location. Uber's role is more prominent where we are unable to get any local taxis. Suppose if you are willing to travel to a destination and due to unavailability of any local taxi or refusal of the taxi drivers, you are stuck midway, in that case Uber cabs come with their efficient and non-refusal service. Uber also provides a part-time employment opportunity to people who wish to use their personal car as a taxi.

In normal taxis, the fare is calculated after the ride completes based on the meter, but Uber uses its own algorithm to calculate the fare.

*{Base Fare + (Cost per minute * Time) + (Cost per kilometre * Time)} * Surge multiplier + Booking fees*

The concept of surge multiplier is truly ground breaking. The thing is, when Uber started out, they saw that in some places there are more available drivers but not sufficient riders, while in some places there are more riders but not sufficient drivers. The authority decided to balance this with surge pricing. They divided the entire city map into hexagons, then in each hexagon they compared the number of drivers with the number of riders. In hexagons where there were more riders than drivers, they decided to apply a surge multiplier in price. If suppose the surge multiplier is 3X, then the final cab fare would increase upto three times. This increases the motivation of drivers to take their car into that location where they would get an increased fare. However, this surge multiplier comes down automatically when a balance between number of drivers and number of riders meets up. Out of the total fare of a cab ride, Uber charges 20-25% as its commission and the rest is handed over to the driver.

However, the problem arises with places where there is scarcity of cars. Either the company could give loans to people for buying cars or they could give away the cars as lease and rent them. In those places, the authority decided to launch a new feature of giving cars someway or the other, naming it as Uber XChange. Under this program, if a person doesn't own a car but he wants to become a driver in Uber, then he can lease a car from Uber by paying a weekly rent to the company.

Uber has also launched a Fleet Model. In several car rental companies, all of their cars are not always rented. These companies having multiple idle cars are called fleet owners by Uber. Uber decided to connect these fleet owners with the drivers, so that the drivers can use the idle cars to earn for themselves, while the rental companies can rent out their cars, and in this case too, Uber becomes a linking platform between the two. This fleet model works in two ways :

- The fleet owners rent out their cars to drivers and the drivers have to pay a rent to the fleet owners weekly. In this case, Uber earnings go to the driver.
- The fleet owners rent their car and give salary to the driver, and the Uber earnings directly go to the fleet owners.

For Uber India, the largest fleet owner is a company called Everest Fleet. They lease out thousands of cars to Uber drivers, to generate profits and income.

However, the several business models of Uber are now successful all over the world. Uber is now recognised as one of the top tech companies.Not only the company is concerned about its own profits, but also provides employment opportunities to several people and helps in arranging a flexible ride for any person.

UPI Scams

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UPI or Unified Payment Interface, is an app developed by the National Payments Corporation of India and nowadays, supported by all major banks in India, such as SBI, ICICI, Axis Bank, HDFC Bank, Punjab National Banks, and many others.. Using this, money can be transferred quite easily from one bank account to another instantly. Using such a single-window mobile payment system, there is no need to enter bank details or sensitive information again and again while processing a transaction. UPI is supported by third-party apps such as GooglePay, PhonePay, PayTM, Mobikwik and a lot more. To use these applications efficiently, often we have to link our bank account to generate an UPI id on the app for carrying out all transactions successfully. To make this process further secure, we need to create a 4-digit pin while linking our bank account, and during every transaction we just need to verify this pin.

As the adoption of digital and online payment becomes widespread all over the world, money can now be transferred from one person to another, even from different banks, without giving complex bank details and having proper re-verification. Now that all can be done just with a simple click of a button, this has also led to an exponential increase in scams using UPI. Often when we hear about scams, it feels that only uneducated or unaware people become victims to such scams, but also in certain circumstances, with the right amount of time pressure and psychological pressure, anybody can get stuck into these scams regardless of the awareness level of the person.

Two of the main reasons why people fall victim to these online payment scams are - Time Pressure and Psychological or Social Pressure. The scammer stays in a phone call with the person continuously, and convinces him that he is short on time and wants to complete this payment process as soon as possible. Under this pressure, that person falls in the trap of the scammer and makes mistakes out of hurry. Secondly, in many cases the scammer builds up trust with a person by showing a fake identity of any government official. There is social pressure when we're talking to someone whom we consider to be somewhat superior to you. And if a person is convinced by this, he'll fall into the trap of the scammer and make a false payment under psychological pressure. In fact a similar case had happened with the daughter of a government employee. It was reported that she was trying to sell a second-hand sofa on an online platform. The scammer pretended to be interested in buying that product, then asked her to scan a QR code to get transferred the agreed amount into her bank account. Unluckily she fell into this scam and lost a huge sum of money. These scams are often termed as Social Engineering Scams because the scammers just try to manipulate the people for their own benefits.

Now the question arises, how can we secure ourselves from these online scams ?

In cases where the scammer uses a QR code, we just need to remember two important points. While we are paying someone from our bank account, then we need to enter an UPI pin for verification but when we are about to receive payment from an individual, there is no need for any UPI pin. Perhaps the scammer may try to convince us that the money will be deducted first and then refunded double, but we should be confident in ourselves and not easily trust them. Often the scammer puts the symbol of a watch in the QR code to convince an individual that there is

a shortage of time or they try to emotionally manipulate them, but we need to be very careful in such situations.

We should remember that we should not share our One - Time Password (OTP) or UPI pin with any unknown person. Similarly, we must avoid giving out our credit card details as much as possible. In certain websites we need to provide credit card details for successful transactions, but in that case we need to check if there is a lock symbol present in the website address bar. The lock symbol highlights that the ongoing transaction is highly secure.

Under any circumstances, we should not trust any unknown person while having a transaction, or avoid providing them with financial or personal details. We should not be under any time pressure while having any deal. If we give ourselves some time to think, we can easily introspect the situation and then make the right decision.

Uncovering the States of A Cyber Attack...

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The world witnesses one cyber attack every 39 seconds (source). Yet,Guest Posting more than 95% of the cyber attacks are due to user error. This statistic shows that people do not understand how a cyber attack works. Cyber attacks launched by unethical hackers and malicious criminals attack mobiles, laptops, multiple computers, and entire networks. The objective is to disable computers and steal sensitive data. Some assailants take our computers and other resources to launch other attacks on other unwary businesses. Cybersecurity experts counter these criminals through tools and precautionary methods.

Types Of Cyber attack Untargeted Cyber Attacks

Some indiscriminate cyber crooks launch large-scale attacks. They disable as many devices, users, and services as possible. In certain cases, they exploit any vulnerability or configuration error in a commonly used software to victimize a large number of machines. These attackers know all about the various online loopholes and vulnerabilities.

Phishing experts send out innumerable emails soliciting bank details. They also encourage victims to visit fake websites.

Some fraudsters set up fake websites to earn a quick buck, and others even hack into legitimate business sites to exploit the customers.

Ransomware attacks disable or take over devices. The key for decryption comes for a ransom payment. However, in most cases, the attack refuses to give complete control and request for more ransom.

Scanning tactics include listening to address ports and services. The criminal discovers loopholes to later launch a targeted attack.

Targeted Assaults

These are tailor-made attacks that target specific systems of a business network. The perpetrator can be a disgruntled employee, former partner, mercenary, or a criminal. These assaults cause more damage as they target specific processes, systems, and personnel.

Spear Phishing, malware attachments, and download links are the common traps.

Botnet devices are helpful to orchestrate a Distributed Denial of Service (DDOS) attack. Specific servers, networks, and services get targeted to disturb or overwhelm the normal traffic. Around 43% of the attackers focus on small businesses only (source).

Supply chain attacks focus on vulnerabilities like sensitive data, products, and software. Rootkits and hardware spies disrupt government or large business operations.

Various Stages Of Attack

Cybercriminals use sophisticated software like web shells, stealers, frameworks, trojans, and obfuscators. Their objective is to infect systems, steal data, collect ransom, and disrupt activities. In some cases, the attacker does not steal it but encrypts it, thus rendering it useless for the owner without the key. If the ransom goes unpaid, they either delete the data or share it in the dark web, ruining the reputation of the company. But achieving these goals requires persistence and snooping abilities. Dedicated fraudsters probe and exploit weaknesses in multiple stages. Cybersecurity experts dig deeper into four

main stages to prevent, detect, and resolve these criminal activities.

1. Survey: Information collected and analyzed to identify the target's vulnerabilities.
2. Delivery: Identifying the point in the system to exploit the known weakness.
3. Breach: Security breach through unauthorized access to gain control.
4. Affect: The predefined goal of either stealing or encrypting data.

Security specialists establish effective defense mechanisms to stop the attacks. Let us look at each stage to understand what happens during a cyber attack.

Survey Stage

Attackers collect procedural, physical, and technical information that reveals weaknesses. These details come from social media platforms like LinkedIn and Facebook. On the other hand, hackers also rely on domain name services and search engines. They use toolkits and scanning software to figure out an organization's security systems and computers.

Company employees are also a good source of information for criminals. Naive users reveal sensitive details on tech forums. They also recklessly share documents with crucial details like author, file location, software version, etc. Some hackers befriend employees to elicit key information on vulnerabilities.

Delivery Stage

The attacker designs a solution or strategy to exploit the vulnerabilities. He uses malicious software to breach security. DDOS attacks make multiple connections to a computer. This plan effectively prevents authorized users from accessing the system. Some other delivery tactics include.

Hack into an online store or e-commerce site.
Distribute infected USB sticks at trade fairs.
Send malware code attachments through email.
Invite the victim to a fake website using email links.

Breach Stage

This stage is an early-stage violation that focuses on unauthorized access. The breach is achievable by using these exploitative methods:

- Malware: A system's operations get affected by making illegal, disruptive changes.
- Stealth: Accessing restricted sites and online accounts by stealing passwords.
- Backdoor: Hacking into parental and remote control mechanisms to take control.
- Impersonation: Pretending to be a victim to gain access to a PC, tablet, or smartphone.
- Insider Threats: Use or compromise an employee for unhindered access.
- Physical Attack: Enter the office, sit before the system, and gain access.

Affect Stage

This stage is the final and dangerous one that leads to a persistent presence. The criminal consolidates by expanding his access and control. He gains administrator access and automatically scans the entire network. He also disables and enables system monitoring processes during this stage.

So…. Be alert … know , empower others and be empowered !!

Revealing the States of A Cyber Attack...

The world observers one digital assault like clockwork (source). Yet,Guest Posting over 95% of the cyberattacks are because of client blunder. This measurement shows that individuals don't have the foggiest idea how a digital assault functions. Digital assaults sent off by exploitative programmers and pernicious crooks assault mobiles, workstations, different PCs, and whole organizations. The goal is to handicap PCs and take delicate information. A few aggressors take our PCs and different assets to send off different assaults on other unwary organizations. Online protection specialists counter these hoodlums through devices and preparatory strategies.

Sorts Of Cyber attack Untargeted Cyber Attacks

Some unpredictable cybercrooks send off huge scope assaults. They handicap as numerous gadgets, clients, and administrations as could really be expected. In specific cases, they exploit any weakness or setup mistake in a usually utilized programming to deceive countless machines. These aggressors have a ton of experience with the different web-based provisos and weaknesses.

Phishing specialists convey endless messages requesting bank subtleties. They likewise urge casualties to visit counterfeit sites.

Some fraudsters set up counterfeit sites to procure a fast buck, and others even hack into genuine business locales to take advantage of the clients.

Ransomware assaults handicap or assume control over gadgets. The key for unscrambling comes for a payoff installment. Nonetheless, generally speaking, the assault will not give unlimited authority and solicitation for more payoff.

Examining strategies incorporate paying attention to address ports and administrations. The crook finds provisos to later send off a designated assault.

Designated Assaults

These are tailor-made assaults that target explicit frameworks of a business organization. The culprit can be a displeased representative, previous accomplice, soldier of fortune, or a crook. These attacks cause more harm as they target explicit cycles, frameworks, and work force.

Skewer Phishing, malware connections, and download joins are the normal snares.

Botnet gadgets are useful to coordinate a Distributed Denial of Service (DDOS) assault. Explicit servers, organizations, and administrations get focused on to upset or overpower the typical traffic. Around 43% of the aggressors center around private ventures just (source).

Store network assaults center around weaknesses like touchy information, items, and programming. Rootkits and equipment spies upset government or huge business activities.

Different Stages Of Attack

Cybercriminals utilize refined programming like web shells, stealers, structures, trojans, and obfuscators. Their goal is to contaminate frameworks, take information, gather recover, and upset exercises. At times, the aggressor doesn't take it yet scrambles it, in this manner delivering it pointless for the proprietor without the key. In the event that the payment goes neglected, they either erase the information or offer it in obscurity web, destroying the standing of the organization. Be that as it may, accomplishing these objectives requires tirelessness and sneaking around capacities. Devoted fraudsters test and take advantage of shortcomings in different stages. Online protection specialists dig further into four fundamental stages to forestall, identify, and resolve these crimes.

1. Review: Information gathered and investigated to recognize the objective's weaknesses.
2. Conveyance: Identifying the guide in the framework toward exploit the known shortcoming.
3. Break: Security break through unapproved admittance to acquire control.
4. Influence: The pre-characterized objective of one or the other taking or scrambling information.

Security experts lay out viable safeguard components to stop the assaults. Allow us to take a gander at each stage to comprehend what occurs during a cyberattack.

Overview Stage

Aggressors gather procedural, physical, and specialized data that uncovers shortcomings. These subtleties come from online entertainment stages like LinkedIn and Facebook. Then again, programmers additionally depend on space name administrations and web indexes. They use tool stash and checking programming to sort out an association's security frameworks and PCs.

Organization representatives are likewise a decent wellspring of data for crooks. Guileless clients uncover touchy subtleties on tech discussions.

They additionally foolishly share records with essential subtleties like creator, document area, programming rendition, and so forth. A few programmers become friends with workers to evoke key data on weaknesses.

Conveyance Stage

The aggressor plans an answer or methodology to take advantage of the weaknesses. He utilizes pernicious programming to penetrate security. DDOS assaults make different associations with a PC. This plan successfully keeps approved clients from getting to the framework. Some other conveyance strategies incorporate.

Hack into a web-based store or online business website.
Appropriate contaminated USB sticks at exchange fairs.
Send malware code connections through email.
Welcome the casualty to a phony site utilizing email joins.

Break Stage

This stage is a beginning phase infringement that spotlights on unapproved access. The break is reachable by utilizing these shady strategies:

- Malware: A framework's tasks get impacted by making unlawful, problematic changes.
- Covertness: Accessing limited destinations and online records by taking passwords.
- Indirect access: Hacking into parental and controller components to assume command.
- Pantomime: Pretending to be a casualty to get to a PC, tablet, or cell phone.
- Insider Threats: Use or compromise a representative for unhindered access.
- Actual Attack: Enter the workplace, sit before the framework, and get entrance.

Influence Stage

This stage is the last and hazardous one that prompts a steady presence. The crook unites by extending his entrance and control. He acquires executive access and naturally checks the whole organization. He additionally debilitates and empowers framework observing cycles during this stage.

So… . Be ready … know , engage others and be enabled !!

Source: ***https://signal8securitymalta.com.mt/targeted-vs-untargeted-cyber-attacks/***
https://www.kensleycollege.ca/cyber-attack

What if we knew Literally everything?

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I'll bet that you've heard about this concept that we only use 10% of our brain's potential and if we should do more than that, we'd have superpowers, teleport and maybe time-travel. This is a century-vintage myth that got everybody addicted to the concept that if we had more knowledge, we should surpass Einstein.

It all goes back to the Eighteen nineties, when a psychology professor at Harvard claimed that humans don't attain their complete ability. His declaration received a ton of momentum and started spreading. In the 1920s, a self-assist movement began based on that notion, where a ton of books came out looking to encourage humans. but the 10% myth changed into a misinterpretation of neurological research in the 19th century. Neurologists have now disproven it, pronouncing that on any given day, we're capable of using 100% of our mind. So, what could manifest if we gained infinite knowledge?

You've woken up and you experience differently.You scan around your room and notice the plant you bought two months in the past. abruptly you know its name, what plant species it is, while it got here into lifestyles on the earth, and the way it grew from a seed. you think its life flashes earlier than your eyes. Then, at the corner of the room you catch a short glimpse of the guitar your mother got you from a thrift save. you notice how it became manufactured decades ago and who purchased it first. You listen to the songs performed on it app.

Round a campfire and the way the proprietor ended up giving it to charity. but then, you see its future. You'll accidentally break it in 3 years even as you're moving out of your parents' house. You head downstairs and meet your brother within the kitchen. you see him talking with your mother about whether he's completed his homework the night time earlier than. You're greatly surprised! Now it's not best to do what homework he had, however you could also tell that he's lying, and you may study his thoughts.

Now, don't get me wrong, there may be some benefits to becoming a real-life encyclopaedia, however there can be a disadvantage too. Our brain is sort of a super fast processing laptop with a ton of storage. greater than a billion neurons connect to create the community that makes up our mind and the way we understand the world.

Your mind is chargeable for your sleep, your goals, your urge for food, and each move you're making. Our expertise capacity is enormous. If we had limitless records, we may want to discover a way to live forever. Perhaps our mind could create a black hole, or explode. That'd be thoughts-blowing on its own. The entire capacity of the human mind isn't fixed, however a few researchers estimate it to be 2.5 petabytes. So, if our mind becomes a pc it is able to keep up to 300 years worth of movies.

Let's return to your room and consider that you have all of the knowledge within the world. There are 3 possible results in that situation. One is that you'll remorse it right away. You won't be able to address all the expertise due to the fact you'll in all likelihood examine something you didn't want to realise. You'd be aware of everybody's mind, emotions, what's going on around the world at any given time, and what's

approximately to occur. So, it can be adverse in your own experience of self.

The other possibility is that you'll feel superior to all of us. You'd realise the final results of any action before it takes place, and you can examine human minds. Because of this, every outcome can be expected. You'd already recognise every choice a person will make, even before they do. So, it'd be like watching a film in actual existence. And if no one else is superior to you, then this sort of thing ought to manifest. You'll change into a supervillain in which you use your knowledge for evil; oryou strive to assist the entire earth.

The second one will weigh you down. You'll have to care for more than just one individual. I imply, it's difficult enough for me to preserve one Sim character alive. believe having to do that with 7 billion people – in actual life. The 1/3 possible outcome is that you'll lose your humanity. That's a continuation of the second scenario. Countless understanding is something no human has ever skilled. You'd see what takes place beyond the universe. You'd recognize other smart life and alien civilizations. You'd even be aware of whether or no longer we've souls. Then, you wouldn't be capable of enjoying the feelings that make us human; along with surprise, hope, surprise and fear. Our emotions are based totally on the unknown. So if you recognise the entirety, it'd be not possible to enjoy them. You'd emerge as an emotionless robotic creature. One solution is to ignore what you simply discovered, and act like it isn't there. but for a way lengthy? in case you're aware about the final results of an event, how could you be able to forget about it? Even then, that's the least of your problems.

Remember the neurons told you about earlier? Well, memories are fashioned through billions of their connections. These connections are known as synapses, and they can come to be stronger or weaker. On the way to form a memory, the brain makes use of two strategies: chemical and electrical synapses. The chemical synapses ship information through a neural pathway. consider it this manner: one little neuron releases molecules inside a small space and the neuron next to it picks it up.

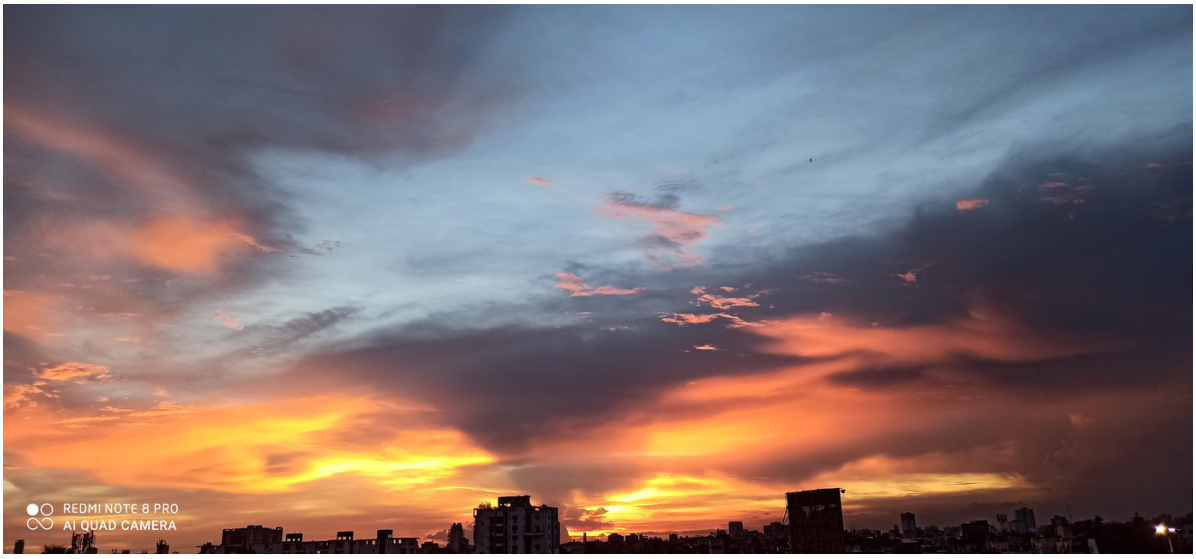
Now, in an electrical synapse, there's an opening among neurons. So, proteins create a hyperlink to connect the two. electrical synapses don't move a long way, but they're speedy. They're the ones we use while we want to respond immediately. The chemical one is for processing data that doesn't require you to act right away. So, in case you needed to study all the data within the global immediately, you'd only use electric synapses. And if endless understanding has been to tour through your brain, it'd overload it. There wouldn't be sufficient pathways available for it to go through. So, automatically, your thoughts will select the data that's important and delete the rest. meaning you won't understand everything after all.

But for the sake of argument, let's say that your mind has a powerful CPU and big processing talents. What takes place in your memory? memories are our way of telling time. The greater we've stored in our mind, the extra we've lived and experienced. That's why time seems to skip slower while we're in elegance gaining knowledge of new matters than while we're out having fun. Imagine yourself in class looking at a clock. when you watch the seconds pass through, they seem to be transferring slower and slower. Your brain is filled with statistics as your eyes move. while the pointer lands on the next second, you're nonetheless processing data; and it seems like time is slowing down. in case you were to utilise countless knowledge all at once, your memory could process that data forever.

Consider how your laptop freezes when you import all the data at once. The same factor might occur in your thoughts. Time will freeze and so will your brain. but, additionally ignore these biological obstacles! Can we forget about physics too? Now, let us go back for a second. while you're seeking to examine the entirety, the electric synapses will ought to create the recollections . We have many more problems there. Your brain gets beaten with the flow of electrons, then neurons will start capturing alerts like crazy. The proteins will struggle to keep up, so everything will pass down the same pathway. And that won't last for long. The proteins will warm up like an electrical cord because of resistance and that they'll get destroyed by way of the current. And that is when gravity comes into play.

Your mind is now a small location with an infinite number of electrons unlike several subatomic particles, electrons have a mass, and therefore gravity. So, a finite area plus limitless electrons will create a black hole. as the knowledge starts to make its way through your brain, the countless electrons will create a gravitational pull and begin to suck in the whole thing around you including your plant and your guitar and your brother's homework. but your issues won't stop there. There's a principle that black holes can only grow.

But on this occasion, something referred to as Hawking Radiation will be more applicable, where the black hole will evaporate, and so will your brain. So, it's settled! we can't beat biology or physics, it's generally the alternative way around. I don't know all of the knowledge on the earth, including predicting the destiny looks like loads of work.



PIXEL SATELLITE - SHAKUNTALA

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Pixel is an American and Indian non-public aerospace company. Several satellite views of the earth's orbit around the scheme are targeted. The beginning of the start-up was best to qualify for the 2019 Techstars Starburst Space Accelerator in la. This was started in February of 2019 by Kshitij Khandelwal and Awais Ahmed, BITS pilani graduates.

History

Pixel's first satellite, Anand, turned at the start, scheduled to be released in late 2020 with the Soyuz rocket. It later entered into an agreement with the Indian country NAIL to use the PSLV rocket to launch it in early 2021. The launch on board PSLV-C51 was delayed in February 2021 thanks to technical troubles. it's now predicted to be offered on a board. PSLV-C53 / EOS-06 function. Pixel unveiled its first 3 satellites with a payload-hosted partnership with Lithuanian firm Nano-Avionics in 2021. Pixel launched its 2nd satellite, Shakuntala / TD-2 to Space-X Falcon-9, Transporter-4 on April 1, 2022. Anand and Shakuntala are a part of a three-satellite platform that Pixel plans to release. It plans to release 6 satellites within the half of 2023 and another 12 by the last month of 2023. Pixel has announced that it will offer the perfect decision of business hyper-spectral photos to be had. Raised over $2.3 million extra in March 2021 at Techstars, Omnivore VC et al.. This adds to the $5 million amassed in August 2020 from speed of light Ventures et al.. Canadian corporation Radical Ventures paid $ 25 million in investment in March 2022. Awais Ahmed, Pixel's lead officer, advised Mint that the discharge would now complete the second release of their first technology satellite, spoken as Anand, in an impending experience with the Indian Space Research Organization (ISRO). The latter is anticipated to launch India's Earth Observation Satellite (Eos) -6, a part of the Indian Oceansat program, within the coming months.

The Eos-6 is also the most payload for the ISRO's Polar Satellite Launch Vehicle (PSLV), further because of the Pixel's Anand satellite that's one among the 2D-technology satellites. However, with Oceansat's work being delayed, the discharge of the Eos-6 may miss the discharge window in April 2022.

Hyper-spectral Image

Hyper-spectral imaging and remote sensing refers back to the seizure and processing of an intensive range of wavelengths, permitting satellite imagery to work out massive amounts of earth statistics. Ahmed said that after the launch occurs, the satellite would take about an hour to function on Earth's low-orientation. "The path is about 520 km above Earth. For the next weeks after delivery, we will do technical tests to create sure they're so as. a few months later, perhaps in May, we are going to start imparting facts values to our clients for instance the competencies of our services ", Ahmed delivered.

Ahmed also showed that after launches in 2022, Pixel will appear to complete six launches within the primary sector of 2023. This might be in the middle of 12 extra launches by the tip of 2023, which will boost the enterprise's average census.

About TD-2

Weighing in at much but 15 kilograms, the TD-2 is capable of capturing orbital pictures with greater than 100 and fifty colour bands from the location and spectrum with a distance of 10 meters in keeping with the pixel, exceeding a specification of 30 meters

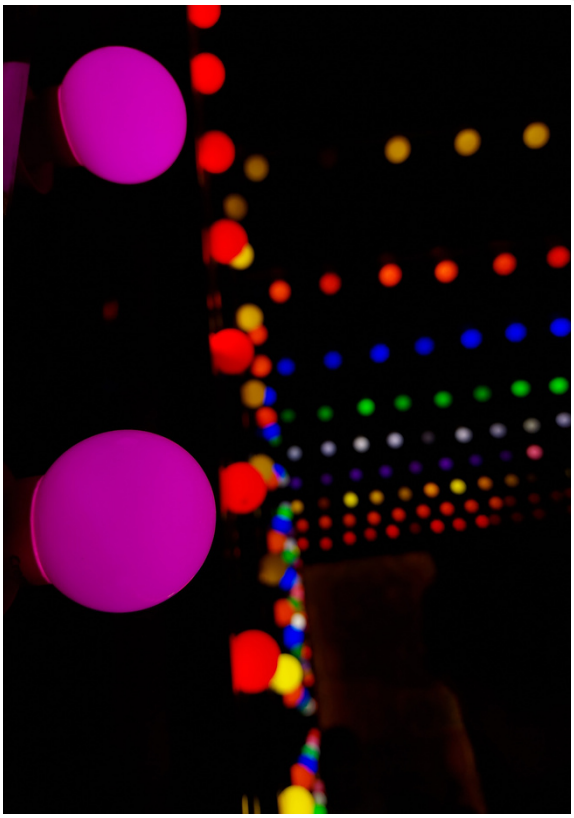
in line with pixel hyper-spectral satellites. Offered by some select businesses consisting of NASA, ESA, and ISRO, the agency stated.

Objective

"In only some weeks after the discharge, TD-2 will begin collecting information and revealing diffused changes which may be inflicting harm to our planet like herbal fuel leaks, deforestation, melting snow, land pollutants and deteriorating planet fitness".

The launch of the primary-of-its-kind Pixel satellite marketplace will be released in early 2023 with the sale of its information. With six satellites flying within the sun device (SSO) at 550-km altitude, Pixel's hyper-spectral constellation can be able to cover any part of the world every 48 hours.

With more satellites scheduled for release in late 2023, Pixel will reach global coverage in early 2024. Lessons from the refined statistics of our galaxy will supply us a top level view of the world ecosystems and biospheres so as to be used. "AI-enabled analysis, which enables us to construct virtual twins round the sector".



The epigenetic regulations in cancer cell

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Abstract:
Epigenome-wide association studies (EWAS) allow researchers to find epigenetic variations across the genome that are linked to cancer. Epigenetics refers to the processes through which mitotically heritable alterations in DNA and chromatin regulate gene expression without changing the nucleotide sequence. In cancer cells, epigenetic regulatory mechanisms can become messed up. Tumor suppressor genes, oncogenes, and cancer-associated viral genes are all affected by this sort of gene dysregulation. Epigenetic alterations, particularly DNA methylation, histone modification, particularly histone acetylation and deacetylation, and miRNA expression, according to the data, may play a role in cancer aetiology. Epigenetic alteration, such as DNA methylation, is becoming more well recognised as a key factor of gene transcriptional control with both heritable and acquired properties. In tumour cells, genomic methylation patterns are commonly changed, with global hypomethylation often accompanying it. When a tumour suppressor gene's promoter is hypermethylated, the linked gene's expression can be inhibited. One of the first and most prevalent occurrences in carcinogenesis is abnormal DNA methylation patterns.

Background:
Epigenetics is a discipline of biology that investigates the causal connections between genes and their products that result in the phenotype. Not the gene sequence, but the tridimensional folding and packing of DNA and related proteins, referred to as chromatin, are influenced by epigenetic events (16). The epigenetic state of cells has two distinct properties. To begin with, unlike somatic mutations and other genetic modifications, which modify genes irreversibly, epigenetic processes are reversible, allowing cells to adapt to different microenvironments (1). Second, chromatin structure is inherited, and the chromatin state possesses an innate memory that is passed down over cell generations in the absence of disturbances. Epimutations may alter early cancer events, which could trigger future events in the disease's evolution, according to a new perspective on cancer epigenetics (2). Both aberrant silencing (for example, silencing of tumor/metastasis suppressors) and reactivation of suppressed areas are epigenetic aberrations in cancer (which leads to oncogenic activation). Comprehensive sets of chemical modifications that occur at both the DNA and the histone tails determine the genome-wide epigenetic status ("epigenetic landscape") of cells (3). Histone modifications include methylation, acetylation, phosphorylation, ubiquitination, and protein isomerization, and there is a wide range of chemical variation. Chemical changes can change the physical characteristics of DNA and/or related proteins, hence modulating chromatin structure (4).

Epigenetic alterations, particularly DNA methylation, histone modification, particularly histone acetylation and deacetylation, and miRNA expression, according to the current data, may play a role in cancer aetiology. Epigenetic changes, like as DNA methylation, are becoming more well recognised as key determinants of gene transcriptional control with heritable and acquired properties (5,6). In tumour cells, genomic methylation patterns are commonly changed, with global hypomethylation often accompanied by region-specific hypermethylation events. When a tumour suppressor gene's promoter

is hypermethylated, the linked gene's expression can be inhibited. One of the first and most prevalent occurrences in carcinogenesis is abnormal DNA methylation patterns (7,8).

Phosphorylation of histones adds negative charges to them, whereas acetylation simply reduces the quantity of positive charges in chromatin. Chemical changes could function to unravel the DNA from the histones, enhancing chromatin relaxation, because the DNA helix is negatively charged. Chemical changes, on the other hand, serve as binding platforms or epitopes for specific endogenous proteins (9,10,11). The interactions between "DNA methylation" and "histone methylation" provide regulatory opportunities for the physical transmission of epigenetic marks along the chromosome (spreading) and for the transmission of epigenetic marks from a mother cell to a daughter cell (epigenetic inheritance), as well as defining crosstalks of multiple epigenetic constituents. Tumor cells exhibit multidimensional aberrations impacting multiple levels of control, including genetic abnormalities as well as significant epigenetic changes. The “cancer methylome” is therefore distinct from normal, nontransformed tissue (12). The epigenetic dysregulation of tumour cells, which includes abnormal tumour suppressor silence and hypomethylation of potential oncogenes, provides the foundation for novel treatment techniques to reverse their chromatin state. Epigenetic inhibitors, such as DNA methyltransferase, histone methyltransferase, and histone deacetylase inhibitors, can reverse tumour suppressor endogenous silence (13,14).

Small chemical inhibitors of certain methyltransferases and methyl-readers (bromodomains) have been developed, allowing for new ways to target the epigenetic processes disturbed in malignant cells. Engineered proteins coupled to chromatin remodelling enzymes that target specific loci associated with malignant progression have a critical advantage in targeting specific loci associated with malignant progression (15).

Lysine 16 acetylation and lysine 20 methylation are frequently lost in cancer cells. Furthermore, when comparing cancer cells to normal cells, global alterations in histone acetylation and methylation can be identified in cancer cells, and these changes can be utilised to predict disease outcome in tumours like prostate cancer. Epigenetic regulators could be a promising therapeutic target for slowing the course of disease. Mainly two type epigenetic-based therapies have made their way into clinical use, HDAC inhibitors (HDACi) and inhibitors of DNA methyltransferases (1,16).

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ALGAE - BASED BIODIESEL

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Energy crisis is among the largest problems, leading the world to be quite unsafe and non-peaceful. The demand is increasing day by day. The available resources are rapidly decreasing and are estimated to vanish soon from the earth. In such situations, more attention is required to run towards renewable energy sources.

Fossil fuels are used on an oversized scale within the world, but they are unsustainable because they increase carbon dioxide (CO 2) levels and accumulate greenhouse gases which make the environment unhealthy.To maintain a clean ,sustainable, renewable environment,environment friendly fuels are mandatory to produce and biodiesel is one of them.

The algae is now becoming the largest source of biodiesel production within the world. They are considered the safer, non-competitive and rapidly growing organisms among those who can be used for biodiesel production. Algae has around 80% energy content to it contained by petroleum.

Algal cells have 30% lipid content , which is quite more than other sources including soybeans and palm oils . Micro-algae have 30%–40% lipid contents by dry weight and this value rises to 85%. Botryococcus braunii may be a micro-algae which has 30%–40% hydrocarbon content, which might be extracted easily. Algaes are important in the wastewater system because they can efficiently remove the toxic components from water.rich sources of biodiesel and their vital role in waste make them suitable sources to be grown on an outsized scale .

In India, an engineer Vishal Prasad Gupta was researching microalgae as feed for livestock to succeed in containing proteins, amino acids, minerals and other nutrients. Vishal noticed that the algae had chemical components like those in oil which it may be accustomed to developing bio diesel.In 2020 he received approval from the Union Ministry of Petroleum and Gas to line up his own petrol pump 'More Mileage', in Ranchi , Jharkhand , India . He has been credited with innovating a biofuel manufactured from species of microalgae native to Jharkhand's ponds, which he says is not only more environmentally friendly than petrol and diesel, but also easier on the pocketbook. The biofuel, which may be utilised in all vehicles with EM590 diesel engines, costs Rs 78 ($1.05 USD) per litre — a less expensive alternative to diesel, which is currently priced at Rs 102 ($1.33 USD) in Ranchi. Meanwhile, the cost of bioethanol, which is Rs 72 ($0.92 USD), which Mr. Gupta said it can replace petrol currently priced at Rs 108 ($1.41USD) per litre (approx). Mr. Gupta also said that a species of algae called Azolla pinnata, which contains a substantial percentage of oil,is taken out of the pond and put within the matter hexene. After being treated within the plant, it becomes a lipid in liquid form before it achieves its final sort of biodiesel or bioethanol.

Algae grown on one acre of land can decrease the Air Quality Index (AQI) of the world by 60 percent. Algae is additionally known for drastically reducing dioxide emissions by converting them into oxygen (and biomass) via photosynthesis. This further reduces the emission of greenhouse gases and reduces the chances of global warming. He hopes the country can move past exporting rock oil and achieve self-reliance in terms of acquiring indigenous stuff to produce sustainable fuel.

Data Warehouse Optimization Things to avoid

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Data warehouse optimization, although hard to achieve, is the goal of every progressive organization. This is primarily because a Business Intelligence (BI) system working with a struggling data warehouse is similar to a building with a weak foundation; both stand useless without a strong base. Since a BI system relies heavily on a stable groundwork, it is vital to have a strong enterprise data warehouse architecture.

Why Optimizing Data Warehouse is Critical for Your Enterprise?

Many enterprises today are constantly building upon their legacy data warehouse systems; adding layer after layer so that the DW model can cater to their ever-changing needs. This results in an intricate data infrastructure, where digging through the layers of the data warehouse architecture becomes a labor-intensive task. Adding to this complexity is the volume and variety of data, which has increased manifold from the time that these systems were designed.

So, what happened in the past 15 or years so that the state-of-the-art systems of those times have begun to collapse? Businesses have evolved and so have their data architecture. As a result, the data warehouse team is under a heap of requests which it is unable to fulfill in a timely manner. The ever-growing data complexity and the endless user needs are difficult to predict for modeling data warehouse infrastructure. Now, there are often demands of adding disparate data to the existing architecture and with everything so strongly bonded, it gets more and more complicated every day.

Replacing these legacy systems and build new data warehouses after testing and prototyping is not an easy option either. Enterprises are now looking for ways to optimize data warehouses as an alternative – often resorting to inaccurate solutions.

Common Data Warehouse Optimization Mistakes

Here, we have put together common data warehouse optimization mistakes that lead companies to use overly priced solutions and still fail to fulfill their BI needs.

1. Heading towards the Cloud

The IDC's prediction of data swelling up to a total of 163 ZB (zettabytes) by the year 2025 has forced enterprises to rethink their data warehousing strategy. Among the emerging alternatives is shifting the data warehouse to the cloud because of its ability to solve many data volume and data computational issues effectively.

But moving a humongous amount of data to the cloud is not that easy. You will need to move the database schema and data along with performing the strenuous ETL functions on the cloud. Especially for data warehouse optimization purposes, there is often a need for architectural modernization, restructuring database schema, and sometimes, rebuilding the data pipelines. These factors further complicate the overall process.

Moreover, even in monetary terms, there aren't many benefits. Companies who choose to shift their data warehouses to the cloud generally end up spending

amounts which are much higher than what they had originally anticipated.

2. Relying on a Data Warehouse Appliance

Nowadays, many companies have begun to revert to data warehouse appliances as a solution to their data warehousing modeling problems. A data warehouse appliance is a set of hardware and software solutions that enterprises use to accommodate huge amounts of data, often measuring in terabytes. Netezza and DATAllegro are some of the most common data warehouse appliances.

Even though data warehouse appliances will increase querying performance speed against millions of records, it can only achieve this through extensive hardware and memory configurations. So, even after the data undergoes lengthy migrations, the primary data warehouse architectural problems are the same. This is largely because a data warehouse appliance does not analyze the core, underlying issues with the schema, and structure of the data warehouse. Instead, it uses heavy-duty hardware for Massively Parallel Processing (MPP) architectures to enhance speed and platform scalability. Companies, even after heavily investing in these appliances, are unable to produce the desired results.

3. Looking towards Big Data Solutions

Big data solutions, like Hadoop, for data warehouse optimization have failed to deliver on the performance and analytics required for a BI system. This is because these systems are not built to act as data warehouses. Architects and scientists, who tried to carry out such feats, have not seen much success due to several reasons, such as:

- The data structures and database schemas are not user-friendly
- Data security is compromised
- Integration of outside data sources is tough
- Incorrect query results

While it's true that systems like Hadoop are affordable in some cases, running an entire data warehouse is not amongst them. Writing complex queries and executing them is, in fact, expensive. So, even though the idea might entice you, do keep in mind there is no guarantee for complex architectures, powered by big data solutions, will work perfectly for your data warehousing processes.

4. Adopting the Continuous ETL Tuning Method to Boost Performance

It's true that analytics experts have used the snowflake and star schemas to get better visibility across the data warehouse, but at some levels, especially for disparate data, they don't work well. At times, these schemas are unable to give the depth that is actually required. This is because they restrict the results of analytics, leading to users to work with bad data. This enforces the DW architects to go back to the basics once again, which doesn't seem that attractive an idea.

Along with this, we have the famous ETL to look at too. It is a complex process that needs to be fine-tuned based on changing business requirements. However, this process is good for the overall feel and maintenance of the data warehouse. Conversely, expecting these rigorous cycles to help in data warehouse optimization by boosting the overall performance is simply asking too much of them.

Since analytics is a process and not a one-time IT project, database tuning becomes a routine task. The reason for this is the massive surge in data volume, leading to an increase in complexity, all of which needs to be considered. For this to happen, companies need to scale their platforms' performance. Expecting positive results just on the basis of ETL or through refined data warehouse modeling won't bear fruit because it will be unable to cope with the increased complexity of the enterprise data.

Solutions for Successful Data Warehouse Optimization

With so many suggested methodologies trying to optimize the failure of legacy data warehouses, alternative approaches like data warehouse automation and data virtualization might work better.

Data Warehouse Automation

Data warehouse automation (DWA) is an effective approach for streamlining traditional data warehousing processes. As a next-gen technology, it relies on advanced approaches to automating the planning, modeling, and integration steps of the data warehousing lifecycle.

DWA solutions have evolved over the decades from hand-coding to a fully automated system. The main reason for this continuous growth is the rapid increase in data volumes and changing integration requirements. It uses a code-free approach to aggregate both structured and unstructured data and then moving the transformed source data to the data warehouse.

Data warehouse automation offers several benefits over the other data warehouse optimization methods in the market, including:

- Avoid manual ETL mistakes, faster query processing, and improved time-to-insights.
- Move data to other platforms like the cloud or data visualization tools at an unprecedented pace.
- Faster data warehouse testing, prototyping, and deployment
- Near real-time access to the most recent data gives users the ability to respond promptly to the changing market demands.
- Reduce the manual work required in developing various data processes, improving outcome and saving developer resources; thereby reducing the overall costs.

Data Virtualization

In order to improve data integration processes involved in preparing data for data warehousing, data virtualization tools have been gaining traction for their ability to speed up the data-to-insights journey.

Adding a layer of the data virtualization tool to the process provides complete abstraction from the complexities of source data and presents it as a database table comprising of all the data. So, no matter how many data sources you are calling data from, the data virtualization tool converts any structured or unstructured data into an easy, readable format.

This abstract layer greatly simplifies the basic data warehousing processes, like ETL and ELT. Moreover, it provides the data in a ready-to-use state for BI and analytics, reporting, and application development. It also makes data accessible through various front-end applications, like portals and dashboards.

Data virtualization gives the added benefit of data security since the front-end users are no more required to get into the technicalities related to the source data. So, organizations can restrict data access to the related personnel only.

Some of the benefits of using data virtualization tools are:

- It enables data to be collected from different sources and integrated at one place.
- It reduces the downtime needed to collect data for analyzing the success/failure of different products.
- If used properly, data virtualization can access data from both relational and non-relational databases (like NoSQL). This feature enables enterprises to create composite results from such sources that otherwise is not possible in a relational data warehouse.
- At times, when the enterprise data warehouse is down, data virtualization's merged sources can be used for analytics and reporting.

Data virtualization tools aid in enhanced data warehousing performance by:

- Integrating data from other data sources (even Hadoop) which minimizes the need to load data into the warehouse prior to analysis. This reduces the time for executing new BI requests.
- Decrease programming and hardware/software costs of data integration and loading by alleviating the data duplication costs, limiting the network bandwidth usage and increasing execution speeds by making use of in-memory caches.

Conclusion

Data warehouse optimization is vital for ensuring trusted data is available for analytics and decision making. With the ever-increasing data size and complexity, applying every other optimization technique may go drastically wrong if applied incorrectly. Solutions like data warehouse automation and data virtualization, when used in combination, can work wonders for optimizing the performance of your data warehouse. However, you should be careful and evaluate these solutions based on your specific data warehousing environment before implementation.

Source: https://datawarehouseinfo.com/data-warehouse-optimization-mistakes-to-avoid/

How Blind People Actually See the World??

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What do blind people perceive in reality? The majority of sighted people believe that what the blind perceive full darkness, however it isn't quite that black and white. There are many degrees and reasons of blindness, which influence what blind people can see from birth. People who are blind from birth have obviously never had the ability to see, and since it is the brain that processes information rather than our eyes, a person can see nothing if the brain gets no signals from the eyes to process it.

It's not as if they're facing endless darkness, as many of us believe. Try shutting one eye and glancing around with only your open eye to get a sense of what it's like. Nothing is visible via a closed eye. Another way to understand how it feels is to answer one question: what can you see with your elbow? Obviously, nothing. People who lose their eyesight and go completely blind, that is, lose their ability to perceive light, are extremely rare. It occurs when the connection between the eyes and the brain is severed, which can occur when the brain or optic nerve is damaged or when the eyes are removed.

It might also indicate that the person has a vision field of 20 degrees or less, when the usual range is between 60 and 100 degrees. There are several varieties of functional blindness, each with a distinct severity degree. A legally blind person can see people and large objects, but everything they see is fuzzy and hazy. They can discern colours and even see things in focus, but only at a specific distance, possibly only as far as right in front of their face. Report says that some people see a swarm of dots of light that move and change colours rapidly, going from brown to turquoise with patches of yellow or green in a matter of seconds. Being able to perceive light does not help blind people see clearly, but it does help them distinguish between light and dark, day and night. Some of them can also tell where the lights are coming from tunnel vision. Tunnel vision is when a person sees the world through a tight tube. The objects may be visible to them perfectly, but only within a field of vision of less than 10 degrees, and they are unable to view their peripherals at all. This condition is frequently caused by optic nerve loss. During the day, blind people see nothingness or specks of light, but there always arise questions like what about at night, when it's time to go to bed and dream, is there any difference? Or do they see images in their dreams again? It's different for those who have been blind since birth and those who lost their ability to see later in life. But people who have always been blind dream with their other senses.

Sleeping scientists from the University of Copenhagen dug further to learn what the blind perceives in their dreams. They discovered that roughly 25% of their dreams are nightmares, and they have them four times more frequently than sighted persons who use other senses. Another frequently asked question about people who have vision impairment or loss is, whether their other senses improve. Researchers believe that blind people remember how different objects smell and frequently use hearing and touch to find their way around. They discover the world using those senses and store the information they gain this way for orientation.

Chi Keeler, a Harvard graduate student, did research on blind mice in 1923. Despite the fact that their eyes lacked crucial elements required for seeing, the mice

nonetheless followed day/night cycles and their pupils even reacted to light.

Eighty years later, scientists revisited non-visual light perception research and discovered that special photosensitive cells exist in both mice and humans, but not on the retina, on the nerves that send signals to the brain. These cells does not participate in the vision process, but they do help distinguish light from dark.

PLUTO - NOT A DWARF PLANET ANYMORE

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Pluto has giant ice volcanoes that could hint at the possibility of life

NASA'S new horizon mission has revealed that there is presence of ice volcanos on surface of planet pluto.

Pluto was relegated to dwarf planet status in 2006 when the International Astronomical Union created a new definition for planets, and Pluto didn't fit the criteria. NASA's spacecraft performed a flyby of the dwarf planet and its moons in July 2015, and the insights gathered then are still rewriting nearly everything scientists understand about Pluto. Its difficult to analyse the gathered data and make meaningful insights from that. The dwarf planet exists on the edge of our solar system in the Kuiper Belt, and it's the larger of the many frozen objects there orbiting far from the sun. The icy world, which has an average temperature of negative 387 degrees Fahrenheit or in negative 232 degrees Celsius is home to mountains, valleys, glaciers, plains and craters. If you were to stand on the surface, you would see blue skies with red snow. Mission scientists are intrigued by the sparse distribution of red material in the image and wonder why it is not more widespread. Also perplexing is that there is only one identified impact crater on Wright Mons itself, telling scientists that the surface (as well as some of the crust underneath) was created relatively recently. This is turn may indicate that Wright Mons was volcanically active late in Pluto's history.

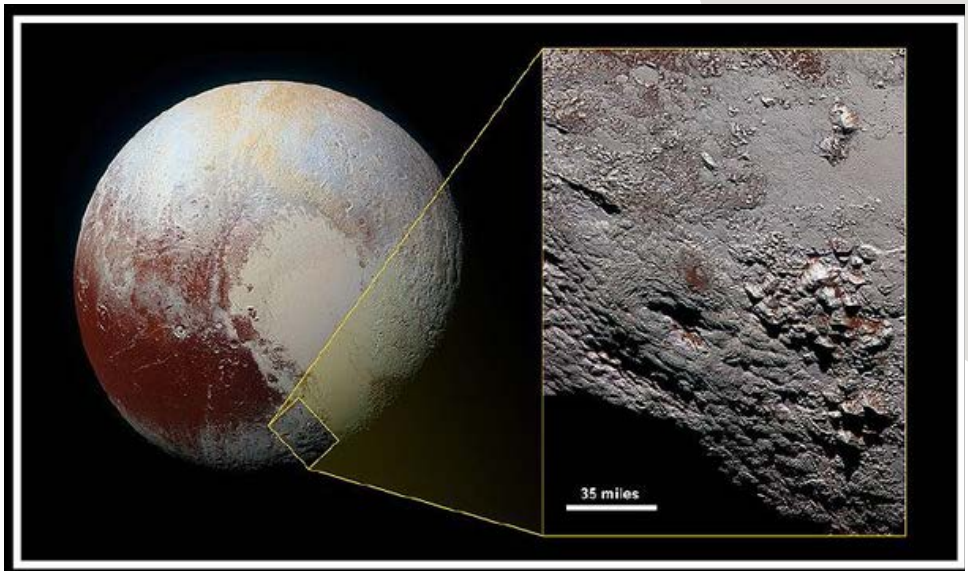
The region is located southwest of the Sputnik Planitia ice sheet, which covers an ancient impact basin stretching 621 miles (1,000 kilometres) across.

Largely made of bumpy water ice, it's filled with volcanic domes. Two of the largest are known as Wright Mons and Piccard Mons. Wright Mons is about 13,123 to 16,404 feet (4 to 5 kilometres) tall and spans 93 miles (150 kilometres), while Piccard Mons reaches about feet 22,965 feet (7 kilometres) high and is 139 miles (225 kilometres) wide. Unlike other parts of Pluto, this area has almost no impact craters. This indicates that the landscape was created relatively recently in geological time; some areas are probably less than 200 million years old. (The surface would otherwise be peppered with craters punched out of the surface by asteroids bombarding Pluto over the course of billions of years.) Liquid erupting from Pluto's interior through cracks in its crust covered the old surface with a smooth new coat as it froze solid.

WHAT ARE ICE VOLCANOS AND ITS RELATION

Ice volcanoes have been observed elsewhere in our solar system. They move material from the subsurface up to the surface and create new terrain. In this case, it was water that quickly became ice once it reached the frigid temperatures of Pluto's surface. While Pluto has a rocky core, scientists have long believed that the planet lacked much interior heating, which is needed to spur volcanism.

The liquid erupting from beneath Pluto's surface is, according to scientists analysing the New Horizons data, mainly water ice. Some substances, such as ammonia or methanol, mixed into the water act as "antifreeze", raising the freezing point above that which is normal for water (0°C or 32°F).



In some ways, Pluto's volcanoes were formed in much the same way as Earth's, which are made from layers of solidified lava. Temperatures on Pluto are far below water's freezing point. This means that liquid water would behave like magma (liquid rock) on Earth, erupting from a hot interior to the much cooler surface and quickly solidifying (or freezing).

FROM WHERE PLUTO IS WARM?

Where does the heat inside Pluto come from? Scientists think that the decay of radioactive elements in Pluto's interior is responsible for the dwarf planet's cryovolcanism. The heat energy produced by this process has created an underground ocean between 100 and 180 kilometres (60 to 110 miles) thick at the boundary between the dwarf planet's core and icy crus.

How did the cracks allowing water from the interior to reach the surface appear in Pluto's crust? On a moon of Saturn, from which liquid water spurts out through fissures in its surface into space, plate tectonics, the cracking of the surface by forces in the crust, is thought to be the cause. On Pluto, some scientists think that the crustal cracking might have instead been the result of a massive asteroid collisions which, many years ago, formed nearby Sputnik Planitia. The large basin punched out by the asteroid later infilled with liquid water upwelling from the interior through the cracks in the ground, before freezing solid.

Here by these I explained how pluto is now not a dwarf planet anymore few of the latest discoveries are proving its existence.

A Deep Drive through Harsh Reality of Railways due to Covid-19 & Optimising Revenue Indicators to improve its contribution in the Indian Economy

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Abstract— *Indian Railways is considered as the transportation the backbone of India, and in this situation where the covid-19 cases are jumping at geometric progression, every day; the established revenue model has been crushed. In this paper, we aim to find the liaison between the earning parameters viz. passenger per km, capital at charge, operating ratio, etc. of the Indian railway with the total revenue. A tri-layered LSTM architecture has been modeled to frame the relationships and dependencies of the parameters in revenue and afterward we have used Particle Swarm Optimization Algorithm to optimize the equation to maximize the revenue earned by taking the passenger count in response to the current situation, thus maximizing the other relative parameters.*

***Keywords*— COVID-19, Indian-Railway, LSTM, ANN, PSO, Optimization**

INTRODUCTION

The transportation and freight service is the backbone of every nation. It circulates the economy with the movement of workforce and material. The transport system circulates and broadens the reach of the market through the length and breadth of the country. In India, the railway network is owned by Ministry of Railways and all the activities have been carried out through them.

The current ongoing situation of Covid-19 have put a halt on the entire railway network of the India for a good long 7 months, which have crushed the established revenue model of the country. Thus in this time it's the need of an hour to analyze which parameters used to earn the maximum amount of revenue and let optimize the entire system by keeping the income from passenger count at the bay.

The article is structured as, Statistical Analysis for the revenue indicators in Sect II, followed by model in Sect. III. and Conclusion and Future scope of study in Sect IV.

To make a nation stand we need the basic formulation of transportation. Railways are the backbone of the transportation system of a country. It is also a pillar of the Indian Economy. The efficient transport system provides socio-economic opportunities. The use of the railway system is best understood for mass communications at a middle-range travels due to its availability and indistinctive time efficiency by connecting more platforms than airdromes. Also, for land-locked regions, it is the most essential medium for trade and increase the productivity. Our country is having the largest railway connection in Asia and making thousands of people reach their destination daily needs a lot of effort to be made behind it. Having started its journey during the time of East India Company, Indian railways had made remarkable progress over the years. Importance of railways can be visualized by analyzing the data for the past few years. It is evident from analysis of data of few years

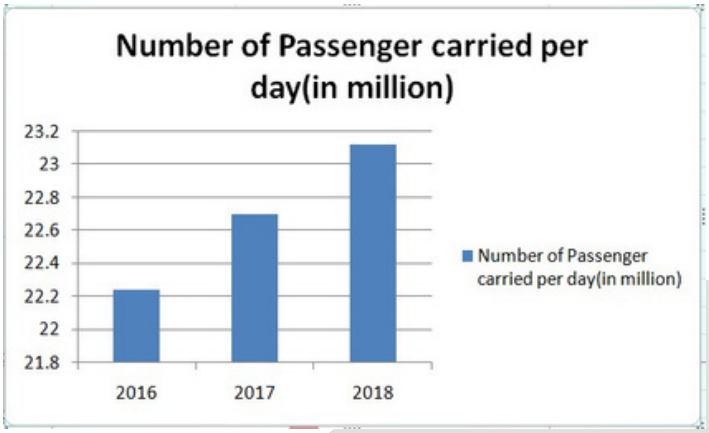

Figure 1: Representing daily no of passenger
Source: Created by author

Also, the number of accidents is decreasing which means railways are becoming cautious which is evident from the Indian Government records. If we look at the financial condition, it is evident that the revenue is an increasing function i.e. with the increase in time, it is increasing which can be visualized from the figure 6 which is scaled and the Y-axis represent the revenue receipt (in trillion)

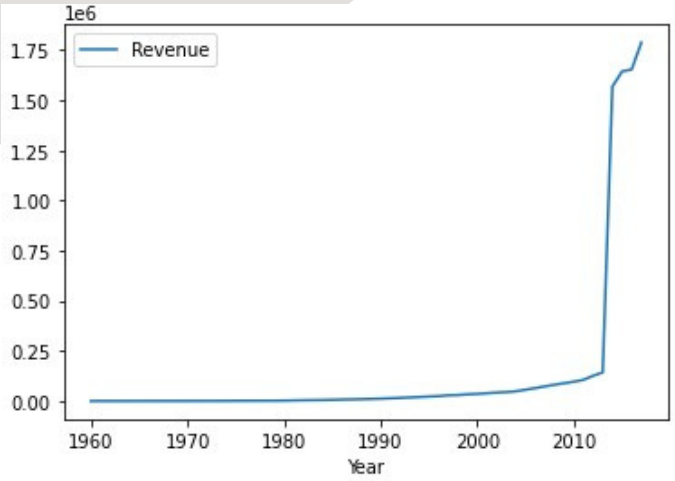

Figure 2: Increasing trend of revenue
Source: Created by author

From the reports and details it is evident that the lion's share of GDP is in the transport sector especially in the railway sector of India's and the change affects the total GDP. The different reports says that during the high growth of railways worldwide, per-capita income was increased 31% .From the reports and published papers of eminent research scholars ,it is proved that there is more than 15% improvement in the agricultural sector, another pillar of economy and the productivity of factory was also increased and the it brought a great revolution in the markets where well-connected local markets were set up instead of segmented market with high transportation cost. So it is obvious that the economic growth is directly proportional the railway development and its density network of the country. [6,7]

If we consider the social savings from the railway we can say:

$$S = (price_{other} - price_{railway\ transport}) * quality\ op \quad (1)$$

$$\therefore \frac{S}{GDP} = \frac{(price_{other} - price_{railway\ transport}) * qual\ op}{GDP} \quad (2)$$

Equation 2 will give the savings as a proportion to GDP and eq 2*100 will give it in terms of percentage and equation 3 give the share of Revenue which is the contributing factor to GDP as well as economic development.

$$\frac{(price_{other} - price_{railway\ transport}) * quality\ output of\ transport}{GDP}$$

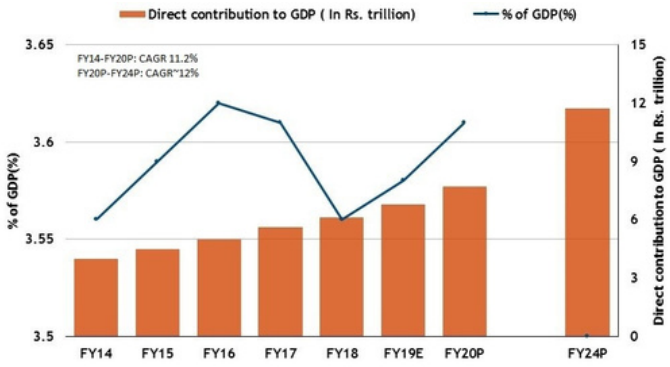

Figure 3: Percentage contribution of railway sector into GDP, Source: Indian Railways

Mainly the urbanization, industrialization, investment in public share promotes the growth of passenger as well as freight traffic and so Indian Govt is ready to invest a percentage of FDI to this sector. It is estimated that Indian railways will be accounting a high percentage of global share of the railway sector nearly 35% by the end 2040.

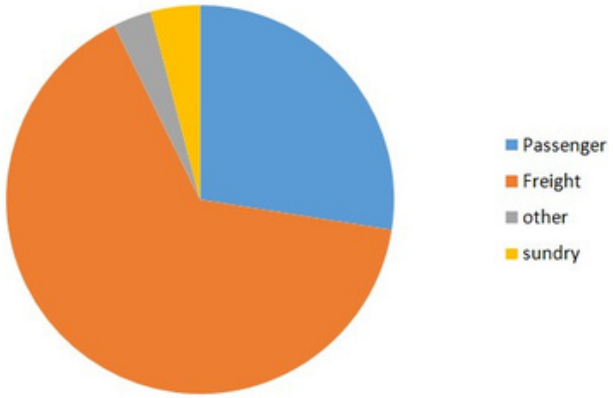

Figure 4: Main components on income of IR
Source: Created by author based on dataset

Here, we aim to analyze the different factors behind the change of the revenue. The dataset has been formed from the different sources mainly from Open Data Source and from the different yearly reports, railway budget books and data provided by the Indian Railways. We have applied predictive forecasting and with the predicted result we can analyze the different

key financial indicators. To understand growth and change of a factor or the target variable we, first need to understand the basic contribution of different factors and how they are affecting .Based on dataset, it is evident that the revenue depends on mainly factors. [8]

Figure 5: analysis of correlation with factors and visualization of heat map

Hypothesis testing is the most essential for carrying out our model, thus the p-values of the revenue indicators are given in Table-1.

Table-1 : Table showing P-values

Parameters	P values
Capital at Charge	0.0006210
Operating Ratio	0.000758692
Total Investment	0.0008568
Total Passenger revenue	0.0006223
Gross Traffic Receipts	0.05648525
Misc. Receipts	0.00075512

Model

Artificial Neural Network (ANN) approach is now-a-days quite popular and widely used and it is well known for data-driven model based on mathematics and the large interconnected architecture. The Recurrent Networks (RNN) is a type of ANN which has the to execute a successive recursion process by a transition function to internal hidden vector state of input.

$$H(t) = \begin{cases} 0 \; when \; t = 0 \\ f(H_{t-1}, ip_t) when \; t > 0 \end{cases}$$

The cyclic connections are the major advantage of using RNN for handling sequence data. But processing of vanishing gradient as well as interpretation of correlation of remote factor cannot be extracted properly and there LSTM come into play. It is the modified version of RNN. It consisted of some special blocks known as memory block in the hidden layer which consisted of a well networked inter-connections that stores the information of the temporary state and the flow is operated by the input(save vector) and output gates(focus vector).). In juxtaposition to shallow Artificial Neural Network, deep learning models plays an advantage role by seeking non-linear transformations to interpret complex patterns using abstraction. There are mainly 3 gates input gate, output gate and forget gate. The major component of LSTM is its state of the cell and its work in similar fashion of a moving conveyor belt. The equation cell state is as follows:

$$p_t = f_t \odot p_{t-1} + i_t \odot \dot{p}_t$$

So it can be used for univariate as well as multivariate time series analysis under certain constraint. So the time-series plot has been done to analyse the revenue over the year.

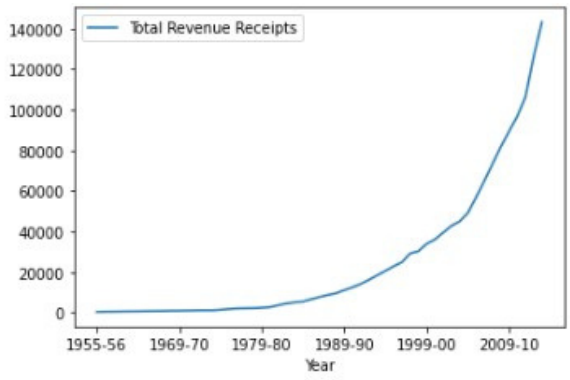

Figure 6: Time series plot of our data
Source: Created by author

So LSTM can be sued for the prediction of the revenue. So we have proposed our problem as a regression problem where n observation point of previous step is used to forecast the next h points and the input data is reshaped to 3d. [9,10]

So in our model it is applicable .The architecture of the model is given in the figure. So LSTM can be sued for the prediction of the revenue. So we have proposed our problem as a regression problem where n observation point of previous step is used to forecast the next h points $[Y_{n(n+1)}, Y_{n(n+2)}$ and the input data is reshaped to 3d. [9,10]

So in our model it is applicable .The architecture of the model is given in the figure.

Layer (type)	Output Shape	Param #
lstm (LSTM)	(None, 5, 100)	40800
dropout (Dropout)	(None, 5, 100)	0
lstm_1 (LSTM)	(None, 5, 50)	30200
dropout_1 (Dropout)	(None, 5, 50)	0
dense (Dense)	(None, 5, 1)	51

Total params: 71,051
Trainable params: 71,051
Non-trainable params: 0

Figure 7: Showing architecture of the model
Source: Created by author

Here, the larger inter-connected neural networks are having huge time complexity issue, making it tougher to interpret and check over fitting .So using Dropout this problem can be addressed. The essence to fix the problem is to drop some units from the network randomly at the time of training the model which resists co-adapting. Here the total numbers of trainable parameters are 71051. Now the loss curve is observed.

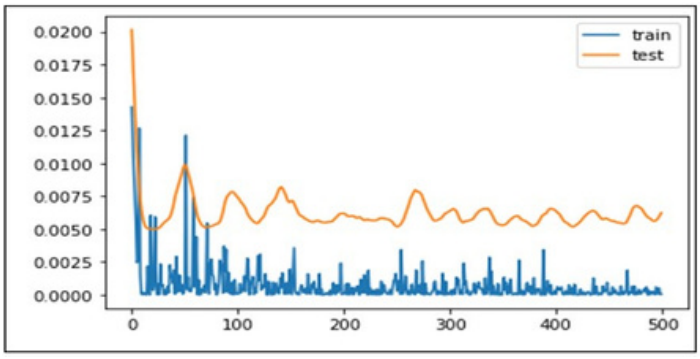

Figure 8: Showing loss curve of the model
Source: Created by author

But, the best window size and other parameters have to be optimized for a better result and so an optimization technique is used. We will customize using meta-heuristic algorithm for optimizing and the optimization technique used is PSO in modelling.

Swarm Intelligence is one of the parts of evolutionary computations. PSO is a Meta-heuristic algorithm and population-based stochastic global optimization technique which was originally proposed by Kennedy and Eberhart long ago in 1995. It was inspired from nature rather social behaviour and movement of the bird. Here, multi-dimensional space is considered for the search space and the behavioural movement of the birds flocks is considered for searching the optimal result and target is to find that swarm which is heading towards global optimal. Here are initialized randomly and then search for optima by updating generations.PSO mainly has two approaches: cognitive, social.

Firstly, the population is randomly initialised. Each swarm moves in search space randomly with their own experience and adjusted dynamically with considering relative movement of its companion. Let the i th particle be ={,,..} and the moves from present best to global best where:

$$p_{bst}(i,t) = arg_{k=1..t} \min[f(P_i(k))] \text{ where } i \in \{1,2,3,4,..N\}$$

$$g_{bst}(i) = arg_{\substack{k=1..t \\ i=1,2,3,}} \min[f(P_i(k))]$$

Now, each has different velocities ranging from = {,,..},where i denotes the index. In the consecutive iterations, the velocity and the position gets updated as:

$$V_i(t+1) = \omega.V_i + c_1r_1.(p_{bst}(i,t) - P_i(t)) + c_2r_2.(g_{bst}(i,t) - P_i(t))$$

$$P_i(t+1) = P_i(t) + V_i(t+1)$$

where ω is intertia for balancing global expolration

$c_1r_1.(p_{bst}(i,t) - P_i(t))$ is due to personal interest and

$c_2r_2.(g_{bst}(i,t) - P_i(t))$ is due to soacial influence

Here our target is to search for optimal lag as well as hyper parameter. These are then feed in the LSTM cell for training purpose. For consideration of value and identifying we tried to feed random forest and support vector regressor but SVR comes out as best as it gives the best result. [11,1 2].

TABLE II: Best regressor value

Parameters	values
c	434.68716890118475
epsilon	0.012109386268924
gamma	0.001

The Loss curve is plotted in the figure .The MSE loss is considered.

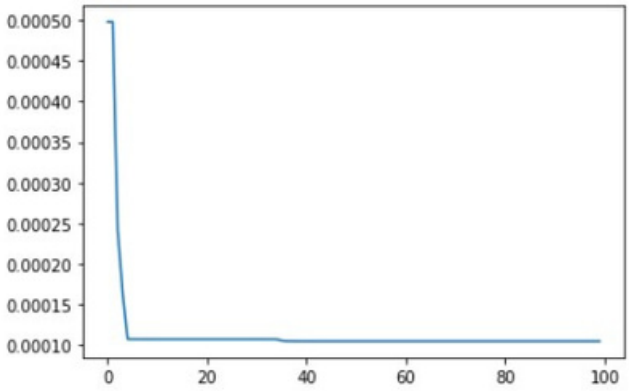

Figure 9: Showing loss curve of the model
Source: Created by author

Slope stability analysis is one of the key factors in analysis of the static behavior. At the edge of failure it is important to understand the equilibrium state of the soil in that condition. The 3D plot of the tuned parameters is plotted.

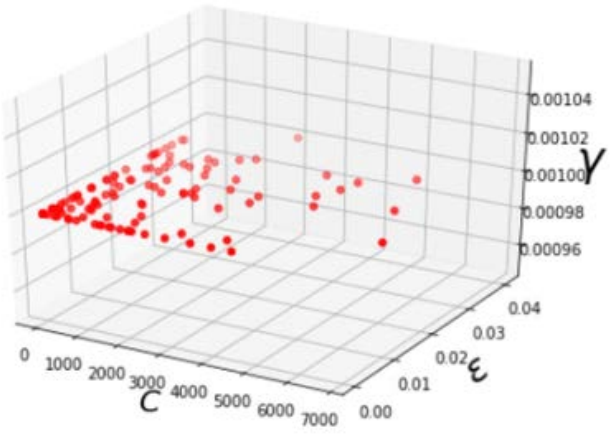

Figure 10: Parameter values plotted across 3D space
Source: Created by author

The Learning curve after optimizing the parameters are plotted in the figure

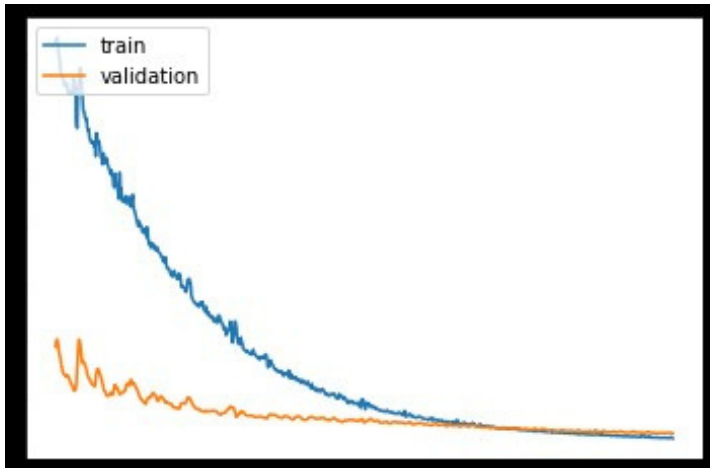

Figure 11: Loss Curve of the model
Source: Created by author

The RMSE has been observed

TABLE III : BEST RMSE

RMSE without PSO Optimization	RMSE with PSO Optimization
0.0578	0.004789

In the history of 167 years old Indian Railway that the trains were utterly empty and would not carry passengers all over the nation. “Never in the history, there has been such long interruption of services. Not during the World wars, not during the 1974 railway strike, or any other national calamity or natural disaster,” a railway spokesperson said. One of the major earnings of the Indian Railway is the passenger revenue. The economic set back started as soon as the outbreak of corona virus took place in India as train ticket cancellations peaked causing losses even before the lockdown was knocked. Several services were cancelled and the occupancy rates grew very poor to avoid the spread of the novel corona virus. The Lockdown breaks the whole revenue model and multi-layered model has been broken. Almost 80% of the trains all over India were cancelled and as soon as the lockdown was announced the whole passenger transporting wing was stopped by the Indian Railway authority. It is expected a loss of Rs 35,000-40,000 core. 40% of the share is hold by freight revenue. So the main target is to augment freight revenue. So at the current time of pandemic it is necessary to appraise passenger segment from different respect and so zero-base analysis is required and the re-

modeling of the freight and the other sectors of the railways has to be done because the passenger sector also is one of the determinant in determination of cost function of freight traffic. Also IR has to increase their wages in the other sectors along with diversification of the capital and investing it in different freight services. SO the increase in volume and increasing efficiency in this sector may increase the earnings of the Indian Railways.

Conclusion and Future Scope of Study

This work majorly focuses on optimizing the revenue structure of Indian Railway after the existing structure getting blowed out during this ongoing global pandemic. The hybrid model has been proposed to get the best case optimized values such that we can design the new model by keeping the revenue from passenger count at bay and maximize the revenue from the other existing parameters. The sharp fall in RMSE value after optimizing the model shows the superiority of our model.

The work can be extended by taking more parameters in study along with we can use bi-directional LSTM model for better result optimizing it by other nature inspired optimizer algorithms.

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Cyclic Combinational Circuits: An Overview

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Abstract
Combinational circuits are generally considered as acyclic (i.e., feed-forward) structured. Conventionally recognized techniques in logic analysis and timing analysis of combinational circuits have limited themselves to acyclic combinational circuits since cyclic feedback in combinational circuits cannot be analyzed in conventional method. However, cyclic circuits can be combinational. With some special arrangement, cyclic combinational circuits can be built with structural feedback; however, there is no logical feedback. In cyclic combinational circuit the primary outputs are combinational even when some intermediate signals are sequential. A general attitude for the synthesis of multilevel combinational circuits with cyclic topologies gives major improvements in area delay and power with respect to the conventional acyclic combinational circuit.
In this article an overview of cyclic combinational circuit has been discussed with practical examples. Detailed study of circuit model, its functional and temporal behavior, simulation based analysis of cyclic circuits using standard simulator shows its better efficiency over conventional acyclic combinational circuit.

Introduction
In digital electronics all circuits can be classified in two categories. They are either combinational or sequential. A combinational circuit produces its output based on present status of input combinations where as in a sequential circuit the output is dependent on present value of input as well as past history. In order to retain its past history there exist a feedback loop or cyclic wire connection. On the other hand combinational circuits are generally thought of as acyclic structures based on Boolean function of input variables. The behavior of a circuit with feedback loop is generally considered as timing-dependent circuit [1]. Traditional combinational circuit logic analysis is restricted to acyclic since they are unable to analyze any circuits with cycles [2]. Now the question is could a combinational circuit be designed with feedback paths? The answer is, not only that it is feasible to design combinational circuits with cyclic topologies, but it is generally advantageous to do so [3].

History
Gates are convenient abstraction, introduced for digital electronic circuits. In an earlier era, people studied switching circuits, built from electro-mechanical relays. A relay is a device that conducts current if it is set to “on" (corresponding to a logical input of 1), and does not conduct current if it is set to “off" (corresponding to a logical input of 0). The device does not have an intrinsic direction; it will conduct current in either direction. Switching circuits were the subject of seminal papers by Claude Shannon: the analysis of such circuits in 1938 [4] and the synthesis of such circuits in 1949 [5]. The circuits of Shannon's day often had cyclic topologies. Since relays are directionless, cycles do not pose any problem.

It was accepted that cycles were an important feature in the design of switching circuits. In 1953, Shannon described a cyclic switching circuit with 18 contacts that computes all 16 Boolean functions of two inputs, and he proved that this circuit is optimal [6]. In his Ph.D. dissertation in 1960, Dr. Short applied an abstract graphical model to the study of switching circuits [7]. Implicitly, his model imposes a direction on the switching elements. It is equivalent to a form of binary decision diagram now known as a zero-suppressed decision diagram [8]. In this context, Short

argued that cyclic designs are necessary for the minimal forms. In recent years, binary decision diagrams have come to the fore as perhaps the most successful data structure for representing Boolean functions [9]. In the 1960's, as the research community was shifting its focus to the now-familiar model of directed logic gates (AND, OR, NOT etc.), researchers naturally pondered the implication of cyclic designs. In 1963, McCaw presented a thesis for his Engineer's Degree titled “Loops in Directed Combinational Switching Networks" [10]. The example what was described by him is shown in Figure 1. This circuit is consisting of two AND gates and two OR gates, with five inputs and two outputs. As with Rivest's circuit, McCaw argues that his circuit has fewer AND/OR gates than is possible with an acyclic circuit implementing the same functions. In his thesis, he grapples with the different implications of cyclic topologies for circuits with logic gates vs. undirected switching elements. As an example, he transforms a switching circuit in Dr. Short's dissertation, consisting of 7 switching elements, into a cyclic logic circuit consisting of 16 AND/OR gates.

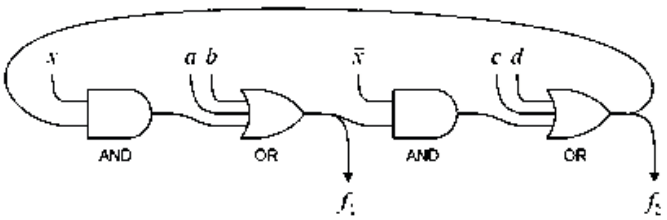


Figure 1: A cyclic combinational circuit introduced by McCaw [10].

Few years later, practitioners observed that cycles sometimes occur in combinational circuits synthesized from high-level descriptions. In such examples, feedback either is inadvertent or else is carefully contrived. For instance, occasionally it is introduced during resource-sharing optimizations at the level of functional units [11]. In these circuits, there is explicit “control" circuitry governing the interaction between “functional" units.

Consider the example in Figure 2. Here we have an input word X (that is, a bundle of wires carrying several bits of information) and a control input c. There are two functional units, F and G, each of which performs a word-wise operation. If c is 1, then the circuit computes G(F(X)); while if it is 0, it computes F(G(X)):

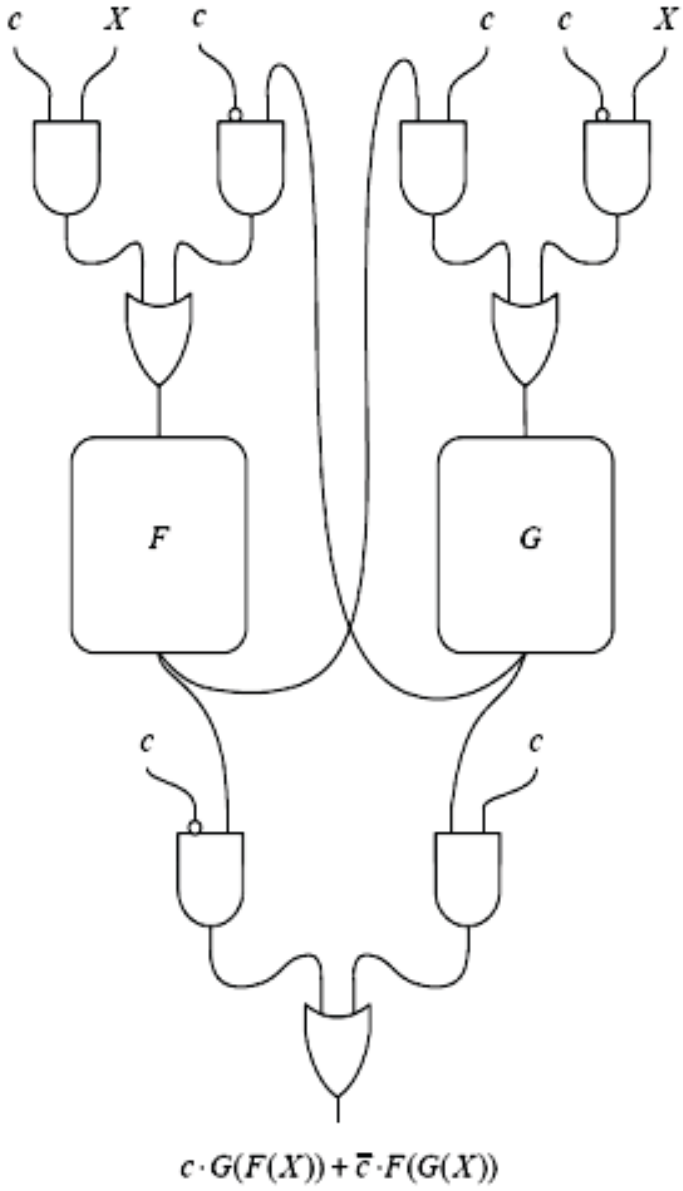


Figure 2: Functional units connected in a cyclic topology.

Later, Raghunathan et al. introduced test generation for cyclic combinational circuit in 1995. In practice, test generation for these circuits is handled in an awkward manner, typically with poor fault coverage [12]. In 2004, Marc D. Riedel redefines the structure of combinational circuit that it might have cyclic loop [3].

Some Examples

A combinational circuit is a collection of logic gates with the outputs described as Boolean functions of the present input values only. It is possible that a circuit output may be dependent on present inputs only under the assignment of

specific delay values to the circuit components (gates and wires), but may be dependent on previous inputs otherwise. It is natural to expect the temporal behavior of a circuit to be a function of the delay values, but it is undesirable for its functional or logical behavior to be dependent on the delay values. Cyclic combinational circuits have structural feedback; however there is no logical feedback that is transmitted to the primary outputs. Here the primary outputs may be combinational even when some intermediate signals in the circuit are sequential. Let we consider few examples of cyclic combinational circuits.

The circuit in Figure 3 is combinational since z is equal to the present value of x and does not depend on the past account of inputs. This can be easily verified by checking the circuit output for both x = 0 and x = 1.

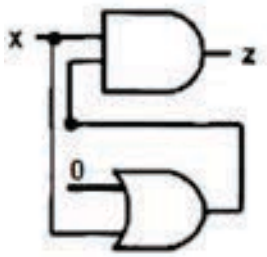


Figure 3: A simple example of cyclic combinational circuit.

Another example shown in figure 4 is a well-known cyclic combinational circuit introduced by Dr. Rivest [13].

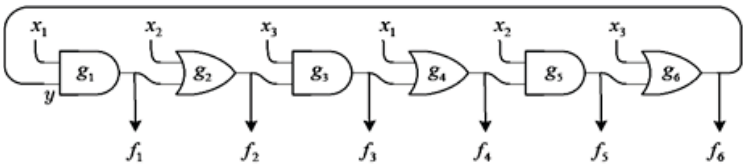


Figure 4: Dr. Rivest's cyclic combinational circuit.

Where the outputs can be computed as,-

$$
\begin{aligned}
f_1 &= x_1 y \\
f_2 &= x_2 + f_1 = x_2 + x_1 y \\
f_3 &= x_3 f_2 = x_3(x_2 + x_1 y) \\
f_4 &= x_1 + f_3 = x_1 + x_3(x_2 + x_1 y) = x_1 + x_2 x_3 \\
f_5 &= x_2 f_4 = x_2(x_1 + x_2 x_3) = x_2(x_1 + x_3) \\
f_6 &= x_3 + f_5 = x_3 + x_2(x_1 + x_3) = x_3 + x_1 x_2.
\end{aligned}
$$

From these examples it can be realized that combinational circuits can be built with cyclic loop also. But how to model a general acyclic combinational structure into cyclic equivalent?

Circuit Model

A binary logic circuit deals with 0's and 1's. Yet, any circuit model recognizes that the original signals are, in fact, analog: each signal is a continuous real valued function of time s(t), related to a voltage level. For analysis, let us assume a ternary structure, extending the set of Boolean values B= [0; 1] to the set of ternary values T= [0, 1, ±], where

logical[s(t)] = 0 if s(t) < Vlow
1 if s(t) > Vhigh
± otherwise

The third value, ± , indicates that the signal is uncertain. It denotes a signal value that is unknown.

An example of a circuit is shown in Figure 5. Even though a wire may split in the diagrams, as is the case with wire w8 in Figure 5, theoretically there is a single instance of it.

Ø The circuit take signals x1,....., xm, ranging over (0, 1), called the primary inputs. Each primary input is fed to one or more gate inputs. Even though the representation for a primary input may appear in numerous places, as is the case with x1, x2 and x3 in Figure 5, conceptually there is a single instance of it.

Ø The gates in the circuit create internal signals, w1,....,wn ranging over(0, 1, ±).

Ø A breaking up of the set of internal signals is designated as the set of primary outputs.

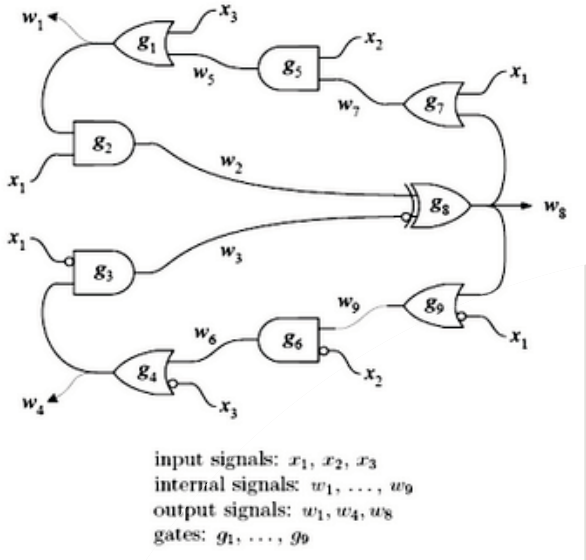


Figure 5: An example of circuit consisting gates and wires

The behavior of the circuit shown in Figure 5 can be described in two manners. The first one is functional behavior and the second one is temporal behavior. The functional behavior means what would be the output nature after reaching the steady state input values and the temporal behavior depends on the delay of the circuit. If the delay of the circuit is zero then functional and temporal behavior would be same. But in practice it is not possible. So to get the functional behavior of the circuit we have to depend on the temporal value. It is easier for the acyclic circuit where all the input values are known and fixed at a time. But in case of cyclic circuit it is difficult to get the temporal value of the entire fan in.

Analysis framework

To analyze the circuit model of combinational blocks let us apply definite values to the inputs, and track the propagation of signal values. The truth-tables for the AND, OR, NOT and XOR gates with ternary states of inputs are shown in Table 1.

X	NOT(X)
0 1 ±	1 0 ±

Table 1: Truth table representation of 2-input logic gates with ternary states of inputs.

X	Y	AND (X,Y)	OR (X,Y)	XOR (X,Y)
0	0	0	0	0
0	1	0	1	1
0	±	0	±	±
1	0	0	1	1
1	1	1	1	0
1	±	±	1	±
±	0	0	±	±
±	1	±	1	±
±	±	±	±	±

For representation of any combinational circuit in cyclic combinational method the logic design should be such that the primary outputs should be able to give the responses as '0' or '1' not '±'. So there is no logical feedback that is transmitted to produce the primary outputs. Let us take an example shown in Figure 6:

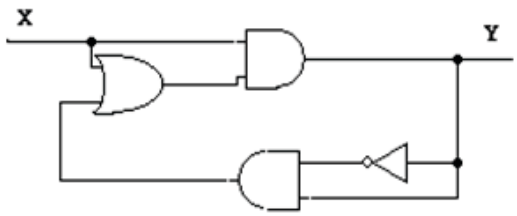


Figure 6: Cyclic circuit with structural feedback

The output Y in the Figure 6 is always equal to the input value X. Though there is structural feedback but the feedback path doesn't have any significance in producing the logical output. For detailed analysis we can use two types of analysis any circuit model – (A) The functional analysis and (B) the timing analysis. The goal of functional analysis is to determine what values appear; the goal of timing analysis is to determine when these values appear. The case for the optimality of the cyclic circuit rests on two properties: (1) each of the output functions depends on all its variables, (2) the output functions are distinct. The simplest way of representing the combinational functions in cyclic method is done by Karnaugh map methodology. First for generation of cyclic expression a dependency graph is required. Then from dependency graph the individual dependent output truth tables are redrawn using that current controlling output. After finding out the dependency the minimized Boolean expressions are obtained from Karnaugh map. After getting the required cyclic expressions for the combinational functions the functional and timing analysis can be done by using standard simulator.

To realize this methodology of converting acyclic circuit into a cyclic, let us take a popular example of 2-bit magnitude comparator circuit. A magnitude comparator is a combinational circuit that compares two numbers, A & B, and determines their relative magnitude. The outcome of the comparison is specified by three binary variables that indicate whether A>B, A=B, or A<B [15].

The circuit for comparing two n-bit numbers has 22n entries in the truth table. For simplicity a 2-bit comparator is taken for example. A 2-bit comparator has four input lines namely A1 & A0 representing A number and B1 & B0

representing number B. the truth table of a 2-bit comparator is shown in Table 2.

Table 2: Truth table of a 2-bit binary magnitude comparator

Inputs				Outputs		
A1	A0	B1	B0	A>B	A=B	A<B
0	0	0	0	0	1	0
0	0	0	1	0	0	1
0	0	1	0	0	0	1
0	0	1	1	0	0	1
0	1	0	0	1	0	0
0	1	0	1	0	1	0
0	1	1	0	0	0	1
0	1	1	1	0	0	1
1	0	0	0	1	0	0
1	0	0	1	1	0	0
1	0	1	0	0	1	0
1	0	1	1	0	0	1
1	1	0	0	1	0	0
1	1	0	1	1	0	0
1	1	1	0	1	0	0
1	1	1	1	0	1	0

With the help of k-maps the output functions can be represented as;

$$(A>B)=A_1\overline{B_1}+A_0\overline{B_0}\,(\overline{B_1}+A_0)$$

$$(A<B)=\overline{A_1}B_1+\overline{A_0}B_0\,(\overline{A_1}+B_1)$$

$$(A=B)=(A_1 \odot B_1).\,(A_0 \odot B_0)$$

Now the same outputs are represented in form of dependency with each other in order to make these functions cyclic. So the dependency graph of 2-bit comparator can be drawn as:

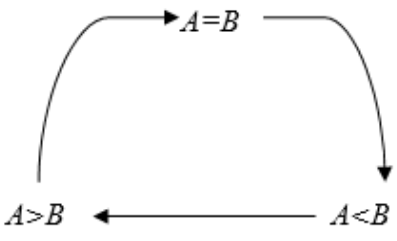


Figure 7: Dependency graph of 2-bit comparator

From this graph it can be determined that the output A>B is depending over A<B, whereas A=B is depending over A>B and A<B is depending over A=B. Now the truth table can be redrawn as follows;

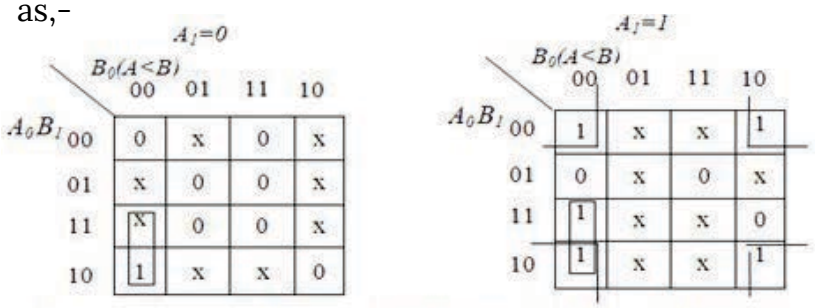
Table 3: Truth table of a cyclic 2-bit comparator with controlling values

Basic inputs				controlling value	output
A_1	A_0	B_1	B_0	A<B	A>B
0	0	0	0	0	0
0	0	0	1	1	0
0	0	1	0	1	0
0	0	1	1	1	0
0	1	0	0	0	1
0	1	0	1	0	0
0	1	1	0	1	0
0	1	1	1	1	0
1	0	0	0	0	1
1	0	0	1	0	1
1	0	1	0	0	0
1	0	1	1	1	0
1	1	0	0	0	1
1	1	0	1	0	1
1	1	1	0	0	1
1	1	1	1	0	0

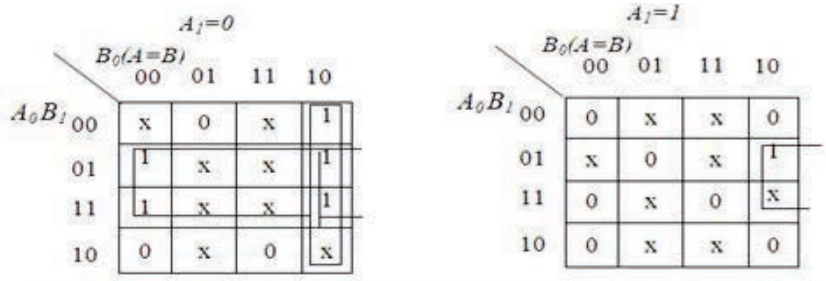
Basic inputs				controlling value	output
A_1	A_0	B_1	B_0	A>B	A=B
0	0	0	0	0	1
0	0	0	1	0	0
0	0	1	0	0	0
0	0	1	1	0	0
0	1	0	0	1	0
0	1	0	1	0	1
0	1	1	0	0	0
0	1	1	1	0	0
1	0	0	0	1	0
1	0	0	1	1	0
1	0	1	0	0	1
1	0	1	1	0	0
1	1	0	0	1	0
1	1	0	1	1	0
1	1	1	0	1	0
1	1	1	1	0	1

Basic inputs				controlling value	output
A_1	A_0	B_1	B_0	$A=B$	$A<B$
0	0	0	0	1	0
0	0	0	1	0	1
0	0	1	0	0	1
0	0	1	1	0	1
0	1	0	0	0	0
0	1	0	1	1	0
0	1	1	0	0	1
0	1	1	1	0	1
1	0	0	0	0	0
1	0	0	1	0	0
1	0	1	0	1	0
1	0	1	1	0	1
1	1	0	0	0	0
1	1	0	1	0	0
1	1	1	0	0	0
1	1	1	1	1	0

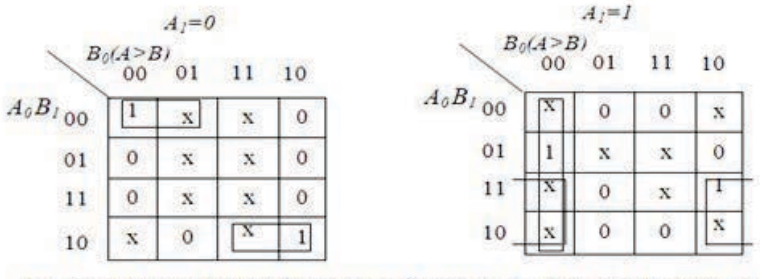
From Table 3 it can be noted that the number of input variables has been increased to five as there is one more controlling input along with other four primary inputs. Now k-map representations of output functions of 2-bit comparator can be found as,-



k-map representation for output function $A>B$ in cyclic manner



k-map representation for output function $A<B$ in cyclic manner



k-map representation for output function $A=B$ in cyclic manner

From the k-maps the following Boolean expressions are found out for the output functions of a 2 bit comparator:

$$(A>B)=\overline{L}\,(A_1\overline{B_1}+A_0\overline{B_0}) \quad , where\ L=A<B$$

$$(A<B)=\overline{A_1}B_1+\overline{E}B_0\,(\overline{A_1}+B_1) \quad , where\ E=A=B$$

$$(A=B)=\overline{A_1}\,\overline{B_1}(A_0\odot B_0)+A_1\overline{G}\,(A_0+\overline{B_0}) \quad , where\ G=A>B$$

Again to understand the logic operation of the cyclic comparator circuit let us take a combination of A=0, B=0. Therefore A1=A0=B1=B0=0. Now the cyclic expression gives output: (A>B)=L'(0.1+0.1)=L'.0=0, which is not depending over L or (A<B) logically. The output (A<B)=1.0+E'0(1+0)=0+E'.0=0 which is not depending over E or (A=B) logically. The last one (A=B)= 1.1(1 x-nor1)+0.G'(0+1)=1+0=1 which is also not depending over other controlling value G or (A>B). So as a result the cyclic comparator is producing the correct output (A>B)=0, (A<B)=0 & (A=B)=1 for A=0 & B=0 combination with having structural feedback excluding the provision for logical feedback. A CAD simulation based comparative study of conventional 2–bit comparator and cyclic 2–bit comparator shows significant improvement in terms of area, power and delay [17]. Figure 8 illustrates the power and delay responses for acyclic and cyclic circuits.

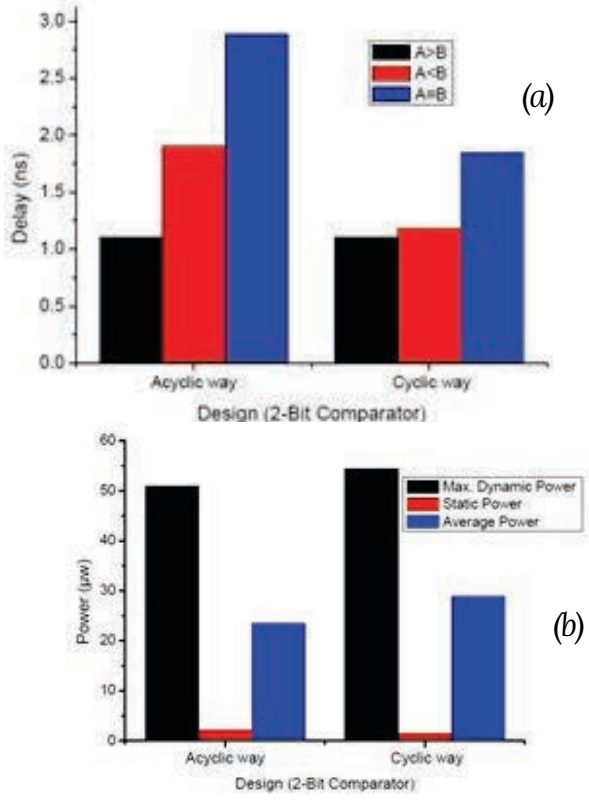
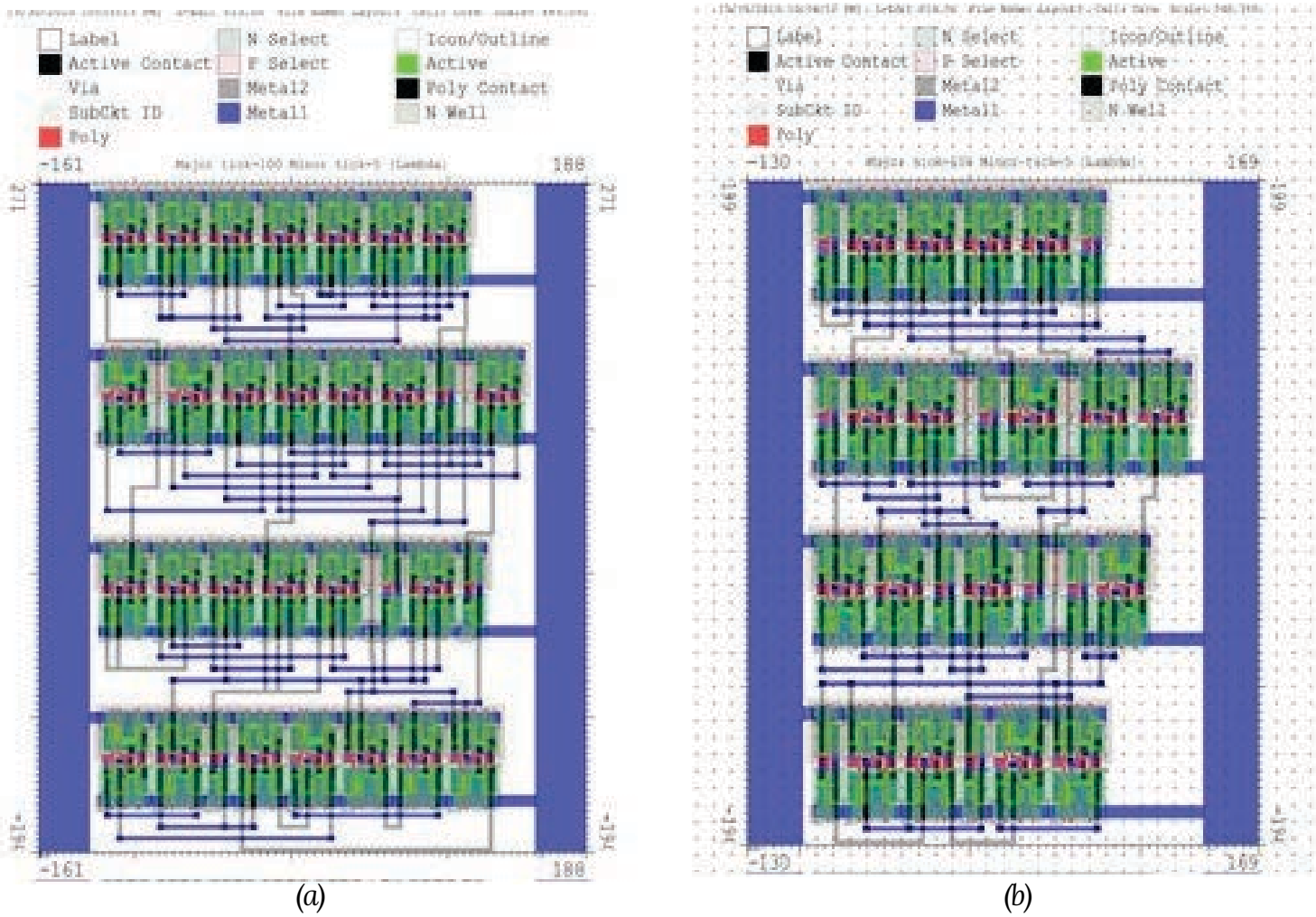


Figure 8.: 2-bit magnitude comparator responses for acyclic and cyclic circuit. (a) Delay introduced at output, (b) Power consumed by the circuits

The core area layouts of the acyclic and cyclic 2-bit comparators using standard cell placement and routing are shown in 9. The corresponding layout analyses are tabulated in Table 4.



(a) (b)

Figure 9: Core layouts of 2-bit comparator circuits using standard cell place and route. (a) acyclic way, (b) cyclic way

Table 4: Comparative study of layout summary of 2-bit comparator

Layout Summary of 2-bit comparator acyclic circuit	Layout Summary of 2-bit comparator cyclic circuit
Number of standard cells : 31	Number of standard cells : 26
Number of signals in netlist : 64	Number of signals in netlist : 49
Core size in Lambda : 349. x 465.	Core size in Lambda : 299. x 393.
Core area (Lambda^2) : 162285	Core area (Lambda^2) : 117507.
Length of nets in core : 8432. Lambda	Length of nets in core : 5192. Lambda
Generated vias in core : 75	Generated vias in core : 47
No. of Nodal Parasitic Capacitance: 91	No. of Nodal Parasitic Capacitance: 66

Conclusion

From the CAD based simulation results it can be concluded that cyclic circuits are better in delay, power and area consideration in comparison with acyclic combinational circuits. Circuits that have a fundamental acyclic topology are definite to be combinational since feedback is necessary for sequential behavior. However, the reverse is not true, since there do exist combinational logic circuits that are cyclic. In fact, such combinational circuits occur often in bus structures in data paths. Cyclic combinational circuits consist of topologically multiplexed acyclic circuits.

The general methodology for the synthesis of multilevel combinational circuits with cyclic topologies introduces feedback in the substitution / minimization phase, optimizing

a multilevel network description for area. In trials with benchmark circuits, many were optimized significantly, with improvements of up to 30% in the area superior to acyclic. . Therefore, it can be concluded that the concept of "combinational" in circuit design: we should no longer think of combinational logic as acyclic in theory or in practice, since nearly all combinational circuits are best designed with cycles.

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Sun Simulator & STRINGER TT2100

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Local governments can dramatically reduce their carbon footprint by purchasing or directly generating electricity from clean, renewable sources.

The most common renewable power technologies include:

- Solar (photovoltaic, solar thermal)
- Wind
- Biogas (e.g., landfill gas/wastewater treatment digester gas)
- Geothermal
- Biomass
- Emerging technologies - wave and tidal power

Local governments can lead by example by generating energy on–site, purchasing green power, or purchasing renewable energy. Using a combination of renewable energy options can help meet local government goals especially in some regions where availability and quality of renewable resources vary.

Benefits of Renewable Energy

Environmental and economic benefits of using renewable energy include:

- Generating energy that produces no greenhouse gas emissions from fossil fuels and reduces some types of air pollution
- Diversifying energy supply and reducing dependence on imported fuels
- Creating economic development and jobs in manufacturing, installation, and more

So we mostly use the solar energy because it is affordable for all of us and as well as less of maintained charge if we install one time then we did not look back 2-3 years. So for the solar power we need the solar panels, battery and a inverter. In those components the most important think is solar panel. So making a solar panel there are so many process likes cell QC, Tabbing and Stringing, Robot Layup, Back EVA and Back sheet, Lamination, Framing, JB Box fixing IV Testing/Sun Simulator, Packing e.t.c.

In those above mention process there are two main machines 1. Sun simulator and 2. Stringer

The solar cells are comes in the single pieces but in solar panel there the cells are connected one by one in a maintaining order. So in huge production there are not possible to connect the cells in this way by hand and it take huge time so where one most important machine is used which name is STRINGER.

When we completely make the solar panel when there has some chance to break the solar cells in panel which we did not see in our normal eye so when we used a another most important machine which name is SUN SIMULATOR. Where we use high voltage D.C in panel's terminal and the cell will be grow, this picture will we see in a big led screen and we found the creak's cells.

Now I discuss about this two machines in briefly in bellow.

Sun Simulator (Module Inspection System)

INTRODUCTION

Photovoltaic solar cells are thin silicon disks that convert sunlight into electricity. These disks act as energy sources for a wide variety of uses, including: calculators and other small devices; telecommunications; rooftop panels on individual houses; and for lighting, pumping, and medical refrigeration for villages in developing countries. Solar cells in the form of large arrays are used to power satellites and, in rare cases, to provide electricity for power plants.

A solar PV module consists of solar cells, glass, EVA, back sheet and frame. Learn more about the components and the process of manufacturing a solar panel.

There are 3 types of solar panels available on the market:

- monocrystalline solar panels
- polycrystalline solar panels
- bifacial solar panels
- thin film solar panels

Thus, at cell structure level, there are different types of material for manufacturing, such as mono silicon, polysilicon or amorphous silicon (AnSi). The first 2 kinds of cells have a somewhat similar manufacturing process.

Step 1: Sand

It all starts with the raw material, which in our case is sand. Most solar panels are made of silicon, which is the main component in natural beach sand. Silicon is abundantly available, making it the second most available element on Earth. However, converting sand into high grade silicon comes at a high cost and is an energy intensive process. High-purity silicon is produced from quartz sand in an arc furnace at very high temperatures.

Step 2: Ingots

The silicon is collected, usually in the form of solid rocks. Hundreds of these rocks are being melted together at very high temperatures in order to form ingots in the shape of a cylinder. To reach the desired shape, a steel, cylindrical furnace is used. In the process of melting, attention is given so that all atoms are perfectly aligned in the desired structure and orientation. Boron is added to the process, which will give the silicone positive electrical polarity.

Mono crystalline cells are manufactured from a single crystal of silicon. Mono Silicon has higher efficiency in converting solar energy into electricity; therefore the price of monocrystalline panels is higher.

Polysilicone cells are made from melting several silicon crystals together. You can recognize them by the shattered glass look given by the different silicon crystals. After the ingot has cooled down, grinding and polishing are being performed, leaving the ingot with flat sides.

Step 3: Wafers

Wafers represent the next step in the manufacturing process. The silicon ingot is sliced into thin disks, also called wafers. A wire saw is used for precision cutting. The thinness of the wafer is similar to that of a piece of paper.

***Fig. 1.1* – INGOTS**

Because pure silicon is shiny, it can reflect the sunlight. To reduce the amount of sunlight lost, an anti-reflective coating is put on the silicon wafer.

Step 4: Solar cells

The following processes will convert a wafer into a solar cell capable of converting solar power into electricity.

Each of the wafers is being treated and metal conductors are added on each surface. The conductors give the wafer a grid-like matrix on the surface. This will ensure the conversion of solar energy into electricity. The coating will facilitate the absorption of sunlight, rather than reflecting it.

In an oven-like chamber, phosphorous is being diffused in a thin layer over the surface of the wafers. This will charge the surface with a negative electrical orientation. The combination of boron and phosphorous will give the positive - negative junction, which is critical for the proper function of the PV cell.

Step 5: From Solar Cell to Solar Panel

The solar cells are soldered together, using metal connectors to link the cells. Solar panels are made of solar cells integrated together in a matrix-like structure. The current standard offering in the market are:

- 60-cell panels - this is the standard size.
- 72-cell panels -used for large-scale installations.
- 144 cell panels - used for large-scale installations.

After the cells are put together, a thin layer (about 6-7 mm) of glass is added on the front side, facing the sun. The back sheet is made from highly durable, polymer-based material. This will prevent water, soil, and other materials from entering the panel from the back. Subsequently, the junction box is added, in order to enable connections inside the module.

It all comes together once the frame is assembled. The frame will also provide protection against impact and weather. The use of a frame will also allow the mounting of the panel in a variety of ways, for example with mounting clamps.

EVA (ethylene vinyl acetate) is the glue that binds everything together. It is very important that the quality of the encapsulate is high so it doesn't damage the cells under harsh weather conditions.

Step 6: Testing the Modules

Once the module is ready, testing is carried out to ensure the cells perform as expected. STC (Standard Test Conditions) are used as a reference point. The panel is put in a flash tester at the manufacturing facility. The tester will deliver the equivalent of 1000W/m2 irradiance, 25°C cell temperature and an air mass of 1.5g. Electrical parameters are written down and you can find these results on the technical specification sheet of every panel. The ratings will reveal the power output, efficiency, voltage, current, and impact and temperature tolerance.

Apart from STC, every manufacturer uses NOCT (nominal operating cell temperature). The parameters used are more close to 'real life' scenario: open-circuit module operation temperature at 800W/m2 irradiance, 20°C ambient temperature, 1m/s wind speed. Again, the ratings of NOCT can be found on the technical specification sheet.

Cleaning and inspection are the final steps of the production before the module is ready to be shipped to homes or businesses.

Research and development in the solar energy industry is aiming at reducing the cost of solar panels and increasing efficiency. The solar panel manufacturing industry is becoming more competitive and is forecasted to become more popular than conventional sources of energy, such as fossil fuels.

Basic flow chart

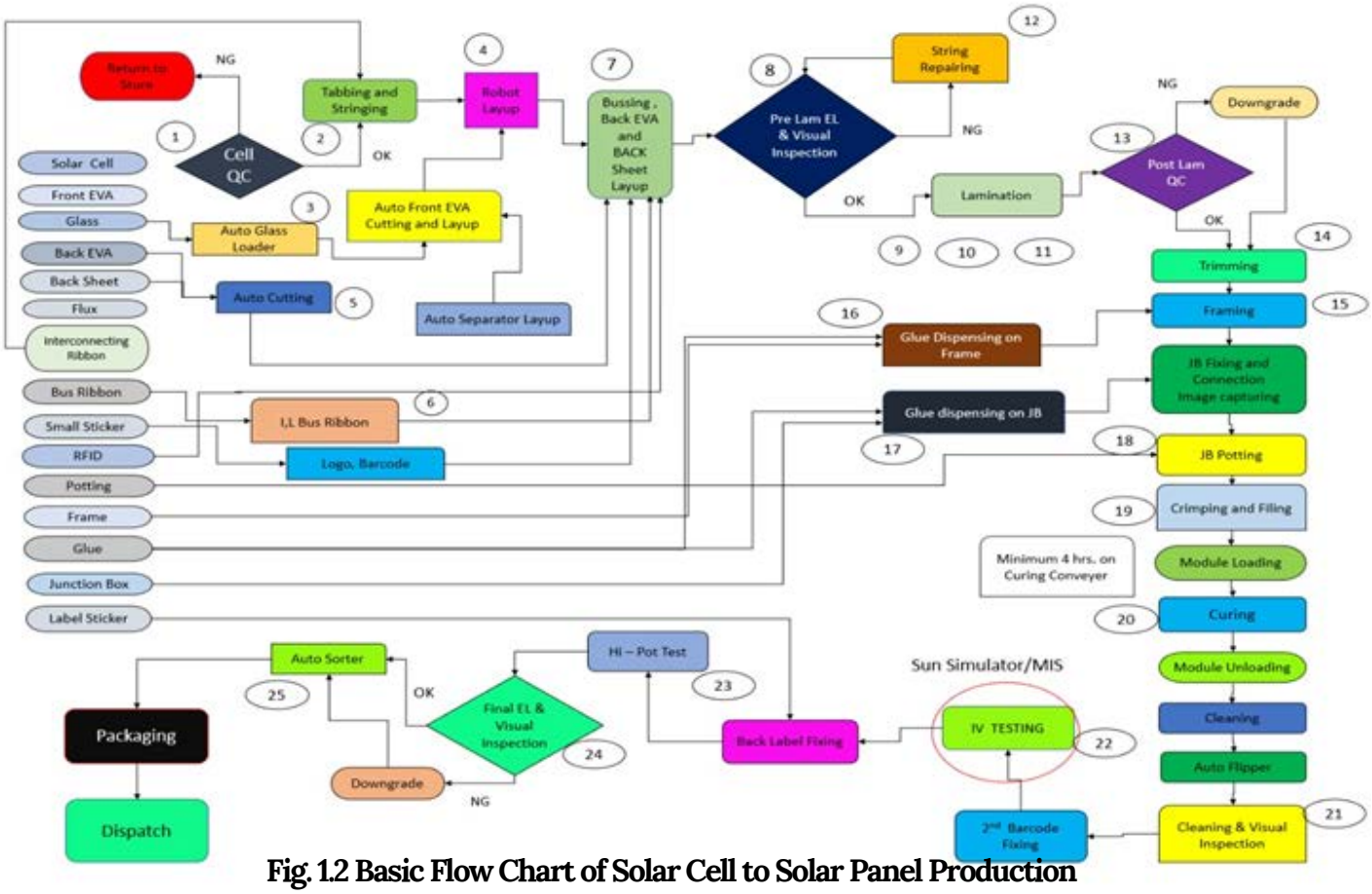


Fig. 1.2 Basic Flow Chart of Solar Cell to Solar Panel Production

Module Inspection System
(SUN SIMULATOR)

The Module Inspection System is a flatbed flasher that is entirely based on LED lighting technology.

The new module tester delivers A+A+A+ results and reduces operating costs thanks to cost-effective and long-lasting LED technology. It can be seamlessly integrated into any existing line, with long or short side opening.

The system offers entirely new measuring options, including the inspection of bifacial solar modules. The module tester can boast TÜV tested A+A+A+ quality, a throughput speed of up to 240 modules per hour (approx), a flash duration of 100-120ms, as well as extremely low total cost of ownership as there are no fluorescent tubes to be replaced. The MIS – controlled by user-friendly proLIGHT software – can easily be integrated into existing lines.

Your benefits:

- Significant spare part savings, no light tubes needed
- Higher productivity (4 Module per Minute (approx))
- ·Accurate measuring of new module technology
- Easy to implement in existing lines
- High investment safety: Almost no change of measurement results after 1 year of flashing without any break (1 flash every 15 seconds 24/7)
    - MIS (sun simulator) is a device that provides illumination approximating natural sunlight.
    - The purpose of the sun simulator is to provide a controllable indoor test facility under laboratory conditions(23-27 degree c), used for the testing of solar cells
    - MIS Provide us I/V curve of a module & provide the measurement of total power of the module.

TYPE OF SUN SIMULATOR:-

Basically sun simulators are 2 types: - 1. S type and 2. P type.

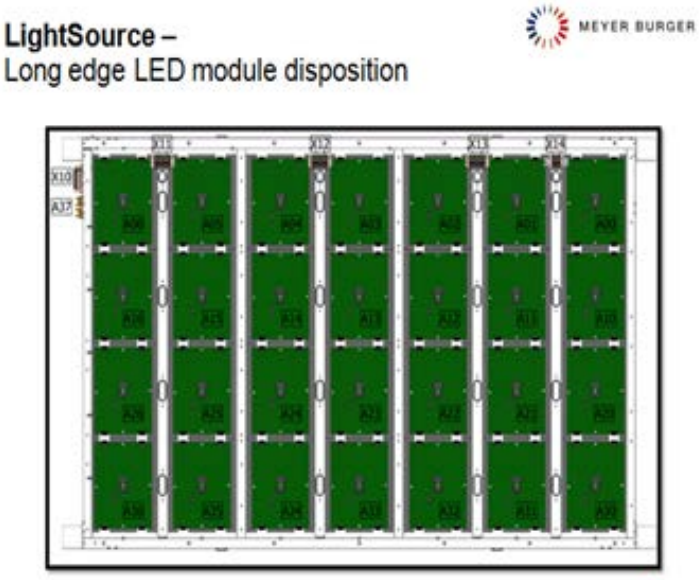


Fig 1.3- L Type sun simulator

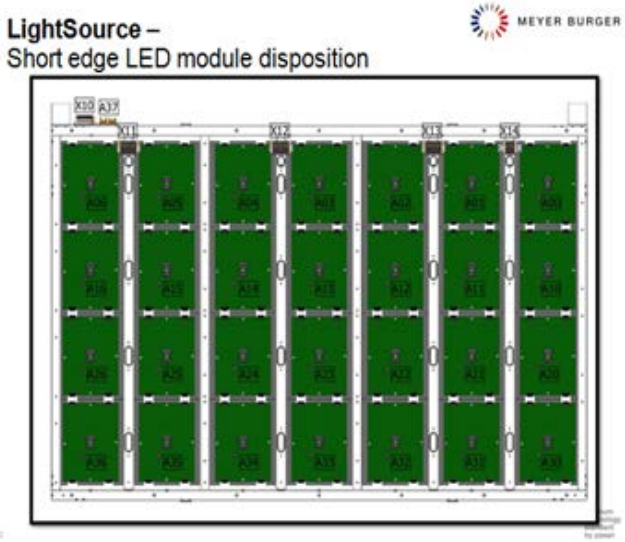


Fig. 1.4- S- Type sun simulator

Basic function of sun simulator

This system main function is when the solar module is fully ready then the modules come in the MIS or sun simulator then the two male connecter connects with the solar two female connecter. Then from the measurement computer we do calibration and from this system LED's are just blink (100-120 ms) in 1000w/m2. Because the average annual solar radiation arriving at the top of the Earth's atmosphere is roughly 1361 W/m2. The Sun's rays are attenuated as they pass through the atmosphere, leaving maximum normal surface irradiance at approximately 1000 W/m2 at sea level on a clear day. That's why we use the 1000w/m2.

Then the solar module absorbed the energy from this light and the value come in the e-load and from the e-load the values come in measurement computer and we see value in out output screen. And according to that we will label it Rated peak power (330w low or high or 335w low or high)open circuit voltage, short circuit current rated voltage, fill factor, efficiency, class of protection, fire rating, maximum system, operating voltage, NOCT, dimension, measurement uncertainty production date etc . We declared the low or high through color code. Orange means high and yellow means low.

Ideal conditions required for testing

For during this sun simulator's process the environment is most important, the temperature is 250C, 1.5 air mass and 1000w/m2.

Equivalent electrical diagram

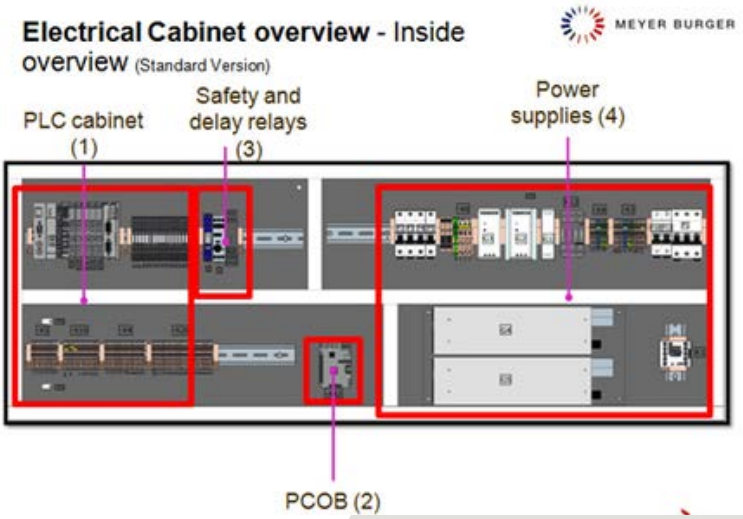


Fig. 1.5- Electrical cabinet overview

How the total system works

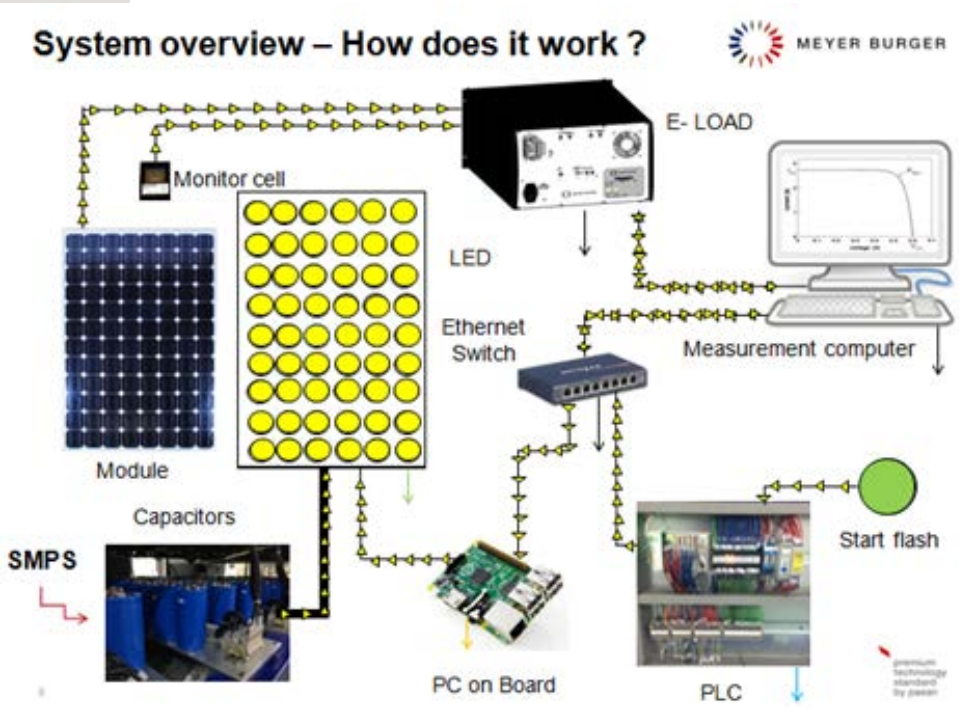


Fig. 1.6 – System Overview of Sun Simulator

If we do this performances then we needs powers. The powers are come from the SMPS

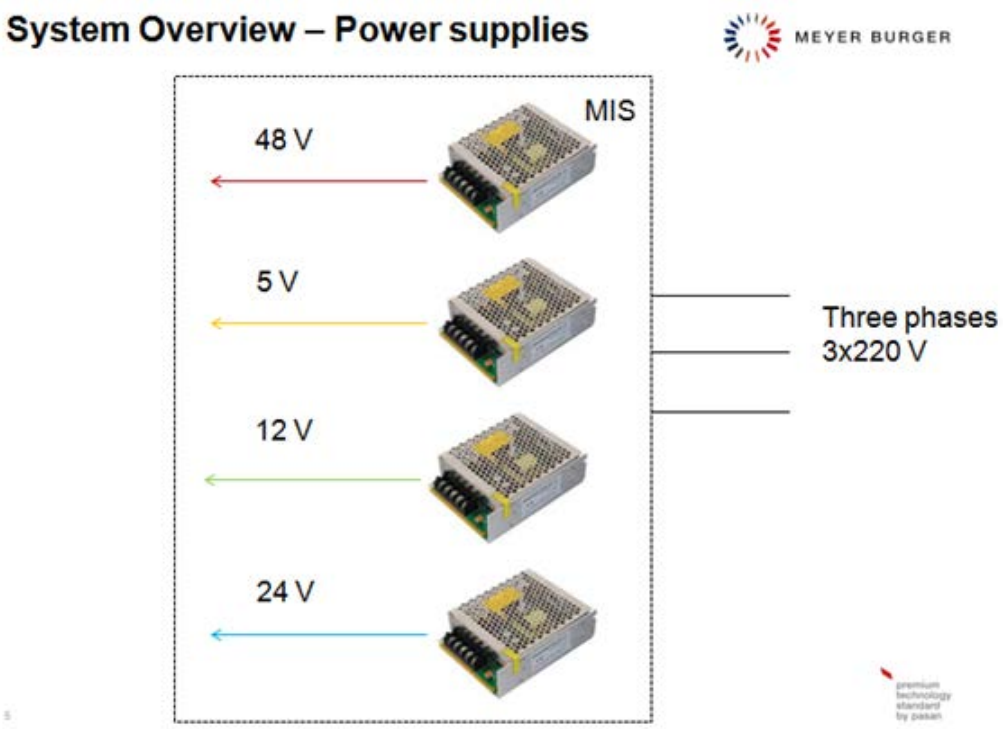


Fig. 1.7- Power Supply of Sun Simulator

In Module Inspection System the most important parts are:-

- Measurement computer
- PLC , I/O card, electrical terminal
- Power supply units
- Capacitor banks
- PC on Board (Link between Measured computer & LED driver)
- Ethernet switch
- Bank of different types of LED
- ELOAD

Monitor cell

Purpose	Measures the irradiance
Shunt	1Ω shunt mounted
Sensitivity	Sensitivity is the voltage on the shunt at 1kW/m2
Connection	To the E-load
Temperature measurement	PT1000
Cleaning	With IPA

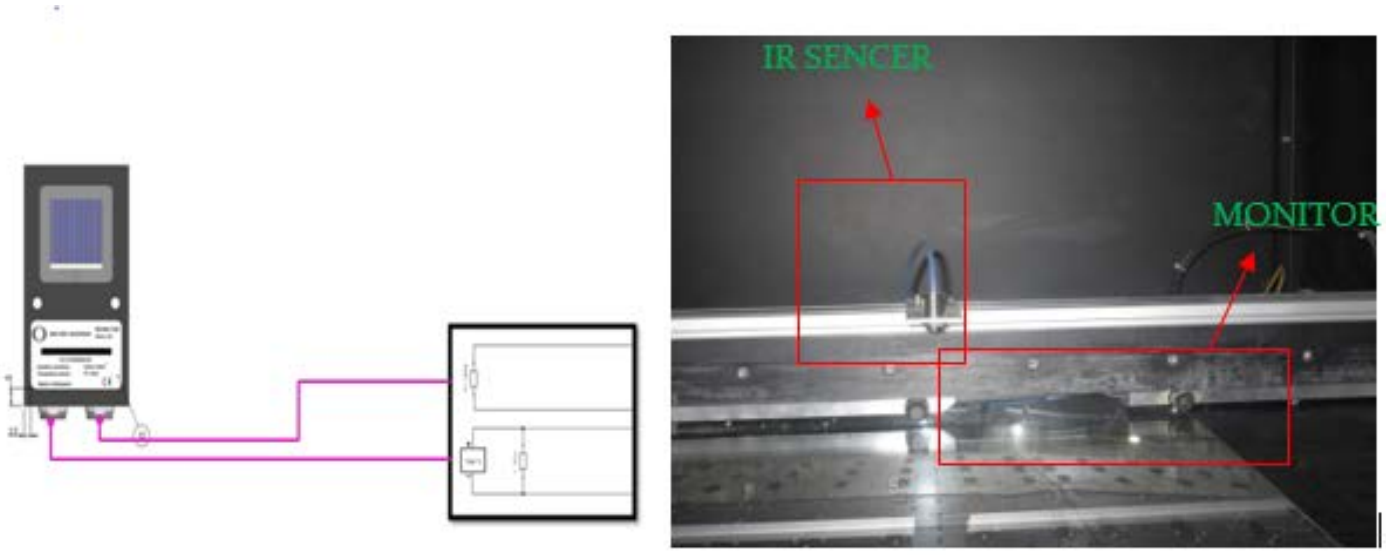


Fig. 1.8 IR Sencer and Connection of Monitor Cell.

Measurement computer

Through this computer we do calibration and control the LEDs. And after complete the process we get the results in this computer. This computer is directly connected with E-LOAD and we get readings.

PLC

Online/Offline mode

Online mode : Start flash signal is sent from conveyor/from the line (automatically by the line. (X20)

Offline mode : Start signal is sent manually from start button (manually by operator). (X10)

The updated variable list//description is available in our «Pasan Measurement System PLC AID» document

The updated list of PLC terminals can be provided by service Pasan.

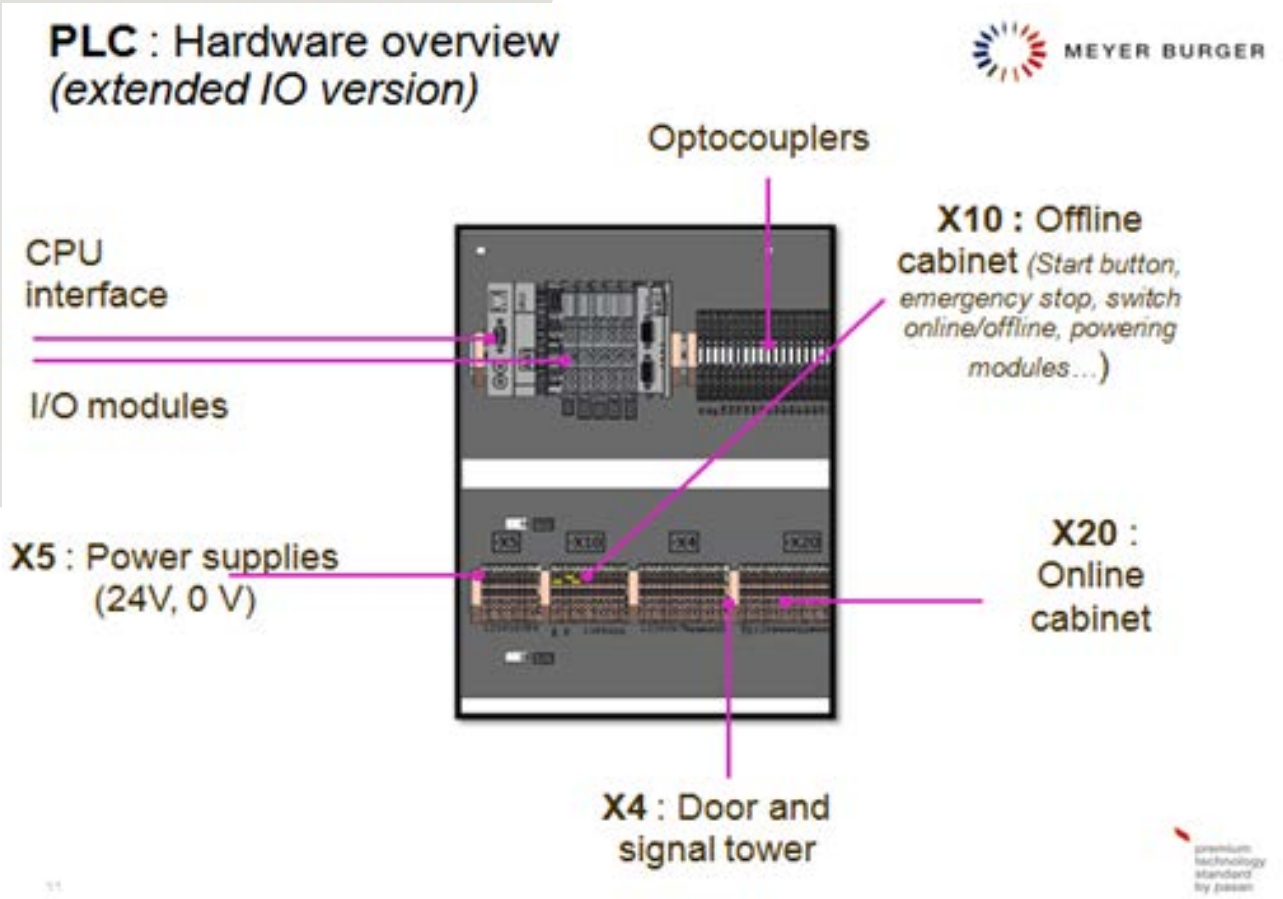


Fig. 1.9- PLC overview

POWER SUPPLY UNITS

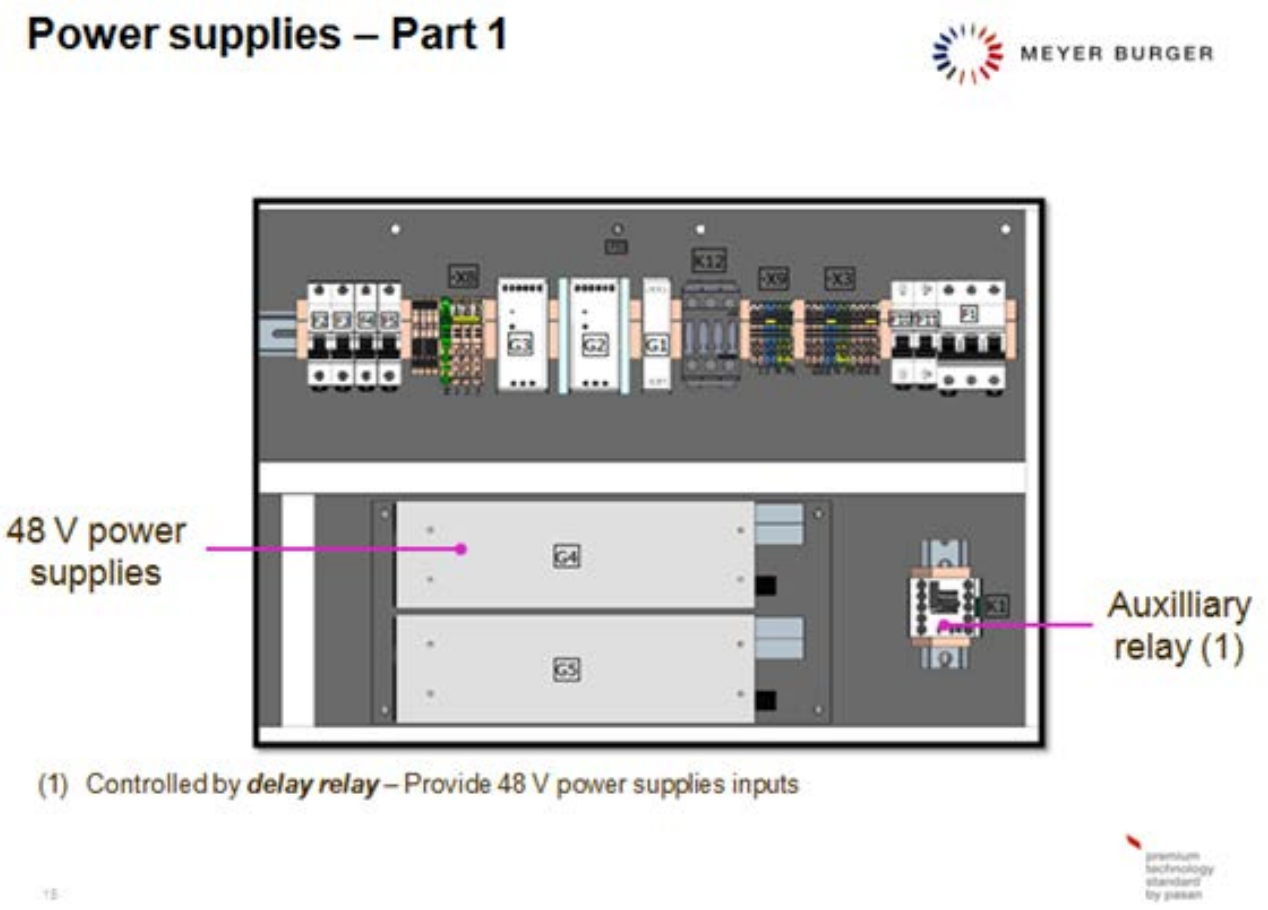


Fig. 1.10- Power Supply of Sun Simulator

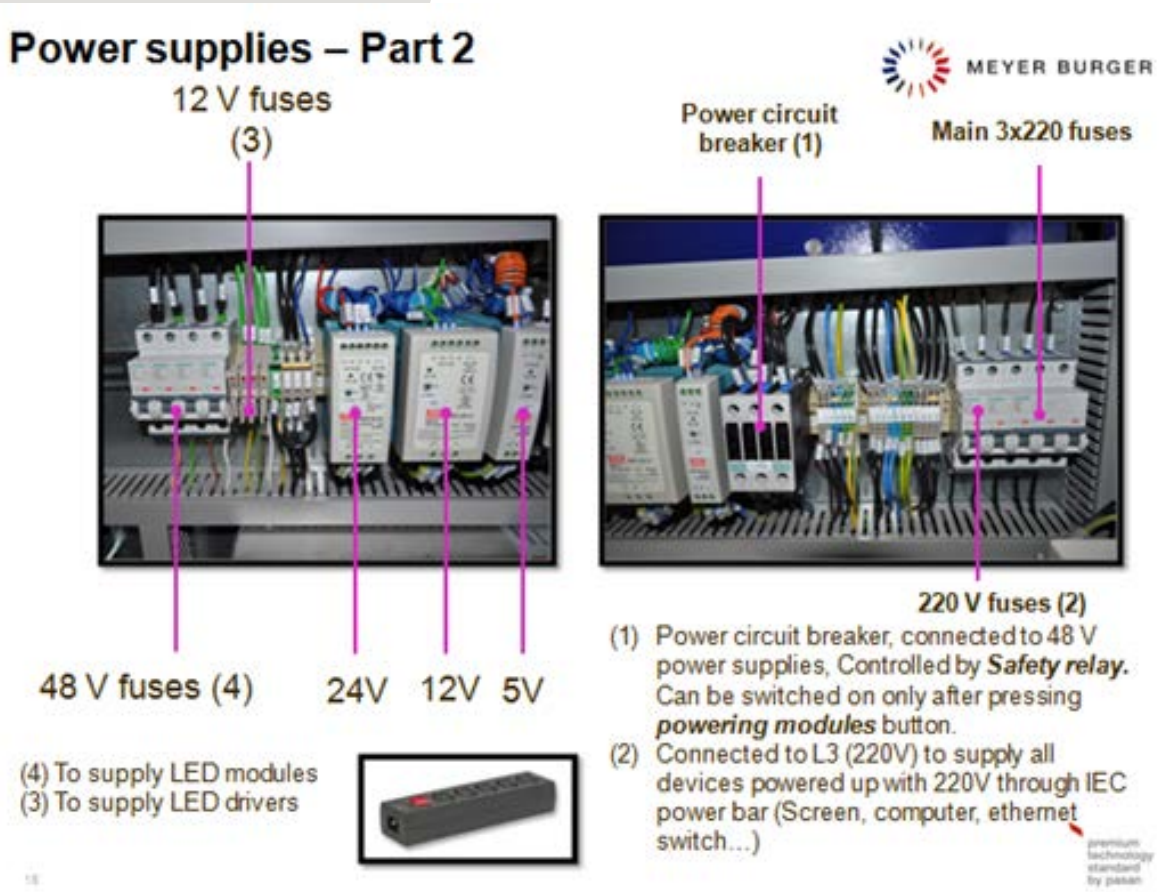


Fig. 1.11 – Original Power Supply of Sun Simulator

Capacitor banks

In this machine the main think is capacitor bank. When the LEDs are blink at that time very much energy required that much power did not give the smps by at a time so we used capacitor bank. There are supers capacitors are used. SMPS are charge the capacitors and the capacitor are stored the energy and when the LEDs are blink at that time instantly the capacitor discharged and produce a high power. This is the main function of capacitor.

Ethernet switch

Ethernet switch is used as a switch. When PLC on when PC on when E-LOAD on this thinks are controlled by ethernet switch.

PC on Board

- Drives the LED (connected to LED drivers through FTDI cable)
- Set up light level
- Allows log files from LED
- Contains the uniformity file (.hex) (Embedded SD card)
- Adjustment of uniformity
- Low level flash control
- Controlled by PC on board server.

Bank of different types of LED

- 8 kinds of LED
- 4928 LED in total
- 28 LED modulent divided into 4 blocks
- Light regulation with LED drivers

Monitor cell is only used to measure irradiance

- Light uniformity is defined with H-file
- Flash pulse duration 120ms
- Each LED is calibrated ; Parameters stored on associate LED driver.

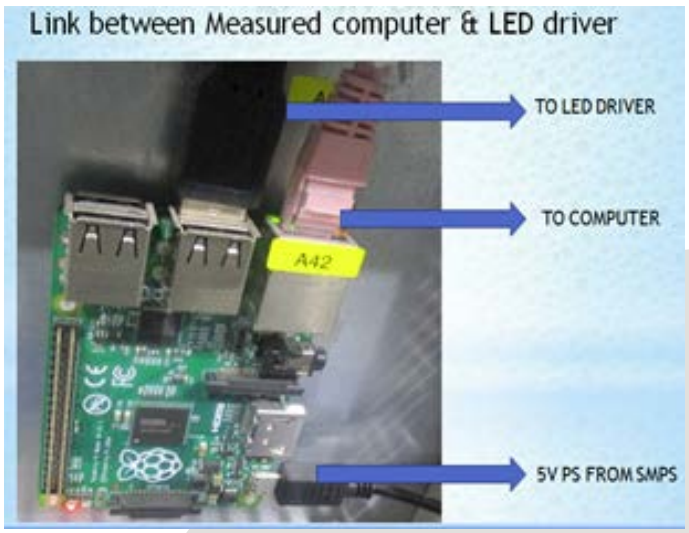


Fig. 1.12- PC on Board

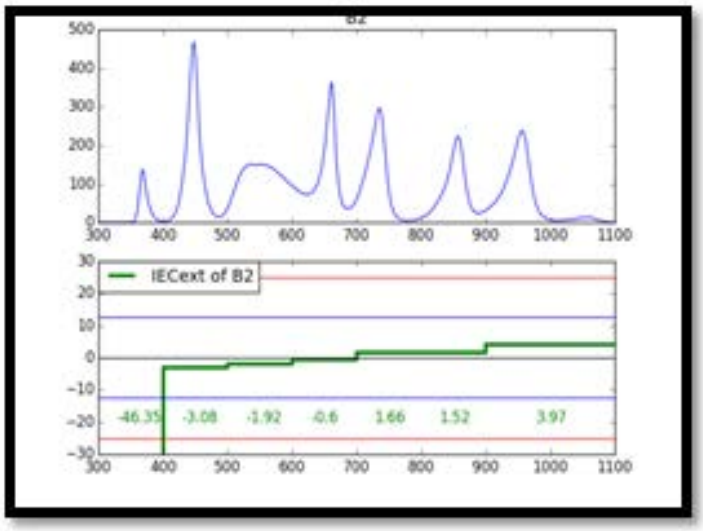


Fig. 1.13 – Technical characteristics

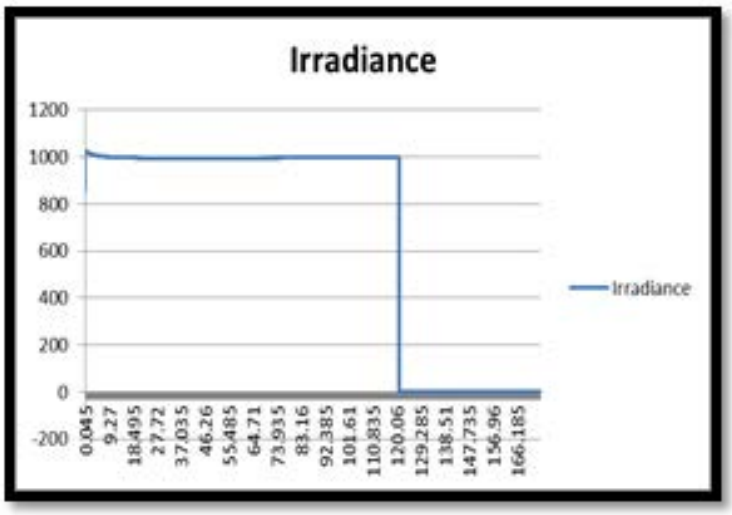


Fig. 1.14– Irradiance

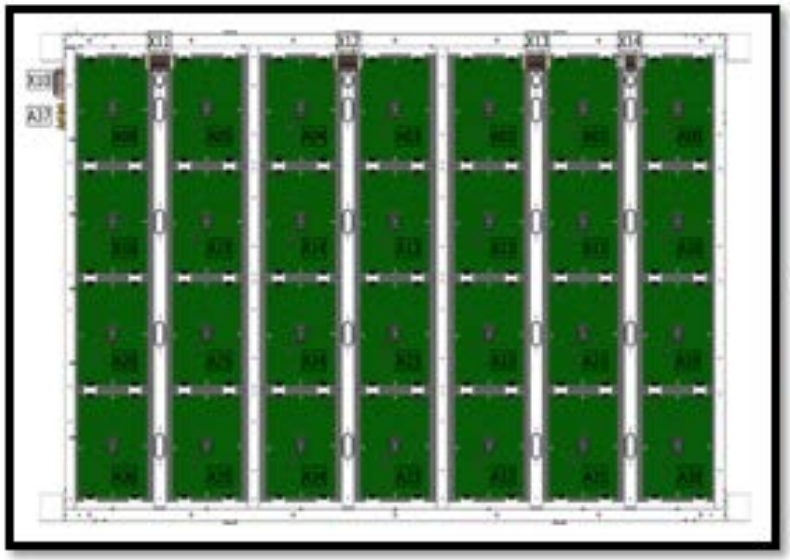


Fig. 1.15 – Diagram of LED Modules

Fig. 1.16- LEDs and

LED Driver

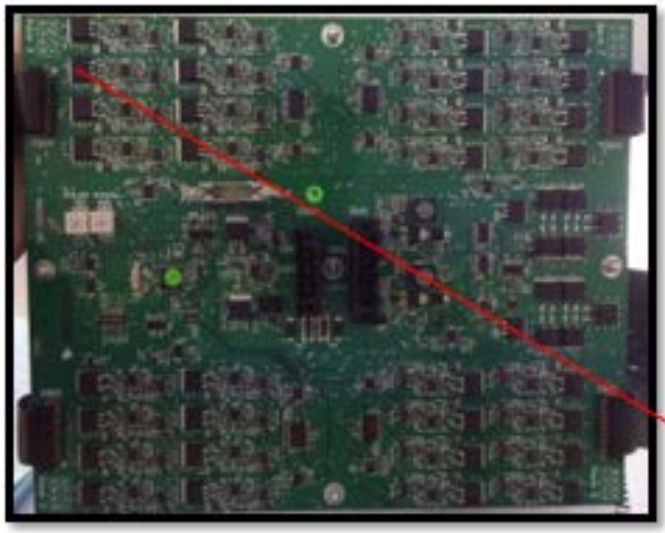


Fig. 1.17- LED Driver

Parameters stored on associate LED Driver

ELOAD:

E- Load is a machine which under have so many parts like: - Power supply filtering
Relay of scale selection,
Master board,
Voltage irradiance and temperature measurement,
Output amplifier controller,
Current measurement

Power supply relay

All components in this part are capacitor.

Relay of scale selection:

Voltage, Temperature and Current this three cards are present inside the E-LOAD. This all cards are did not works at a time. When the current card, temperature or, voltage card will be work this things are controlled by Relay scale selection.

Master board

Through the board connect all the card with LAN, so mainly its main purposes LAN communication.

Voltage irradiance and temperature measurement:-

Through this card we can measure voltage and temperature which is comes from the solar module.

Output amplifier controller

If some who output current is hazy then through this device we can control the current waveform.

Current measurement

Through this card we can measure current which is comes from the solar module.

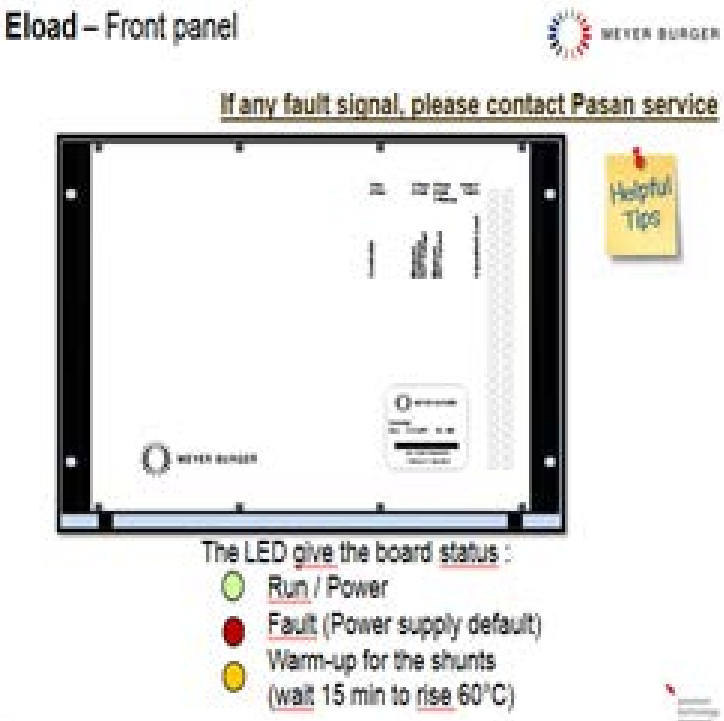


Fig. 1.18- Front Panel of E-LOAD

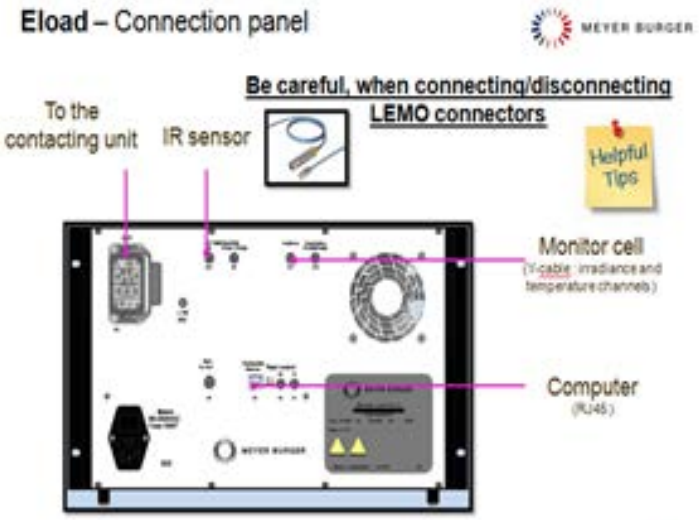


Fig 1.19- Back Panel of E-LOAD

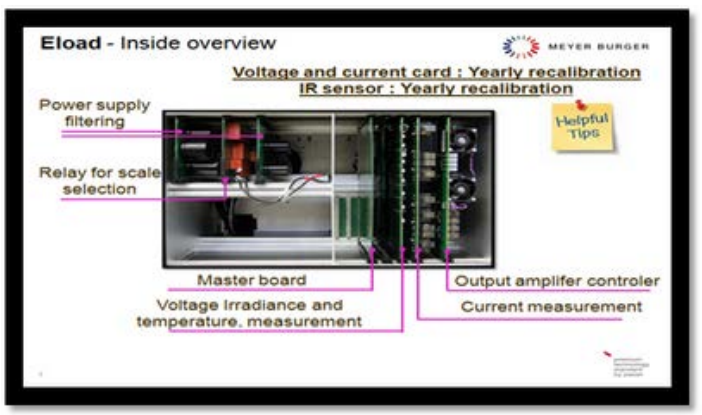


Fig 1.20- Inside Of E-LOAD

Front panel description

Local mode machine control

Fig. 1.21- Local mode machine control

Not the lattest version – May be different according to MIS version

- Start flash
- Switch offline/online
- Reset/safety loop : To be used to power on the LED modules

Only with motion version

- Dut eject - To release DUT after measurement
- Safety off – To enable/disable the safety relay

Contacting Unit

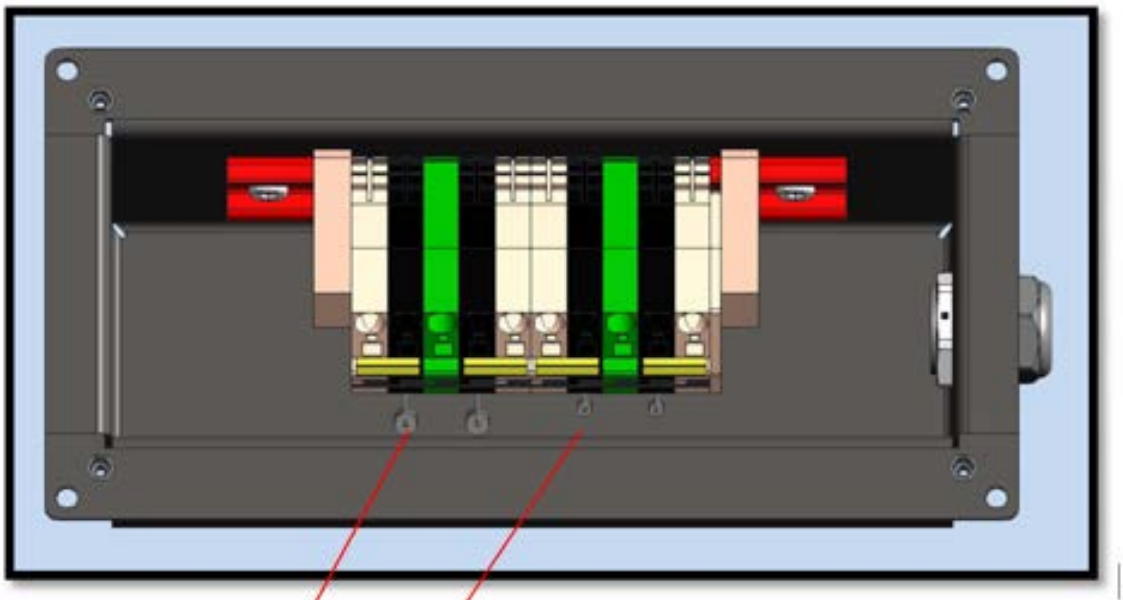


Fig. 1.22- Contacting Unit of E-LOAD

- 4 points terminal between DUT and e – load
- Easy to exchange the type of connector
- Protective diodes between terminal and ground to protect against overcurrent damaging eload current card :
    - 27V bidirectional diodes : biggest ones (V- and I-)
    - 530V bidirectional diodes : smallest ones (V+ and I+)

Signal from buttons :-

Buttons	Signal
Reset/Safety Loop	**ON:** No power on module = Safety relay off = emergency stop OR Door open OR machine starting **OFF:** Load on capacitors is active
Start Measurement	**Blinking:** Door is open (can't no flash from HMI) **Fix:** ready to flash **OFF:** ONLINE mode selected or capacitors are loading **(15sec)**

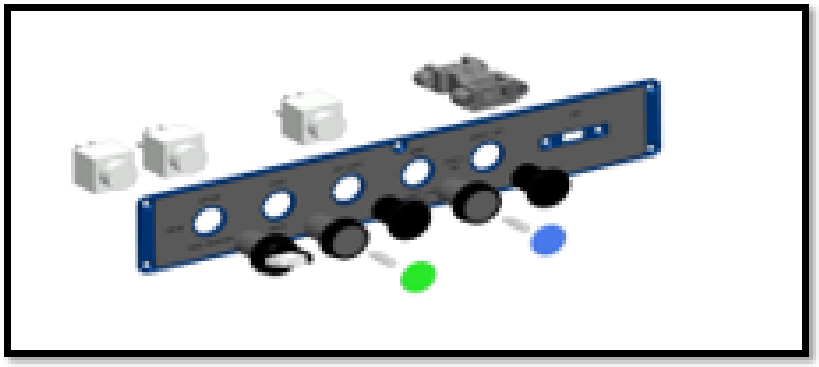


Fig 1.23- Controller's part

Signal	Description	Details
Off	Sys OFF	-
Green	Ready for production	• MIS is ready to flash • Production mode enable • Flash from front panel • If blinking = standby
Orange	Engineering mode	• Flash only from measure button • Engineering mode enable
Red	Alarm	• Prolight is down • PLC-Prolight Link lost • Emergency stop enabled • ...
All lighted	Initialisation	-

	Machine (Map) Status	Measurement (Map) Status
Purpose	Machine acceptable state ?	Measurement acceptable state ?
Details	«Troubleshooting Tab»	«Report Tab»
OK Status	Machine is OK	Measurement is OK
AtRisk Status	Could flash Results is not guaranteed	Could flash Results is not guaranteed
KO Status	No flash or no measurement	Could not measure the key data

Some clues : Signal from Light Tower

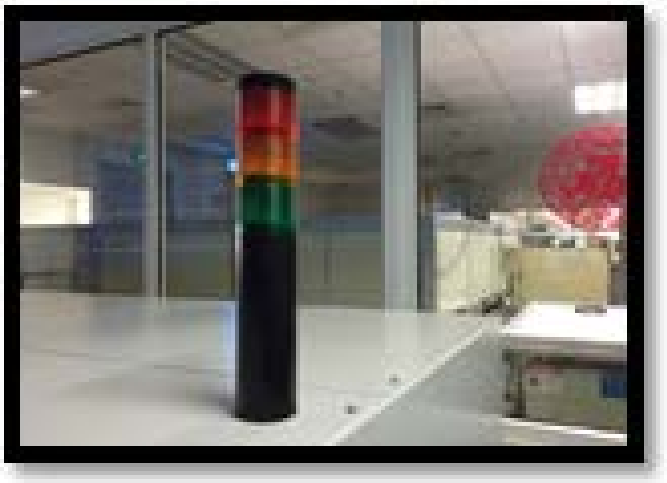


Fig. 1.24- Light Tower

Some clues : Map and Mep status

	Machine (Map) State	Measurement (Mep) State
Purpose	Machine acceptable state ?	Measurement acceptable state ?
Details	«Troubleshooting Tab»	«Report Tab»
OK Status	Machine is OK	Measurement is OK
AtRisk Status	Could flash Results is not guaranteed	Could flash Results is not guaranteed
KO Status	No flash or no measurement	Could not measure the key data

Fig 1.25 – Measurement and Machine Status

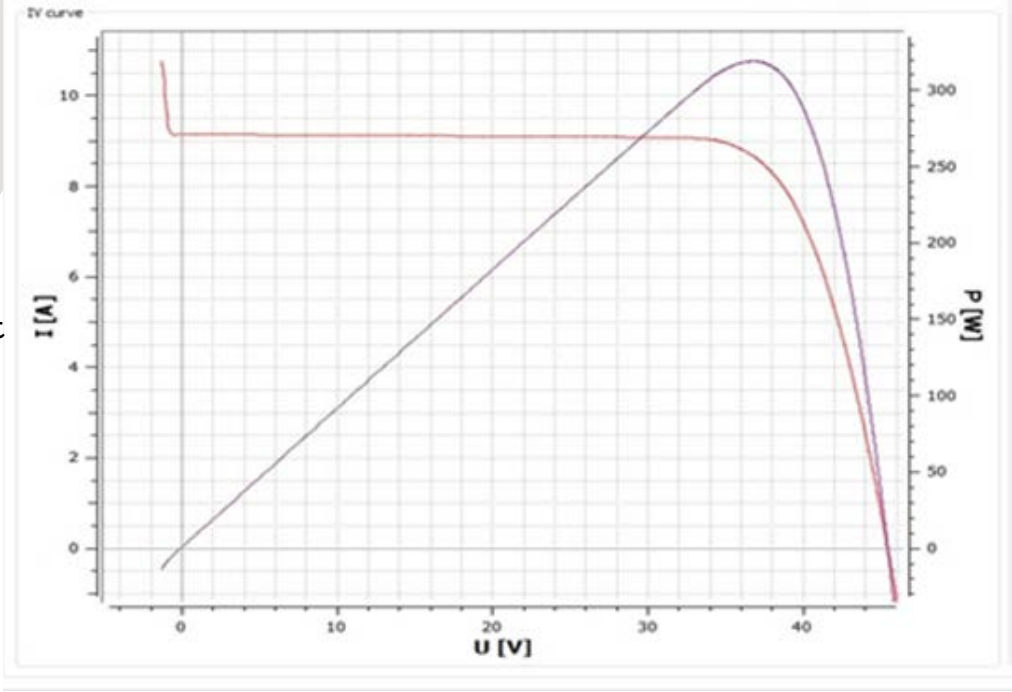


Fig. 1.26- I/V Measurement Test Report

Some clues : Frequent issues and mistakes

MEYER BURGER

Description	Solutions
Emergency stop pressed	Do not forget to release ES and power module again

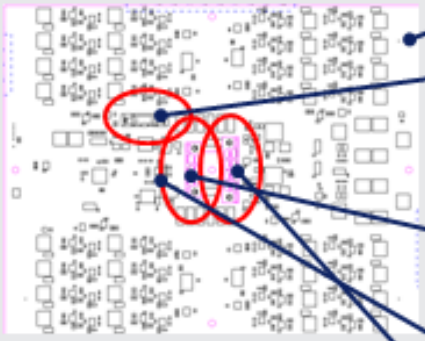
LED modules not flashing 	• Is the LED module connected to the LED driver?
	• Is the LED module connected to others ?
	• Is the LED driver light blinking ?
	  • Yes : driver is powered ON with 12 V
	  • No : connect driver OR check fuses
	• Is the 48 V connected to capacitors ?
	  • Check the 48 V fuses
	• Is the LED module connected to capacitors ?

Fig 1.27- Worsened LEDs

STRINGER TT2100 (Teamtechnik)

The new generation of teamtechnik stringers sets a new standard with a cycle time of 1.7 seconds. With an annual capacity of 65 MWp, the Stringer TT2100 is the fastest single-track system in the world. Once set up, its teamtechnik technology operates reliably without the need for further adjustment and offers availability of up to 98%. Customers of the more than 600 high-tech systems sold to date include leading global manufacturers of solar modules that are now ordering the fourth generation of teamtechnik stringers. Highly dependable output and the best soldering quality have made teamtechnik the market leader in this area of solar technology.

Exact ribbon positioning even with 0.6 mm widths

An unique feature of teamtechnik stringers is that the key processes of ribbon and cell handling on the one hand and soldering on the other are decoupled by means of a patented hold-down device. This ensures optimal ribbon positioning, even down to very narrow ribbon widths of just 0.6 mm. Combined with the contactless infrared soldering process that compensates for fluctuations in the cell material, this results in consistently the best soldering, precise ribbon positioning and exact string geometry.

Flexibility for up to 6 busbars

The new system can process solar cells with up to six busbars. Even after delivery, it can be modified to accept five or six busbars. This applies for both full cells and half cells. The result: constantly high string quality with breakage rates of less than 0.1–0.3%.

FIG no. 2.1 – STRINGER TT2100

The Stringer TT2100 is setting a new standard at 2100 cycles per hour or 1.7 seconds for a single cycle. It confirms teamtechnik's position as the supplier of the fastest single-track soldering solutions for solar cells in the world, increasing the throughput per stringer to 65 MW per year and production system. The full teamtechnik layup system with two Stringer TT2100s and a 6-axis robot achieves a total output of 130 MW per year.

The new stringer saves on space, because, despite achieving higher output, it takes up much less room in the production hall. Compact in design, the Stringer TT2100 needs less production space than its predecessor system. At the same time, teamtechnik has reduced the electricity and compressed air consumption by another 10%.

"The pressure on costs in the solar industry is still enormous, so we are constantly striving to improve the performance of our stringer systems. With system availability of up to 98% and exceptionally high output, we help our customer to cut their production costs continually," said Axel Riethmueller, Executive Vice President at teamtechnik.

Teamtechnik stringers are known for their very low cell breakage rates, accurate string geometries and ribbon positioning. Gentle cell handling, optimum soldering parameters and technologically sophisticated processes also ensure that the even faster STRINGER TT2100 also boasts these features.

Even ribbons with very narrow widths of less than 0.6 mm are perfectly placed, as they and the cells are carefully held in place during transport with the patented teamtechnik hold-down system. Soldering is becoming ever more sophisticated as the width of both busbars and ribbons steadily decreases. This is a challenge which teamtechnik has mastered perfectly with its stringer technology. Teamtechnik focuses consistently on improving its expertise in high-performance stringers. High, reliable output and the best soldering results are at the heart of the innovative stringer technology. The company has become the world leader in just a few years. Solar module manufacturers from all over the world place orders with teamtechnik. Teamtechnik delivered its 600th high-tech system at the beginning of 2016.

STRINGER TT2100 i8 – worldwide the fastest technology on one track

The high-output 72.5 MWp TT2100 i8 achieves maximum output and consistently high production levels on a single track. The patented hold-down device separates the soldering process from the handling processes. This enables 2,100 cycles per hour to be achieved on a single track – technology which has been applied successfully in over 800 systems around the world and achieves minimum breakage rates and the largest possible processing windows, for stable production.

STRINGER TT2100 i8 – the benefits:

- High throughput: 1.71 seconds cycle time
- Low breakage rate < 0.1 - 0.3 %
- Availability > 95 %
- Cost-effective and economical production
- Compact footprint

Safe handling and reliable processes

It is the stringing and soldering processes that determine the productivity of a production system – processes in which teamtechnik has huge Expertise.

FIG no. 2.2- SRTRINGER'S SOME PARTS.

Best outlook for the future

The management at teamtechnik views the market potential for this segment as significant: annual growth in installed PV capacity is expected to be up to some 15% and production capacity worldwide is being expanded. 'The Stringer TT2100 offers a colossal output at low cost and the highest quality – and also an efficient 24/7 production regime and high system availability,' says Lingxang Xu, CEO of teamtechnik China. 'With this machine we are helping our customers to cut their manufacturing costs and secure a competitive advantage.'

I**n our industry which parts are mainly used?**

1. 130 cell Magazine
2. 160 Cell Handling
3. 205 Cell Changeover
4. 200 Fluxing Cell and Bitronix Camera
5. Cell transfer to heating plate
6. 355 Ribbon Supply
7. 400 String Transport
8. 455 Place Frame And Ribbon
9. 410 Bottom heating
10. 611 Soldering
11. 470 Pick Up Frame
12. 485 Frame Run Back
13. 459 Vacuum Generator Place Frame And Ribbon
14,. 800 Lay Up.

FIG no. 2.3-STRINGER

1. 130 CELL MAGAZINE

We put the ray material (cell) in the magazine and put this magazine the machine.

2. 160 CELL HANDING

This is a robotic arm which is took the cell from the magazine and put in the cell changeover plate.

FIG no. 2.4- CELL HANDING

3. 205 CELL CHANGE OVER

The cells transfer the 200 fluxing plate.

4. 1.200 FLUXING CELL AND BITRONIX CAMERA

When the cell transfer to this plate at that time 10 fluxing spray nozzle spray up on the cell(5 nozzle upper side in the cell and 5 nozzle lower side in the cell) and in this plate we check the cells by computer. Here two LED illumination red light present which operate in 12v and cur (o): 1.6 A cur (o): 5.6 A Pulsed. And just this upper size presents a Bitronix Camera who create IR image and check the dimension if the dimension which we said in computer according to our cell standard size if this size did not match with the present cell then the cell will be rejected and if it will pass then the cell will go forward to the next step.

FLUX

Soldering flux

Dangerous components

CAS: 67-63-0 Isopropanol 85-100% Aliphatic hydrocarbon solvent 5-10% Azole isomers 0.1-1%

5. CELL TRANSFER TO HEATING PLATE

After fluxing and checking through this robotics arm cell transfer to the heating plate

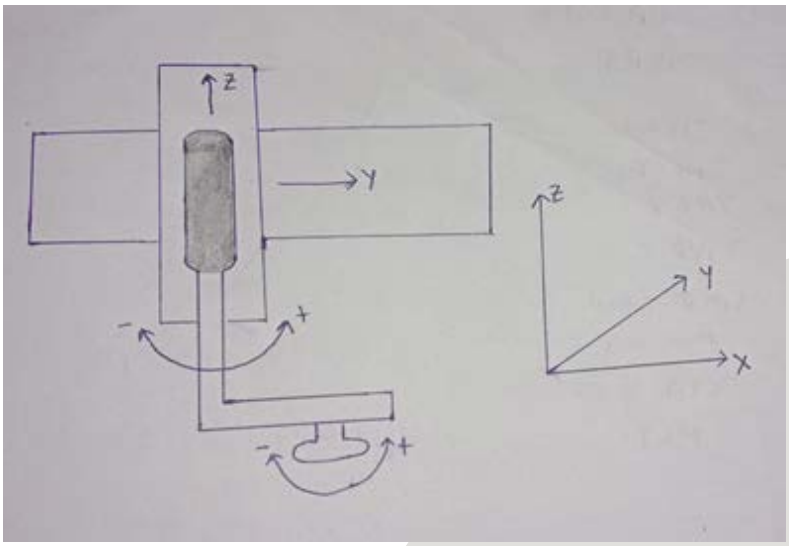


FIG no. 2.5 CELL TRANSFER TO HEATING PLATE CIRCUIT DIAGRAM.

6. 355 RIBBON SUPPLY

355 a part of stringer which cut the ribbon and makes a Z shape at a time with this ribbon frame attached and placed up on the cell. This frame is use because the cell and ribbon solder at that time the ribbon can move and the soldering can be ruined. So maintained the cell and ribbon at place we use the frame.

7. 400 STRING TRANSPORT

355 a part of stringer which carry the cut strings and frames. And put those frame with strings in stringer's main plate or 410.

8. 410 BOTTOM HEATING

In 611 part solar cell with string soldering is done. At the soldering time the temperature is 150 (approx) if we increase that much temperature at a time then cell will be crack. So interrupt this thermal crack we use the 410 bottom heating which is gradually increase the temperature. And after soldering gradually we decrease the temperature.

9. SOLDERING

In this part solar cell and ribbon are joint with together by soldering. In this part we used 8-IR Lamp in this passion the temperature is 1480C (approx).

FIG no. 2.6- CELL TRANSFER AND FRAME, STRING SUPPLY

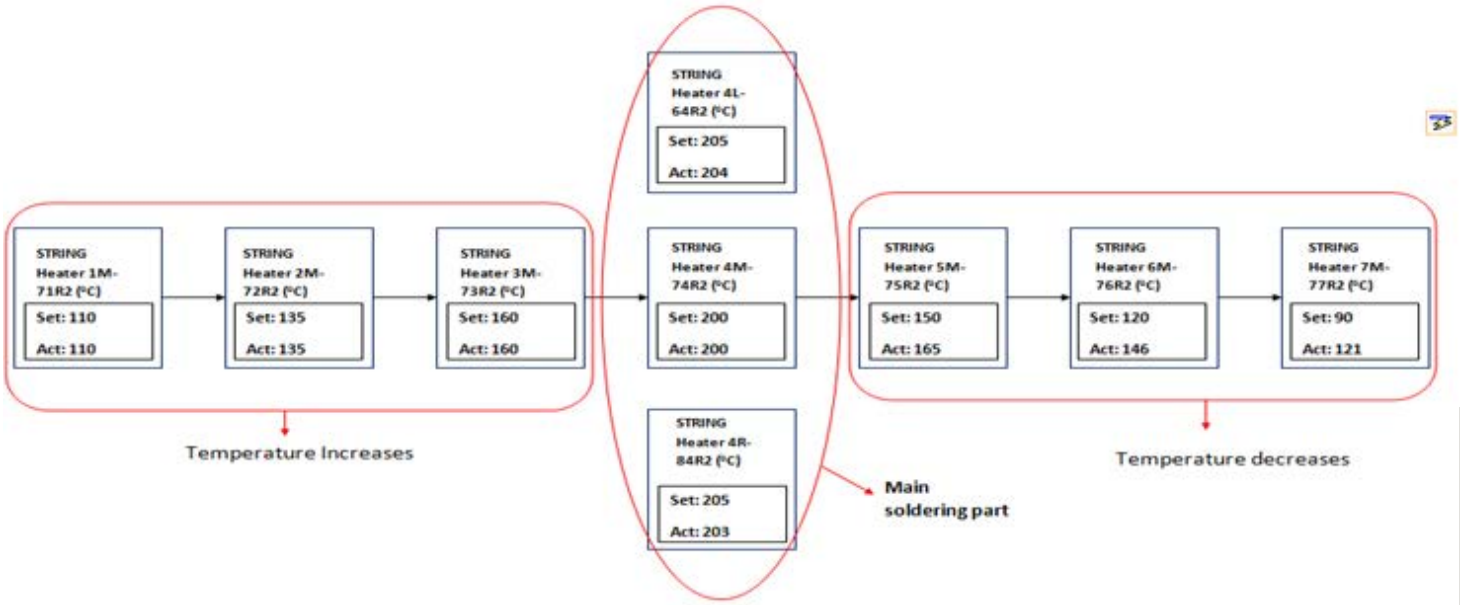


FIG no. 2.7 HEATING CHAMBERS BOTTOM SIDE

10. 470 PICK UP FRAME :-

After soldering the cell and ribbon make string (1 string = 12 cells) then there did not do any work of frame what's why 470 a robotic arm pick up the frames and put in to the 485 and the cycle again start.

11. 485 FRAME RUN BACK:-

After pick up the frame 470 robotic arm put into 485 and this part comes with frame at the begging part string transport and ribbon supply part and it again do the same process.

12. 459 VACUUM GENERATOR PLACE FRAM:-

After formed the string the string go to the vacuum generator place and 12 robotics teath touch the string and create a vacuum and the string attach with this part.

13. **800 LAY UP**

This part a 12 teeth's robotics arm come and touch the string and generate the vacuum and the string contacted with this robotics arm and this robotics arm go to the glass and place the string up on the glass.

FIG no. 2.8 SOLDERING CHAMBER AND FRAME

FIG no. 1.9- 800 LAYUP

AIR FILTER AND AIR PRESSURE

Here we use only air pressure, which is comes from compressors we need to filter and for another parts control we need a constant air pressure and for this purposes we used the air filter which have 7 chambers. The pressure of this air approx 6 bar.

First chamber: - come the air from compressor
Second chamber: - measure the air pressure and filter
Third chamber: - continuous air supply
Fourth chamber: - 59Y1 and 59S1 (air filter)
Fifth Chamber: - controlled air supply
Six Chamber: - 59Y4/59S4 (air filter)
Seventh chamber: - compressed air secure discharge.

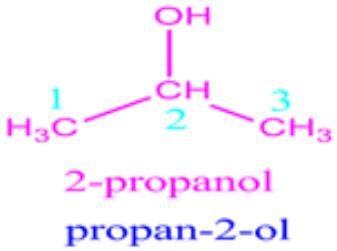
CLEANER

When the soldering took place between the ribbon and cell at that time the rezone created. If we did not clear this rezone then the belt (cell transfer belt) will be blocked or some many problems will be created so we need to clean this. For these cleaning purposes we use Emplura 2- propanol.

2- Propanol

Specification

Purity (GC) ⩾ 99% CH3CHOHCH3
Density 0.784-0.786
(d 200C/40C)
Evaporation
Residue ≤ 0.0002% water ≤ 0.5%



M = 60.10 g/mol.
(1L= 0.786 kg)

POWER SUPPLY

But the main things is for this works most important think is power supply

Power supply: - 3L/400V/N/PE/50-60HZ
Fuse Protection max: - 32A
Power consumption: - max 22KVA
Control Voltage: - 24V DC

CONTROLLER

For the controlling of the purpose we need a controller

Main Board: - CB3060-0009
CPU: - Core i3-4110E 2.6 GHz
Memory: - 2*2048 MB DDR3L-RAM SO.
Mini PCL: - 16 GB (Fast ADATA)
HDD: - 2.5" 320 GB SATA
Power Supply: - 24 V DC UYPS on COM3

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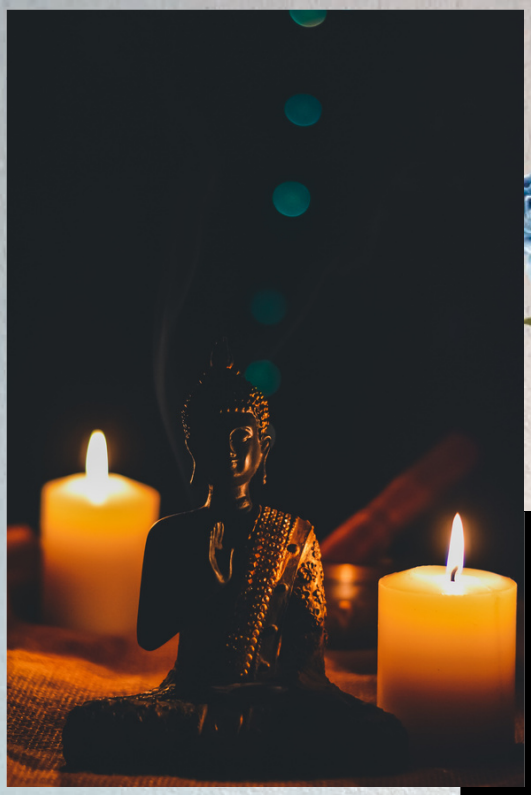
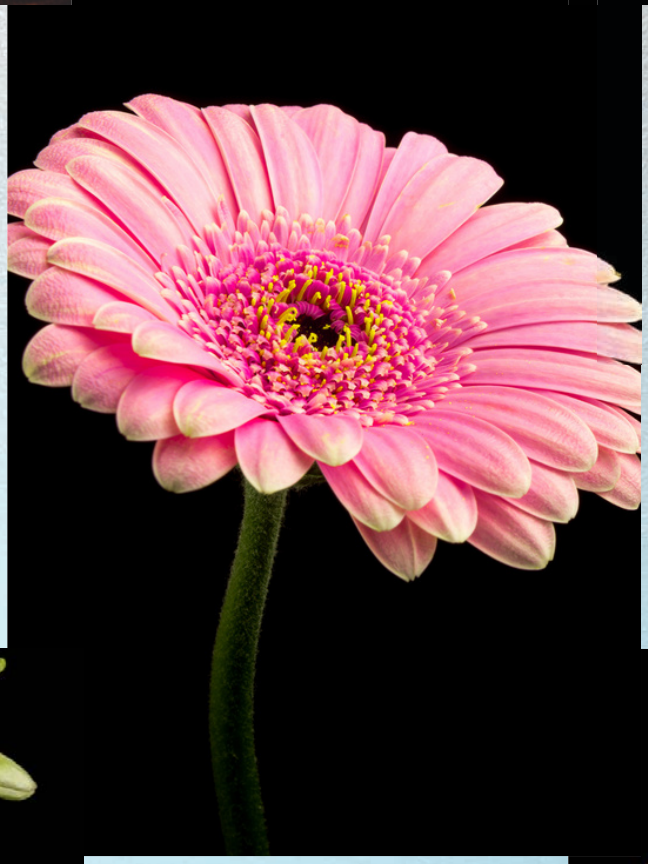
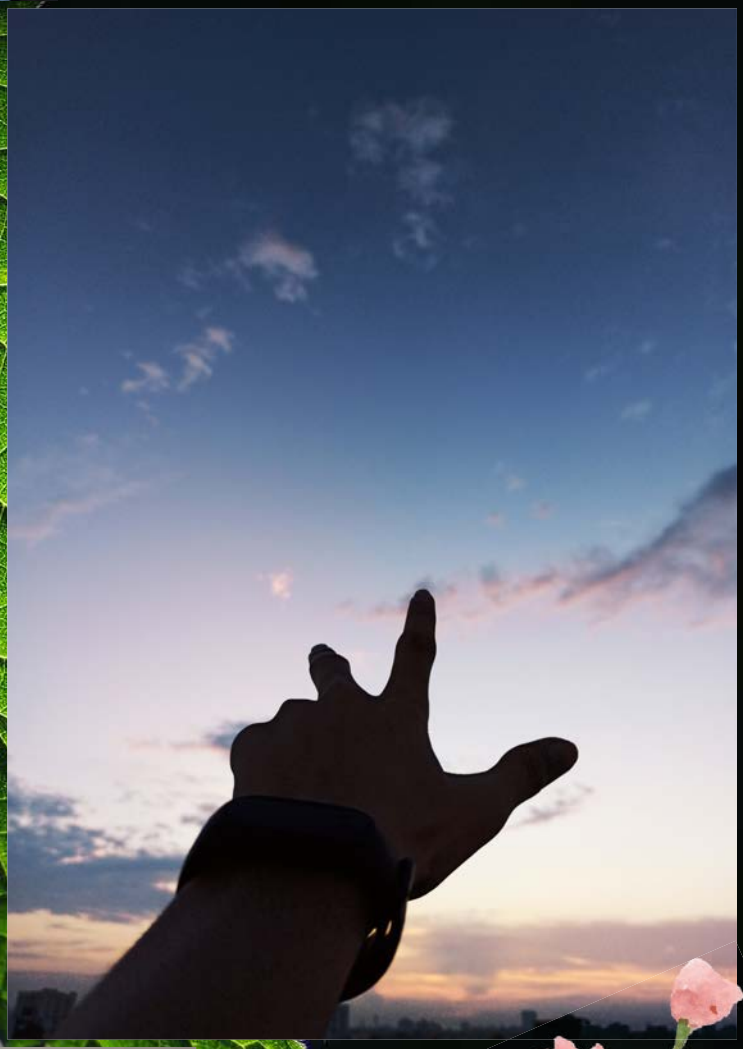





SUBHAM JANA
-EE , TNU



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A Walkthrough on Percolation Theory

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Introduction

"Seeing is believing"

The major focus of this paper is to visualize percolation theory and put it up with mathematical concept. The history of percolation theory starts from the middle of twentieth century. Percolation Theory was introduced by S.R. Broadbent and J.M. Hamersley. Percolation theory gives an analytic solution over 1D percolation occurring and mean-field percolation. This theory has its most simple model in the form of phase transition visualization. A model can be implemented through percolation theory which can display the phase transition. The most common real life example which can be identified by percolation theory is the distribution of water through sand grains, that"s how water finds their distribution through the open bonds which are present in the sand grains. Moreover we can understand the concept of fractals, which are some complex patterns, which are similar among themselves and occurs at different levels, they are the never ending patterns. In easy words we can say through the study of percolation we understand connectivity of random sites.

Percolation Theory

Preliminaries of Probability in Percolation Theory

Let, there is an event A.
Let, the probability of that event is $P(A)$.
Similarly there are 2 events A1 and A2, and joint probability of these events are: $P(A1 \cap A2)$
Let there exist n events as A1, A2..., An.
All these events are said mutually independent then. P A1∩A2....An =P A1 ×P A2 ....×P(An)
There exist lattice through which percolation occurs. Let the probability of that lattice be occupied with the probability p, therefore the probability of the site in lattice be empty is (1-p). This p is known as occupation probability or concentration

Basics of Percolation Theory

The percolation occurs through clusters in a lattice. The percolation can occur in a lattice only when there is a presence of cluster, the amount of larger cluster the better percolation occurs in it. Percolation depends on the number and property of the cluster when site are occupied with probability p.
The percolation is visualized in figure 1. A 2D matrix is taken to understand the basic concepts. It"s a 4*4 matrix and each site of the lattice is marked with probabilities p. All the probabilities are marked with random numbers.

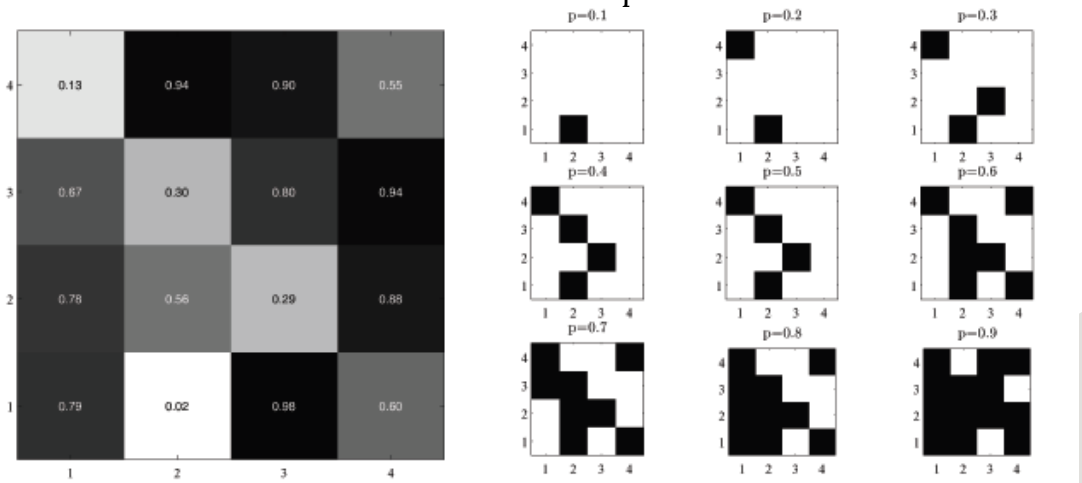

Figure 1: Representing 4*4 Matrix marked with some probabilities of site occupied or empty
Source: Anders Sorrensen, Percolation and Disordered system- A Numerical Approach, 2015

Percolation is basically the study of connectivity; the simplest approach is to connect the both sides with some path creating in between them. The right side of the image is representing p values ranging from 0.1 to 0.9. When the p=0.1 only those sites are said occupied which has p values less than the given value.

In the given p = 0.7 value we can see there is a path or connection formed from one side to the other side. The path is created by nearest neighbor connectivity. Two lattices are connected if and only if there are nearest neighbor connectivity.

Percolation Threshold

We can clearly see with p=0.7 there is a path formed form bottom to up with nearest neighbor connectivity. But on the other hand we can also see that in p=0.4 there is also a path being created from the bottom to top but there is next-neighboring connectivity. This probability of occupation where there is a first formation of path from bottom to up or left to right we called it as percolation threshold (pc).

Basic Definitions of Percolation Theory

- In a lattice 2 sites will be connected if and only if they are nearest neighbors (there are 4 neighbors for a square lattice).
- A cluster is defined as a set sites connected.
- A cluster is said to be spanning if it connects the both sides of a lattice (bottom to top or left to right), and if that happens that cluster is said Spanning Cluster, and that system will be considered percolating if it contains spanning cluster.

Percolation Probability

Now the question arises that at what occupation probability does the system will percolate, when there will be a path formed connecting both the sides. This can happen at certain value of p = pc. This characterized probability is defined by $\pi(p,L)$. The percolation probability $\pi(p,L)$ is defined by the probability exist to connect the two side of a system, as a function of p in a system of size L.

Here, L is the length of a square lattice. We can simulate the and measure $\pi(p,L)$ of a system by creating various matrices in matlab or python. For each forming matrix we will do the cluster analysis and will find the values of Pi values (i=1, 2, 3...n) and the cluster will be selected which has the best extent, if found extent cluster is equal to the system size we can conclude there is a spanning cluster and that system is percolating.

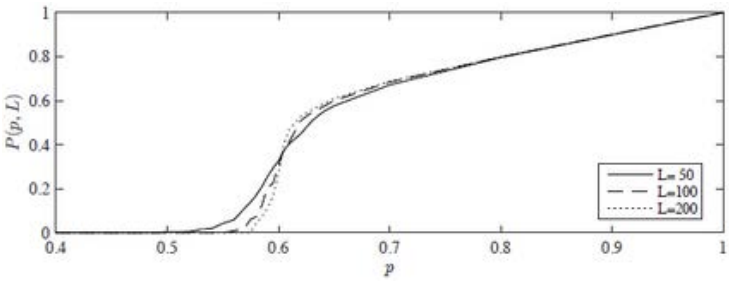

Figure 2: A plot of $\pi(p,L)$, the said probability to connect the two sides of a system showing on different size of lattice (L).
Source: Anders Sorrensen, Percolation and Disordered system- A Numerical Approach, 2015

Spanning Cluster

In this section we will see the characterization of spanning cluster, we define the probability $\pi(p,L)$ to find there is a spanning cluster or not. Spanning Cluster is characterized by its density. The density also states the probability for a site to be in a spanning cluster.

Let, the mass of the spanning cluster be MS

And the size of the lattice be L

Then the density is said as: $P(p,L) = {}^{M_S}/_{L^2}$

Density of Spanning Cluster: A *site belongs to a spanning cluster is defined by the probability P(p,L) this is also known as density of spanning cluster, also called order parameter for the percolation problem.*

Percolation in One Dimension

Percolation theory can be addressed in various dimension lattices. Of them the most basic and easy visualization is in 1D. We can see the analytic solutions of percolation theory in 1D. Various characterizations and staggering features of percolation theory are visible in one dimension also. The percolation problem can be analyzed and solved in two limits: one dimension limit and in infinite dimension case. In one dimension the complexity in the model is less thus we will go through it at first.

Percolation in One Dimension

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$$\pi(p, L) = p^L \qquad (1)$$

Equation 1 has a trivial solution for $L \to \infty$,

$$\pi(p, \infty) = \begin{cases} 0 \text{ when } p < 1 \\ 1 \text{ when } p = 1 \end{cases} \qquad (2)$$

Through the solution we can say that for one dimensional system percolation threshold pc =1. And in higher dimension the percolation threshold is pc < 1. In one dimensional system we can only study the system below pc.

Cluster Number Density

The percolation system is characterized by the clusters, how they are being arranged and distributed. Regions of connected sites form the cluster through which percolation can take place. Shapes and size of clusters vary. The cluster size increases with the increase of p and to the maximum limit when it reaches pc, that is the system size. In the figure 3, we will visualize the concept of cluster in one dimension that is how they are formed.

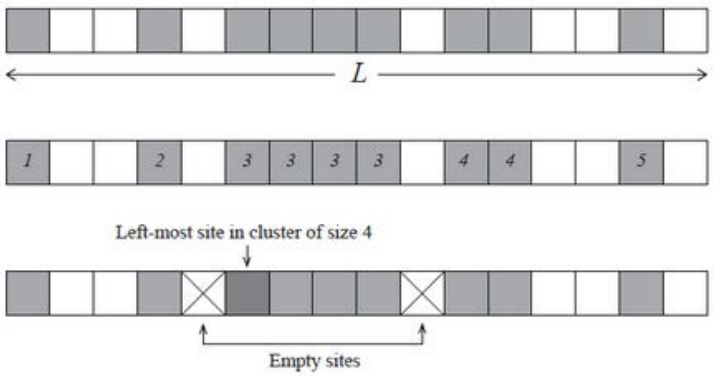

Figure 3: Realization of Cluster Formation in One Dimension (1D) Source: Anders Sorrensen, Percolation and Disordered system- A Numerical Approach, 2015

Here in the figure 3 we can see there are some darkened blocks, which represents the occupied blocks, and the adjacent occupied blocks form a cluster which eventually forms the spanning cluster and percolation in the system is formed. From the figure we can clearly see there are 4 clusters which are formed. From the left cluster„ 1" with only 1 site. Then proceeding towards right we can see cluster„ 2" with 1 site, cluster„ 3" with 4 sites, cluster„ 4" with 2 site, and cluster„ 5" with 1 site respectively. There are presences of empty sites for which multiple clusters are formed and we can conclude that this system is not percolating as it's a one dimension figure and there are multiple presences of empty sites.

Now mathematical representation of cluster density is represented in equation 3,

Let us consider a cluster is being formed in a 1D lattice.

Cluster of size L, is formed when s number of sites are placed adjacently in one dimension.

With the condition $L \to \infty$

Now the effects of boundary sites are being ignored and let the occupancy of the sites are being independent.

$$n(s, p) = (1 - p)^2 p^s \qquad (3)$$

Cluster Number Density:

The cluster number density $n\ s,p$ is defined as the probability for a site to be in a cluster of size s.

Normalization of the Cluster Number Density:

Let a site be occupied with probability p, that occupied site is either a part of the finite cluster or a part of a infinite cluster.

The probability of being in the finite cluster is given by sn s,p

The probability of being in the infinite (spanning) cluster is given by P

Thus normalization is represented in the equation 4.

$$p = \sum_{s=1}^{\infty} \mathrm{sn}(\mathrm{s}, \mathrm{p}) + P \qquad (4)$$

Percolation in Bethe Lattice

A Bethe Lattice is a tree where each site has z neighbors and each branch is divided to z-1 other branches. It is quite similar to an infinitely dimensional case. The percolation problem in Bethe Lattice can be solved analytically in d=1 and d=∞.

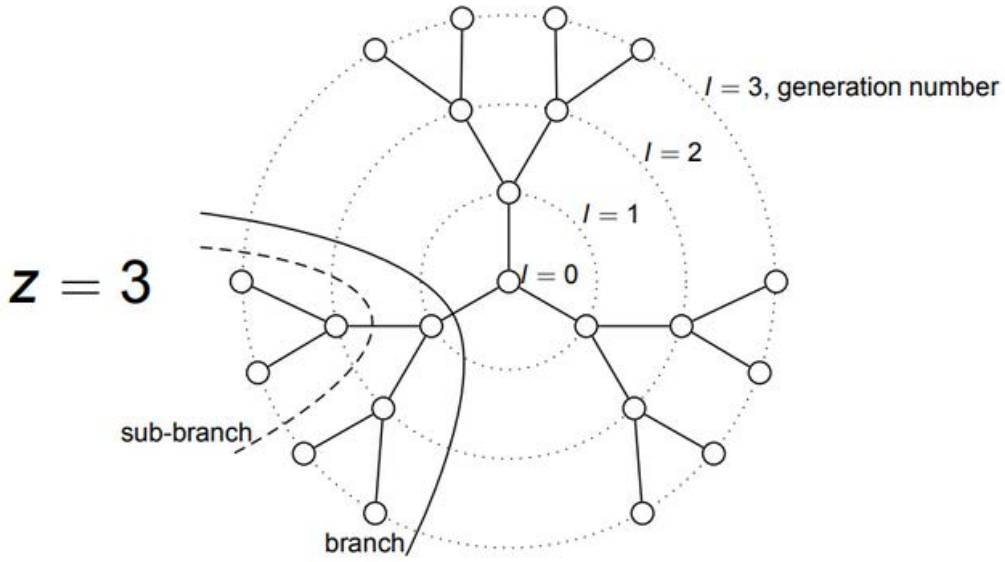

Figure: The Bethe Lattice with z=3. Each site has got 3 neighbors. Each branch contains 2 sub branches. Source: Kim Christensen, Critical Phenomenon and Percolation Theory: II, April 2013

A Bethe Lattice with z-1 = 2 is the 1d case. So the question arises why the Bethe Lattice corresponds to the spatial dimension d = ∞?

In a hyper cubic lattice

a) The number of surface site relative to the total number of sites approaches a constant when d =∞.

b) There are no closed loops when d = ∞.

Both the properties are present in Bethe Lattice and so it corresponds to the spatial dimension d = ∞.

1. The number of sites reaches a constant when d = ∞

Let us consider g as the distance from a "centre site". Note, in case of infinite Bethe Lattice all sites are equivalent so the "centre site" notion is not to be taken literally. As shown in the above figure the first ring has three sites which belongs to the generation g =1 and the next ring consist of six sites which belong to generation g=2 and so on. Hence the total sites in a Bethe Lattice consisting g generation can be calculated as:

$$\text{Total number of sites} = 1 + 3.(1 + 2 + 3 + \ldots + 2^{g-1})$$
$$= 1 + 3.\frac{1-2^g}{1-2}$$
$$= 3.(2^g - 2)$$

If the number of surface sites is 3.2^{g-1}.

Thus

$$\frac{No.of\ surface\ sites}{Total\ no.of\ sites} = \frac{3.2g-1}{3.2g-2} = \frac{1}{2}\ for\ g = \infty$$

Is the surface/volume tending to the constant.

2. There are no closed loops.

From the "centre site" going outwards we cannot return to the starting point. As mentioned above in hypercube lattice the chances of having a loop approaches zero as the dimension d = ∞.

For example let us place 4 particles in hyper-cubic lattice with dimensions d. The first ring has 2d nearest neighbours where the second ring particles can be placed with increase in the dimension the possible sites for the third and fourth are 2d - 1 and 2d – 2, with a total no. of chains as 2d.(2d – 1)2. We get the total number of ways to place four particles in loop as 2d. (2d – 2).1,

Therefore probability of

$$\frac{No.of\ surface\ sites}{Total\ no.of\ sites} = \frac{2d.(2d-2).1}{2d.(2d-1)^2} = \frac{(2d-2)}{(2d-1)^2} = 0 \quad \text{for } g = \infty.$$

Percolation in Two Dimension (2D)

Percolation is the basic elementary model in statistical mechanics presenting the phase transition indicating the exposure of big connected discrete components or particles. It also gets us acquainted with the macroscopic level.

Consider the following case that what portion of the combined system made of indiscriminately distributed insulating material should be metallic for the flow of electric current. Another example is how much portion or what proportion of water will reach to bottom of a container through porous material. In the above mention cases percolation theory is needed for the calculation and resolves the problem. This theory has a numerous application in the fields of geometry, computer, electrical circuit also in liquid dynamics that is flow of liquid material through solid porous fragmented particles, etc.

The 2 classical models of the problems are

a) Bond percolation

b) Site percolation

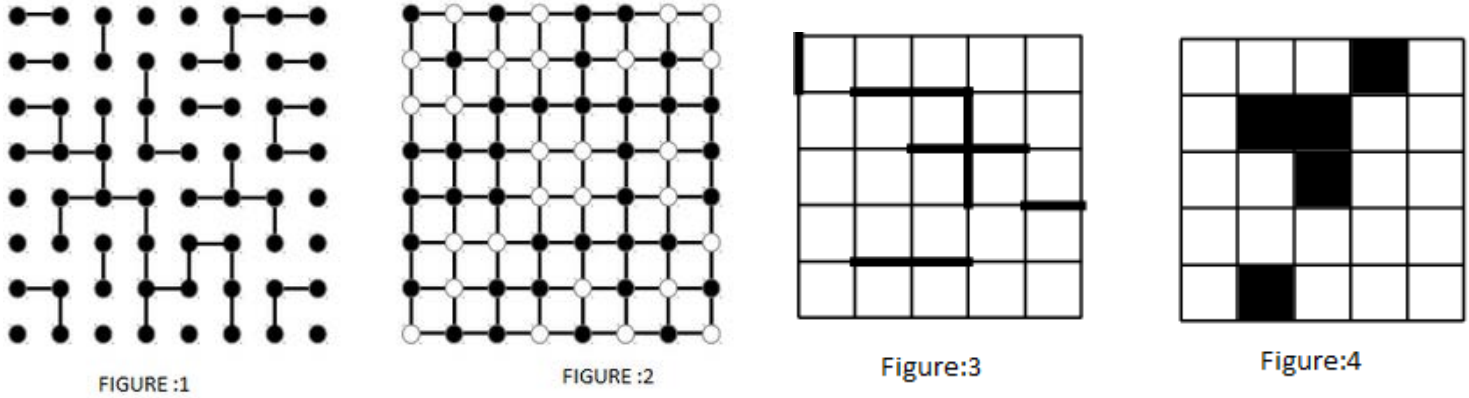

Figure: 1, 3 represent bond percolation and figure 2, 4 represents site percolation.

To the model percolation we need a $N \times N$ grid of site which is either open or closed.

In 2D lattice corresponds to the regular arrangements of points mainly tiles. The line in between segregates the plane into many small structures known as cell. An open edge or open site empowers the cell on the other side to get connected while a blocked /closed edge hold back them to separate. In this way cells are connected and the immediate next figure or shapes formed following the same mechanism is called neighbor. So in this way collection of cells formed are connected by the open edges which is called clusters. In site percolation, the vertices of the lattices are taken into account and in bond percolation the lattice is considered. The length of lattice is considered as $L=lx \times ly$ but for the simplicity or rather for square lattice we use $L=lx=ly$. Here lx means number of rows and ly means number of columns & since in square number of rows=number of columns so it is written as L.

In 2D mainly there are 4 types of lattices:

a) Hexagonal /Honeycomb

b) Square

c) Triangular

d) Quadratic

There are many ways to increase the number of clusters. If we remove edges and then the size of clusters increases and increase .So if we consider that original lattice percolates then the new lattice will as well. The concept of lattice transformation and duality (dual lattice) comes into action here. For lattice transformation if the vertices of lattices and edges are interchanged then vertex cluster would be formed, so only one type of clusters percolates at any given probability. The square lattice is itself is self-dual. There is also a formation of infinite cluster which is important for the material to percolate to bottom. For lattice transformation in 2D power law must be applied.

Mathematical Aspect in Two Dimensional (2D) Lattice

If there is an event then A and probability of occurring that event is P(A). If there is another event B then B is independent of A

if $P(A \cap B) = P(A).P(B)$ ie

In general we can say that A, B, C, D are mutually exclusive and independent if

$$P(A \cap B \cap C \ldots) = P(A).P(B).P(C) \ldots \ldots \ldots \ldots$$

If we consider probability of presence of bond or bond is intact in bond problem be p then absence of bond or presence of broken bond is 1-p.Similarly for a site or lattice problem if probability of presence of open site is p then presence of blocked site is (1-p) and both are equally likely events. For site problem if p=0 then percolation doesn't takes place at all or cluster is absent or not formed and if p=1 then percolation will takes place for sure. Here p is called occupation probability or concentration or percolation probability, more the value of p more is the chance of percolation. If we consider infinite cluster, then the percolation probability is that probability or chance that a given cell is a constituent of infinite cluster. For larger grid, Probability p is more as well as it takes sharp and abrupt phase transition and so we can conclude that large the system more the sharpness of percolation. Here, concept of critical probability *pc* comes into action. Here, for 2D as well as 3D thickness of the lattice is one of the major factors and is written as h. If *P<Pc* system doesn"t percolates and for *P≥PC* the system does percolates. The percolation threshold is is the denoted by critical value of percolation probability or in general critical surface of many arguments or parameters such that infinite connectivity persists. At {p*(percolation threshold)} occurrence of infinite clusters takes place. The p* value depends on types of lattice. If h is taken into account then for determination of the different expression in this theory $|P-Pc|$ (where ( ) is threshold) is taken and power law is applied. At critical threshold more clusters as well as long range connectivity first occurs. The density of the infinite cluster is a non-decaying function of probability P. So, if the cluster exists at some concentration P, it cannot disappear at higher concentrations.

Lattice	Z (no. of neighbor)	p_c^{site}	p_c^{bond}
Honeycomb	3	0.692	0.65271
Triangular	6	0.5	0.3472
Quadratic (special case is square for 2D)	4	0.592	0.5

Table 1: Different types of 2D lattice and their characteristics.

From the table 1, we can get an idea about percolation threshold in different lattices in 2D.

Lattice spacing is one of the determination factors for the percolation which is defined as the shortest distance between two sites. It is denoted by a, usually for simplicity a is taken as 1.

From the table we come to know that $P_c Z > 1$

So for n dimension by the Scher-Zallen "invariant" we can say that

$P_c Z \approx \frac{n}{n-1}$, where z is the number of neighbors.

Another important factor apart from the neighbors is the boundary conditions.
If a cluster extends from one end to another or simply connects left border with right one or top border with lowest level that cluster is known as spanning cluster. The condition for existence of spanning cluster is $P \geq PC$ and if this cluster exists then percolation will take place.$P\infty$ is the probability of an occupied site belong to spanning clusters and between PC to P=1 the value increases monotonically.

Visualization of Two Dimensional (2D) Lattice

If we consider the dual lattice and if the probability of percolation before transformation be PC and after some transformation be QC then it holds an inequality $P_c + Q_c \geq 1$.
Note that both the lattice cannot percolate simultaneously. This inequality is however a strict equality in the following case $P_c + Q_c = 1$

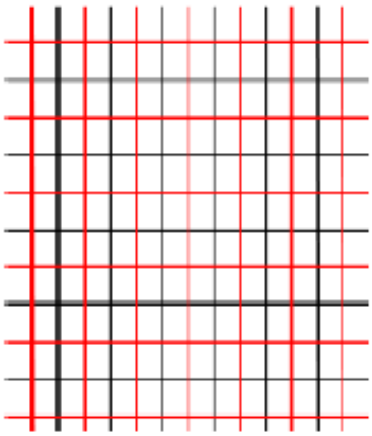

fig 2

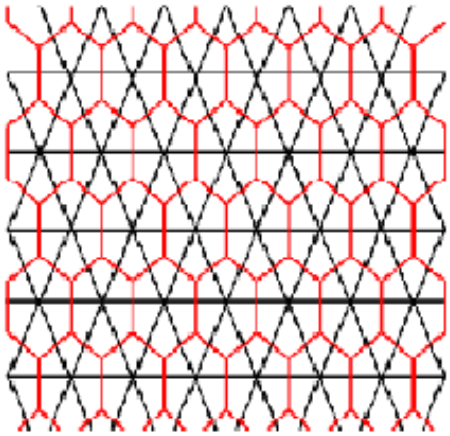

fig:3

Figure 2: Simple planar surface **Figure 3: Dual planar surface**

Another important factor apart from the neighbors is the boundary conditions.
If a cluster extends from one end to another or simply connects left border with right one or top border with lowest level that cluster is known as spanning cluster. The condition for existence of spanning cluster is $P \geq PC$ and if this cluster exists then percolation will take place.$P\infty$ is the probability of an occupied site belong to spanning clusters and between PC to P=1 the value increases monotonically.

Visualization of Two Dimensional (2D) Lattice

If we consider the dual lattice and if the probability of percolation before transformation be PC and after some transformation be QC then it holds an inequality
Note that both the lattice cannot percolate simultaneously. This inequality is however a strict equality in the following case
It is transformed to dual by cutting the lattice from the middle then diagonally like this.
In case of square lattice, being a self dual $PC=QC$ ie both are equally likely and probability of occurring each is ½ ie 0.5.
In case of triangular and hexagonal both are dual to each other so we can write equation $PC(t)+PC(h)=1$.The calculation and results are derived from Sykes and Essam"s work.
If we consider $ns(m)$ is the mean cluster distribution i.e.

$$\text{Average} = \frac{no\ of\ clusters}{total\ number\ of\ lattice}$$

m is the number of sites which belong to it . So the percolation probability

$$P=\sum m.n(m)$$

And cluster distribution can be written in the form $n(m) \approx m^{-\tau} f(m/m_\tau)$
Where f is the exponential function. When m is greater than mτ exponential law applied and when it is smaller power law dominates. The divergence of distribution is denoted by 1σ . In 2D value of $1/\sigma$ is 2.52. If we consider mean cluster m, then it will diverge at *PC*=P and so $M \approx |p - p_c|^{-\gamma}$.
In 2D the value is γ=2.389 .
The relation between them is $\gamma = \frac{3-\tau}{\sigma}$.

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Climate Change: Mathematics behind the Global Crisis

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With the dynamic nature of the 21st century, no one really knows what is going to happen next and which state of life we might be exposed to. Climate change has turned into one of the most daunting issues in the world; Our daily actions, our eating habits, and even something as small as switching off the light switch before leaving the house all adds up towards the reality of climate change. Why do we have to wait until this issue reaches its last stage in order to start treating it as the reality it is? Climate change exists and it's high time we start fixing our mistakes.

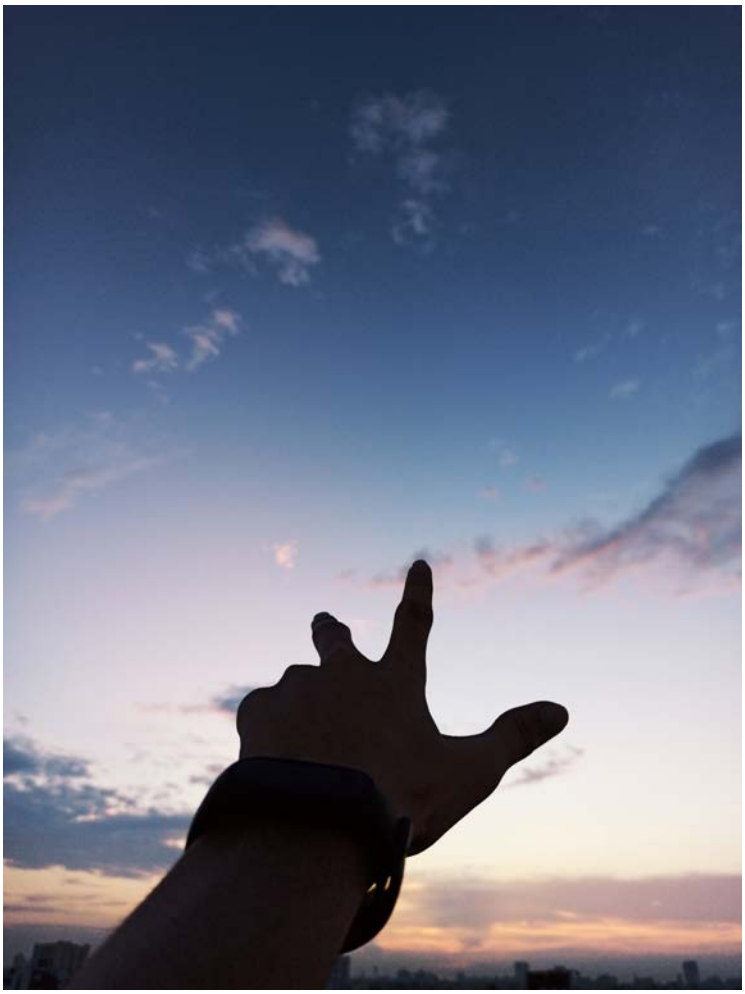
Post-industrial and neo-technological societies have rigorously separated the stories of cultural values and those of the earth's nature and climate. Human civilizations have been fully dependent on the wilderness of nature and the particularities of climate for their survival and success for millennia. It is understandable that this decoupling in the 20'th century was inevitably perceived as a desirable outcome.

The mathematical topics discussed here include empirical information theory, fluctuation-dissipation theorems, reduced-order stochastic modeling, and the development of mathematically unambiguous exactly solvable test models for climate science that capture crucial features of vastly more complex scientific problems. The applied mathematics topics include the emerging development of multiscale algorithms for data assimilation and super-parametrization for climate science and other problems in science and engineering, as well as suitable unambiguous mathematical test problems for their behaviour. Interesting contemporary research directions and specific open problems are being discussed now-a-days. The perspective here should also be useful for applications to other complex dynamical systems arising in neural science, material science, and environmental/mechanical engineering. "We need better ways to assimilate all the data from both global and local measurements via mathematical modeling, and also better ways to think about uncertainties and risks. We need more analysis of uncertainties generally. There are many uncertainties, due both to our ignorance and perhaps to the physical uncertainties". Meanwhile, we use both statistical models and constrained models, and keep weighing the advantages and disadvantages of each as we attempt to mitigate and adapt to climate change.

The complexity of the current problems is formidable. How do we analyze the dynamics of the atmosphere, the oceans, the solid earth (especially volcanic eruptions) and the biosphere (the system of plants, animals, and other living things)? Scientists have studied pieces of these systems, cutting them both conceptually and geographically, but even the pieces are not tractable by current mathematics, and the challenges as we try to understand the interplay of all phenomena involved are far beyond current conceptual and computational capabilities.

Modeling the carbon cycle is pivotal because carbon dioxide in the air prevents easy transmission of energy, and is well known to be a major cause of climate change, along with other greenhouse gases such as methane. The 700 to 800 gigatons of carbon dioxide in the atmosphere, however, is less than that in the soil and is dwarfed by the 38,000 gt. in the

ocean. The 5,000 gt. in fossil fuel is easily available for humans to put into the atmosphere and the 60 gt. in the biosphere is not negligible. The interactions in the biosphere seem impossible to even begin to understand with current mathematics and computer technology. We do know that burning fossil fuel has been a major factor in the increase of atmospheric carbon dioxide in recent centuries, as has been the disappearance of forest covers that absorb CO2. The role and modelling of methane and other greenhouse gases provide further challenges. Scientists from around the world have devised complex Atmosphere-Ocean General Circulation Models (AOGCMs) under forty different sets of assumptions about human behaviour called "scenarios"
with regard to such things as greenhouse gas release and land use. These forty scenarios are grouped into six, whose behaviours are displayed in graphs published in the reports of the Intergovernmental Panel on Climate Change (IPCC).



Mathematicians are absolutely integral in every step towards preventing climate change. From designing climate models and presenting results that can be understood by the public to guiding policy makers into achieving the most effective outcome, the mathematics involved in the climate crisis is endless. There is still much that is unknown about the future of our planet, and there are still those who deny the threat of climate change entirely. In the words of Stephen Hawking, "We are in danger of destroying ourselves by our greed and stupidity. We cannot remain looking inwards at ourselves on a small and increasingly polluted and overcrowded planet". If we do manage to slow down or even reverse the damages caused by climate change, our unsung heroes will surely be the mathematicians.

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JOURNEY OF THE UNIVERSE

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Perhaps the most important question we can ask about the Universe is where it all began. This is a difficult issue to answer since, in order to comprehend where something emerged from, we must first grasp what it is. Similarly, we must have a thorough understanding of physical principles in order to compute the result of a physical system that starts with a certain set of beginning conditions. Only from those beginning points can we determine the many pathways for how things came to be the way they are now, and which of them make predictions that are consistent with the universe we live in. However, the fascinating thing about thinking this is that no matter when we address this issue in the past or future, a scientific approach to it will always return the same cosmic account. We have pushed the boundaries of science so far back that we have discovered the origins of planets, stars, elements, atoms, and more. We have uncovered a plethora of evidence supporting the scorching Big Bang, as well as knowledge that takes us back in time before that awe-inspiring moment of creation. Despite what we know, there are certain colossal mysteries that remain unsolved for the time being. When we gaze beyond the confines of our planet, we see a beautiful and pretty complete image of the Universe. We know that our planet is made up of atoms, just like every other planet in the Universe. A solid core, made up of the densest, heaviest atoms are encased in a gaseous environment.

Lighter layers are always on the top of denser layers, resulting in an onion-like compositional structure for every planet, dwarf planet, and the moon that has been thoroughly explored. Planets float in space and orbit stars, which fuse lighter elements into heaviernes in their centers. The core of a star compresses and heats up as it runs out of fuel. The next set of components in the chain will continue to fuse if it grows hot and dense enough; otherwise, the star will transition into a stellar remnant, which can be gentle or catastrophic.

If we want to understand how everything came to be that way, we must apply physics rules to the Universe and track the evolution of the physical systems we are aware of. Simply said, if you offer a physicist a set of beginning circumstances that define your system, they can write down equations that control its development and tell you what the system's conclusion will be at any instance.

So, where did it all originate? It makes logical sense to begin with Earth, which has an atmosphere, seas, and a stratified interior with a crust, mantle, and outer and inner core, and is teeming with sophisticated, differentiated, and even sentient life. Earth is made up of atoms at its most basic level. Earth, on a more complicated level, is made up of the whole periodic table's atoms, except iron, oxygen, silicon, magnesium, sulphur, nickel, calcium, and Aluminium.

This is intriguing since these are predominantly heavy elements, as opposed to hydrogen and helium, which are the lightest. So, in order to construct a planet like Earth, which is made up of rocks, metals, ices, and complicated molecules, you will need a technique to manufacture these heavier elements, as well as a way to aggregate them in sufficient quantities in one area to form planets. Fortunately, we can witness the processes that are necessary for this to happen when we look out into the Universe. The fact that galaxies develop and change through time suggests something significant. If we travel far enough back in time,

we cat all.an locate a population of “first” stars and galaxies, followed by no stars or galaxies If the Universe expands, cools, and becomes gravitationally “clumpier” through time, it means the Universe was once smaller, denser, hotter, and more uniform than it is now. We can extend things back as far as we want using this reasoning and the necessary physics.

Prior to the hot Big Bang, when matter and radiation filled the hot, dense, essentially uniform, quickly expanding Universe, cosmic inflation theories that the Universe was totally empty. Instead of having no energy (or a very little quantity, as is the case with today’s dark energy), it had a massive amount of energy built into the fabric of space. Because additional space is generated as the Universe expands, the energy density remains constant. With our current understanding of the Universe, we can only travel back that far.

Inflation, by its very nature, wipes out any information that existed in the Universe prior to its occurrence. In reality, we can only expect to have access to what happened in the last 10 to 32 seconds of inflation; anything that happened before that would be unavailable to us from here in the world. Although we can confidently declare where our observable Universe originated from and explain the origins of many phenomena inside it, we still don't know where entities like space, time, energy, or the rules of physics came from in the first place, or whether they ever did.

Regardless of what we know, we may be assured that all we will ever know is finite. Within our observable Universe, there are a finite number of particles encoding a finite quantity of information that has lived for a limited period of time. While questions such as why our Universe is filled with matter rather than antimatter, why we have dark matter and dark energy, and why the constants of nature have the values they do may be answered in the future, there is no guarantee that what remains in the Universe today will provide us with enough information to find our answers. We do not know if we will ever be able to answer these questions, but we will be correct the moment we conclude we can’t and stop looking.

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Automatic Garbage Collector Robotic Car

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It is a robotic car which is used to collect the garbage using a robotic arm . There is a sensor which will sense the garbage, then the arm will pick it and placed in a bin inside the car. This robotic car is able to perform human tasks of collecting garbage. The using components in this project are Arduino Uno, L293D Motor Shield Driver, DC Motor, Servomotor, Ultrasonic Sensor, Wheel, Ply-Board, Battery, Acrylic Sheet, Jumper Wire, Switch etc . In this project, I am designing a robot which is capable of collecting the waste products from various places. This robotic vehicle is working automatically and saves the human power. Using this “Garbage Collector Robotic Car” we can easily collect the garbage of school, college , playground etc. without help of humans. It will pick all the garbage by using the arm and will placed in the dustbin-box inside the car. Garbage collectors serve a vital role in our society by helping to manage waste, which if allowed to build up, cloud pose enormous health and environmental issues. They work either for the municipal government or for private waste management companies.

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An Approaches to Different Types of E-Banking Attacks and Protection with Cryptography

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Today, security is the main concern in every field of life, and in every field, computers which have become an integral part of our everyday work. Now, we all do our work on the computer and use the internet to communicate with others. Nowadays data security is the most important consideration for secure communication and data transformation over a connected network. For security purposes, cryptography is the term that comes to our mind although there are thousands of techniques for securing the data still cryptography is in continuous research. Electronic Banking which is also called E-Banking, is a way to get information about banks and their numerous services over the Internet. E-banking has become an integral part of banking services. Information technology has changed dramatically in the operating environment of the banking sector. All internet banking procedures are concerned with the security and privacy of information. To avoid any fraudulent purchases, online transactions require the highest level of security. The internet provides consumers with a wealth of information as well as a variety of transactional services. In addition, the Online Banking system is subject to user authentication assaults.

To provide a safe and secure banking environment for its consumers, banks must meet certain requirements. It will result in numerous processes that can compromise the security of data. Client trust can be eroded by security vulnerabilities, reducing the number of e-banking customers. In order to persuade customers to embrace the e-banking system and win user trust, banks should find a means to improve user trust by offering a variety of the latest and finest security technology. As a result, we require a method for securing essential data that is difficult to get by those who are not allowed. Cryptographic technology is one of the mechanisms for improving security.

In contemporary online banking, information encryption is the source of security and privacy. Passwords, pin codes, biometrics, digital signatures, steganography, and other forms of security technology are used. A cryptography key distribution measure as a means of enhancing the security of the banking system for both customer's & bankers also.

Keylogger, phishing, dictionary-based attack, vishing, spoofing, social engineering, and trojan horse are the most common e-banking authentication attack scenarios. A keylogger is malicious software that examines and records keystrokes before sending them to an attacker. Phishing is another different type of attack. In this type of attack, the attacker attempts to steal personal information from the victim, such as credit card numbers, passwords, or account numbers. It works by sending phoney e-mails that appear to be genuine requests from the victim's bank or another comparable organisation. These emails request that the victim's personal information be entered on the referenced page. This page resembles an authentic internet banking page. In the good faith belief that all of his information will be protected, the user fills in all requested fields, resulting in the compromise of all of his information. A dictionary-based attack is another type of attack. Guessing, often known as password guessing, is a dictionary-based attack in which the attacker attempts to guess your password. Typically, a dictionary containing a large number of common passwords is utilised. When an assault fails to deplete a specified list of passwords, the user is forwarded to another user. Exhaustive search, often known as a brute-force attack, involves testing a vast number of different password or secret key combinations.

The attack will continue in this situation until the proper password is obtained or the attack is discovered. Vishing is a scam. It's an old scam in which the attacker calls the victim and employs social engineering to deceive them into divulging sensitive information like credit card numbers. What's new is the use of voice-over-IP and how it affects people's expectations of phone systems. Spoofing is a newer sort of cyber security concern, in which hackers imitate a banking website's URL with a website that appears and functions identically. When a user submits his or her login information, hackers steal it and store it for later use. Even more alarming, new spoofing tactics do not rely on a slightly different but similar URL to target viewers who have already visited the proper URL. Another kind of attack is social engineering, in which an attacker impersonates an authorised user and phones the bank's help desk to obtain information about the system, including altering passwords. A programmer can embed code into a system that allows the programmer or another individual to gain illegal access to the system or network.

In comparison to other transaction services, handling security in online banking and phone banking is the most difficult.

Cryptography plays a fundamental role in protecting data integrity and confidentiality in information systems. It plays a major role in ensuring that all of a bank's and other financial service firm's vital data transactions are processed securely. It is a strategy for developing a mechanism to authenticate the source of messages and ensuring that the message has not been counterfeited while in transit. It renders a message incoherent or unreadable to everyone except legitimate users. A cryptosystem is an encryption and decryption procedure that involves the use of keys to hide information. The role of keys is to determine the functional output of the cryptographic algorithm. It specifies how an original message is transformed into an encrypted message and vice versa. As a result, the secrecy of the key is crucial to the security of cryptographic algorithms. Encryption and decryption are the two main concepts of cryptography. Encryption is the process of converting plain text data into an incoherent or unreadable text called ciphertext, and decryption is the process of restoring data that has been rendered unreadable. The reformation, rebuilding, and reconstruction of the key can help to improve security in e-banking. In cryptography, the key plays the most significant function in terms of security.

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The Adventures of River Rafting at Rishikesh

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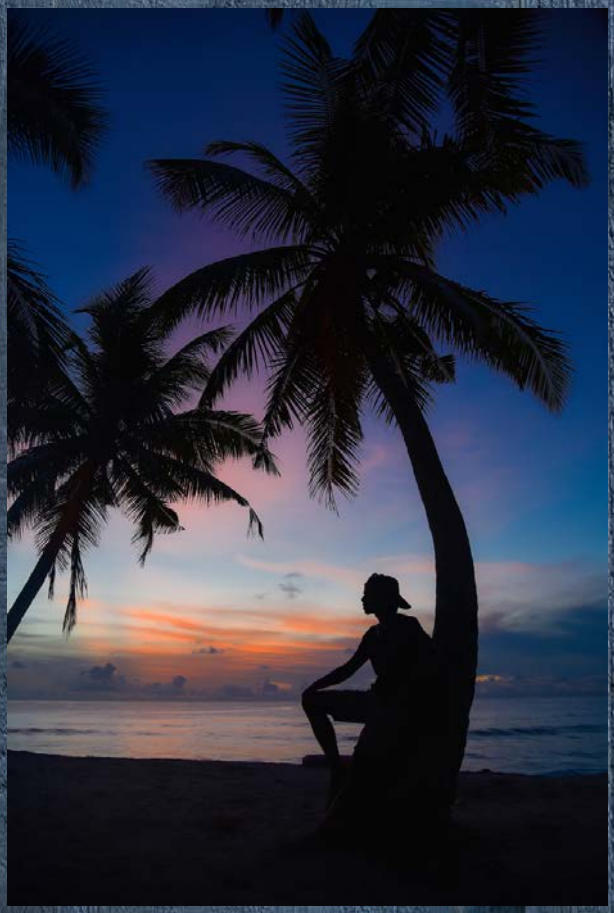
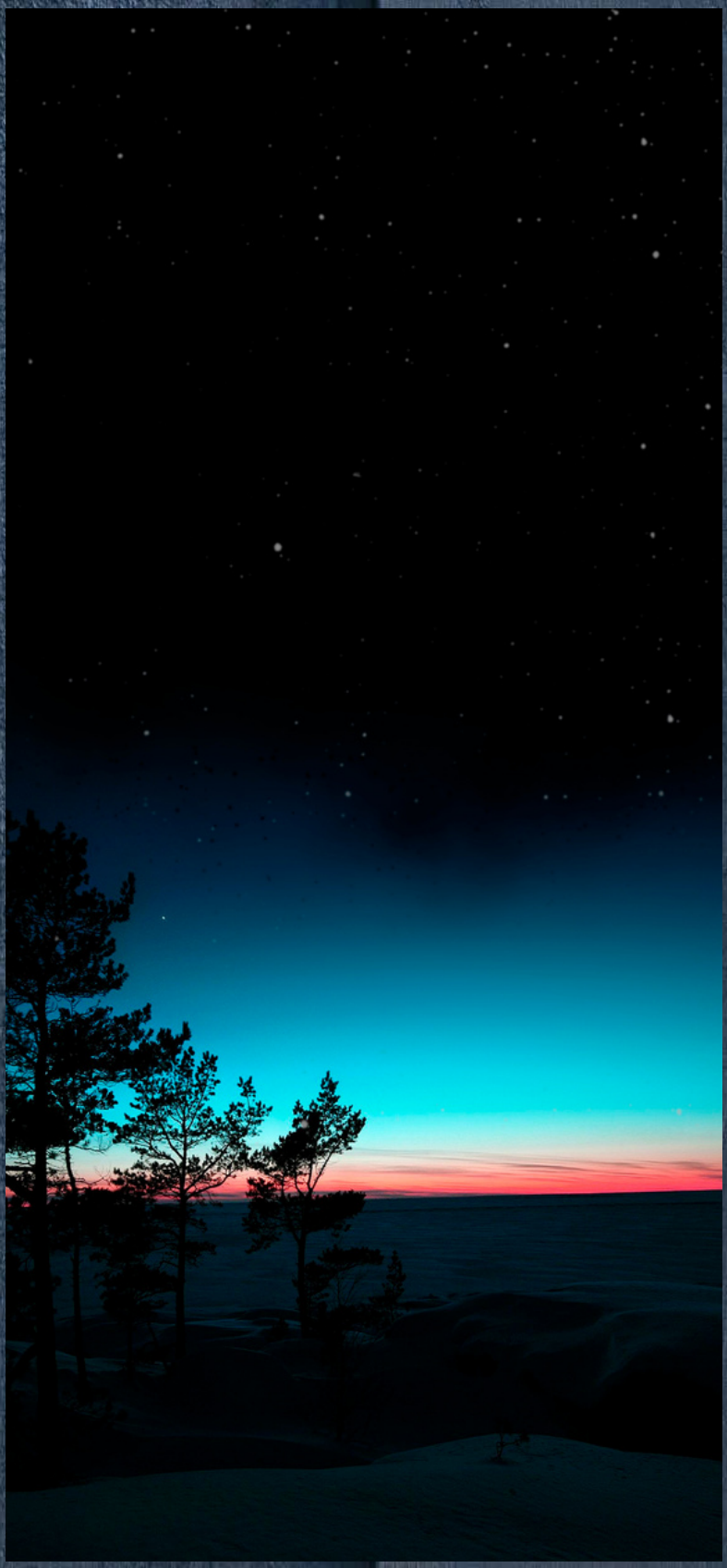
"Life is either a Daring adventure, or nothing!".... Helen Keller.

Life is all about adventure. Who wants to sit in the same cubicle every day, listening to their boss babble? If your life is becoming a repetitive stream, make it more exciting by visiting Rishikesh with some of your old classmates. After arriving, engage in the once-in-a-lifetime experience of White Water River Rafting, because memories are what we are made of! My life has also prompted me to make decisions such as this one, which I aim to remember for the rest of my life. Rishikesh is a city in Uttarakhand noted for its scenic splendor, which includes the green Himalayan foothills and the magnificent Ganga River, which makes the place pure and sacred for visitors from all over the world. It was a beautiful and sunny morning in late December 2021, specifically the 21st of December. I arrived at Dehradun in the evening after taking the Doon Express from Howrah with a few of my friends. As we drove from Dehradun to Rishikesh, I was astounded by the city's breathtaking natural splendor. The Mountain remained motionless, as if it could tell me stories of anguish, joy, and triumph. I was on a quest to rediscover myself in the city known for its yoga and ashramas, where the fundamentals of life are taught. Rishikesh is ideal for anyone in need of some inspiration away from the rush and bustle of city life. The next day, our driver Ram explained to us about river rafting and how it was one of those adventurous sports that you only experience once in a lifetime. We discovered that river rafting can be done in the heavy current rapids of the great Ganga throughout the year, with the exception of the monsoon season in India, which runs from July 15th to September 15th, when the water forces are extremely high. Rafting costs between 450 and 1800 rupees, depending on the distance along which you want to participate in this adventurous sport. Rafting's main attraction is the development of various rapids, which can range from I-shaped to V and even U-shaped. My friends and I finally had a ticket and headed full of excitement to go on a new journey. The rapids were minor for the first 1km and we didn't have any trouble getting our boats off! But then the enormous rocks and boulders appeared to test our ability to withstand the water and the dangers, just as we do in our daily lives. These rocks and rapids are suitable for novice rafters, but the third stage, when the rapids rise dramatically, requires exceptional expertise to sustain the speed. We didn't lose hope and maintained our composure during the last stretch. We thought this was a milestone we had to reach after all the exhales of the day as we lay down on the open tents looking at the sky above us, congratulating us for our courage and devotion. So, if you're on the fence about whether or not to visit Rishikesh, I would expect you to travel there to breathe in the pure air, enjoy the calm of nature, or let go of your inner self.

Rafting down the rapids, we recognized that nature was, is, and always will be the beautiful woman she is; it is us who have wrecked it and are currently doing so. The green Himalayan foothills will take you back to your first family hill excursion when you were a child and frightened the hills. These hills have now shown to be highly valuable to you. Splashes of cold water will wash over your face as you reflect on all those experiences, signaling that you are about to embark on another journey.

So, if you're in need of a break, fly or train to Dehradun and then drive 35 kilometers to Rishikesh. Enjoy the scenery along the journey and give thanks to God for his amazing works!!





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নারী

নারী তুমি নিজেও গুনে হয়েছ ধন্যা
ভগিনী গৃহিনী জননীরুপে রয়েছ অনন্যা।
এই বিশ্ব চরাচরে তোমার নাইকো তুলনা
পৃথিবী গড়ার কারিগর,তুমি গর্ভধারিনী মা।

নারী তুমি পিতার রাজকন্যা মাতার আদুরে মেয়ে আবার কখনো
প্রেমিকের মন ভরাও,প্রেমিকা হয়ে।
নারী তুমি মিষ্টিভাষী,স্নেহময়,আদরিনী।
আবার তুমি অসুরনাসে হও ক্রোধিত সংহারিনি।

নারী তোমার মতো ত্যাগী আর কজন আছে
নামধাম আপনজনকে ছেড়ে,
তোমরাই তো যেতে পারো অন্যের কাছে
সত্যিই নারী,সব সময় অন্যের জন্য বাঁচে।
তাই আমার মাথা নত হয় এই নারী জাতির কাছে।

ছোট থেকে তোমাদের কষ্টদায়ক রাজঃচক্র চলে
সঠিক সময়ে ২৯0 দিন শিশুভ্রুন আশ্রয় দাও পেটের তলে।
সন্তানরূপে তাকে জন্ম দাও কত কষ্ট সয়ে
মা ডাক শোনার জন্য যন্ত্রণাকে লুকাও হাসির আড়ালে।
নারী জাতির এই সহ্য ক্ষমতা কে প্রণাম জানাই আমরা সকলে।

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Background Picture
Soumyadip Adak (CEC, NITMAS)

স্মৃতি

না হোক কোনো এক মেঘে বৃষ্টি
না হোক আমার শেষ পাতার কবিতা সৃষ্টি
না উঠুক আসল সূর্য প্রভাতে
না বসুক বেল তলার মেলা
তবু কল্পনায় সাজিয়েছি বিকেল
না হয় মনে রেখো সেই বেলা।

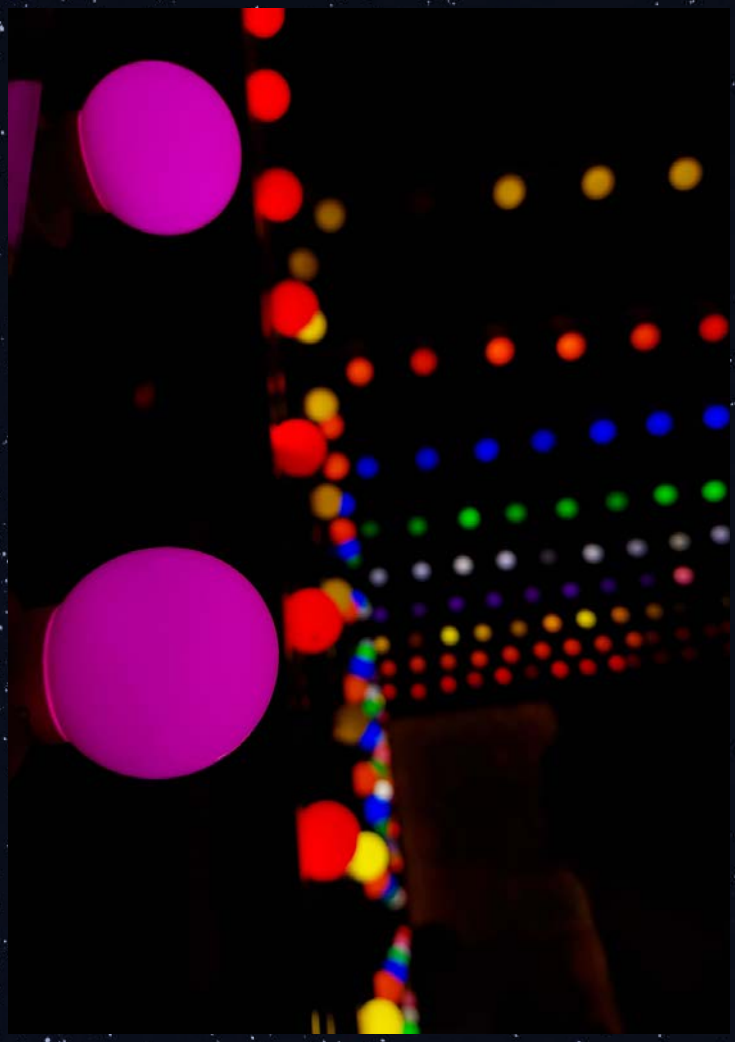
না ঝরুক শীতকালে গাছের পাতা
না পড়ুক ঘাসে আলগা শিশির
না জড়াক কুয়াশা বাতাসে
না জ্বলুক ভোরের আলো
তবু উত্তরের বাতাস মেখেছি গায়ে
এই তো শীতের আমেজ।

না ফুটুক বসন্তের ফুল
না তাল দিক কোকিলের সুর
না গজাক ডালে নতুন পাতা
না হোক কালবৈশাখীর আগমন
তবু বসন্তের আবির চড়িয়েছি আকাশে
এতো ভালো থাকার রং।

না জ্বলুক রাতে প্রদীপ
না আসুক ঘরে জোনাকিরা
না দেখি আকাশে চাঁদের মুখ
না ফেরে সে আমার ঘরে
না ফিরুক ঘরে সুখ
তবু তারে রাতের কালোয় এঁকেছি মনে
এইতো আছি বেশ দুজনে।

Adrija Adhikary
Computer Science & Engineering (2019-23)
Neotia Institute of Technology Management and Science

Rohan Kumar Basu
CSE (2018-22)
Neotia Institute of Technology Management and Science



Will you look at me?

Although spring is coming,
Will you look at me?
I will draw with
The last little drop of my blood
The triumph of your forehead.
Will you look at me?
When the dreamy twilight of the sky
Composes the poem of sorrow,
At that moment
Will you look at me?
Although spring time is short
In the intense heat
When the surrounding trees
Will pray for water,
At that moment
I will fall from the sky.
Then will you look at me?
Then in the evening
When the light of the last ray of
The setting sun fades,
I will disappear
As the light of that ray.
In that last moment
Will you look at me?

Ankita Ghosh
Computer Science & Engineering (2019-23)
Neotia Institute of Technology Management and Science

Background Picture
Subham Jana(E.E)

অবাক ধরন

অবাক পৃথিবীর অবাক ধরণ
অবাক যে তাহার রকম সকম,
কখন ঘোরে কখন থামে
কে যে বোঝে সাধ্য রকম।

অবাক প্রাণীর অবাক ধরন
ভালো মন্দ যখন তখন।
রঙ্গমঞ্চে রমরমিয়ে,
বাজছে সেতার গমগমিয়ে
বাজছে না আর জলতরঙ্গ
থেমে গেছে হাত
দিয়ে বাতি পাপ, খুইয়ে সাত খুন মাপ।

দুলছে ফুঁসছে আকার নৌকা
জর্জরিত স্বাধীন বোকা,
ফিরিয়ে দিচ্ছে দুটি হাত
বাবু বলছে "কেয়া বাত"।
পিছন ফিরে দেখছে না কেউ
রক্তে রাঙা দিন গুলো,
ভাতা চাই, ত্রাণ চাই
চাইছে মোদের পথের ধুলো।

বীরের প্রতি শ্রদ্ধা যখন
ভরিয়ে দেয় এই প্রাণপণ,
উপচে পড়ে হাজার আলো
একটি দিন সাজলো ভাল।
শ্রদ্ধা যখন অসন্তোষে
করলো কাদের স্বাধীন!
স্বাধীন তখন অন্ধকারে
আঁকড়ে ধরলো অধীন
কাদের জন্য স্বাধীন, অধীন,
দেখলো না কেউ সত্যের খোঁজ
বছর পঁচাত্তর পৃথিবীতে আজ
ভরে উঠলো মিথ্যার গোঁজ।

জীবন পাখি বসে থাকে,
একটু সুখের আশায়।
সুখ আমার হারিয়ে যাচ্ছে
কোন অচেনার বাসায়।

Background Picture -
Subham Jana(E.E)

Debashis Mondal
Computer Science & Engineering (2020-24)
Neotia Institute of Technology Management and Science

Sohom Sarkar
Electronics Communication & Engineering (2020-24)
Neotia Institute of Technology Management and Science

Soumak Mukherjee
Computer Science & Engineering (2020-24)
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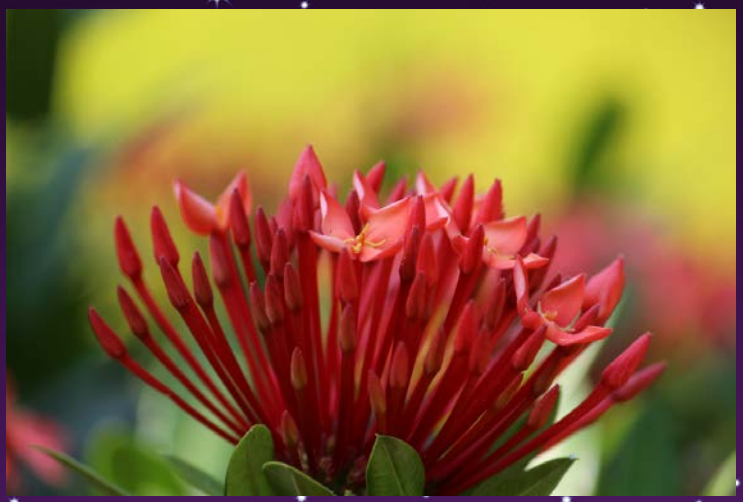


“লকডাউন”

এক করোনায় রক্ষে নেই
দোসর হলো ওমিক্রন
ঘর- সংসার বলতে এখন
হাঁচি-কাশি আর সংক্রমণ

এমন করে চলবে কদিন!
ছেলেবেলা হারায় যে সুর
একে একে স্বপ্নগুলো
যাচ্ছে চলে অনেকটা দূর

কেউবা গেছে স্রোতে ভেসে
বই খোলেনি দু'বছর
কেউবা আছে মুখ থুবড়ে
বন্দি হয়ে খাঁচার ভিতর

অনলাইন ক্লাস করতে করতে
মাথার ভিতর যন্ত্রণা
চোখের পাওয়ার বাড়ে-কমে
একে কি বলে পড়াশোনা!

ওদিকে সব বন্ধ তালা
ঝুলে ভর্তি ক্লাসরুম
জানিনা তা খুলবে কবে!
ভাঙবে কবে এ শীতঘুম!

আবার কবে পড়বে সাড়া
জাগবে উঠে স্কুলগুলো
ছন্দে তালে গাইবে আবার
ছোট্ট ছোট্ট ফুলগুলো!

ডিপ্রেশনে ভুগছে ওরা
ভিতর ভিতর বাড়ছে ক্রোধ
যন্ত্র যতই ভালো পড়াক
শেখায় না সে মূল্যবোধ

Background Picture -
Subham Jana(E.E)

Payel Dalal
Computer Science & Engineering (2020-24)
Neotia Institute of Technology Management and Science

Soumyadip Adak
Computer Science & Engineering (2020-24)
Neotia Institute of Technology Management and Science

ARPAN MAL
-RE, TNU

সন্ধিবিচ্ছেদ

আজ সারাটা দিন ধরে মেঘে মেঘে সংঘাত,
বৃষ্টি নেমেছে জোর
কাকভেজা এই পাড়ার মোড়ে তোমার রঙচটা সাইকেল পড়ে আছে।
স্যাঁতস্যাঁতে কফির কাপে মৃদু কম্পন
দু'ঠোঁটের; পরীদের মুখ ভার।
এমন দিনে হাতে হাত রেখে সন্ধি করা যায় গন্ধরাজের সাথে।

চোখের জলে মিশে যায় বৃষ্টির কুচি,
কার পায়ের হেঁটে যাওয়ার
অস্পষ্ট শব্দ–
যেন নূপুরের চিৎকার, বাতাসের শনশন্!
এ হাওয়ায় ওড়ে কিশোরীর চুল
মৃদুমন্দ উল্লাসে...

আম কুড়োতে গিয়ে হোঁচট খেয়ে পড়ি তোমার সাইকেলের উপর।
সাইকেল, না কয়েক গুচ্ছ স্মৃতি ও?

Rohit Gupta
Computer Science & Engineering (2019-23)
Neotia Institute of Technology Management and Science

Background Picture -
Arpan Mal(R.E)

गंगा

खंडहर खोज उसे ज्वलंत करती गंगा,
मस्तक जो बंधे शिकन में
उसे नभचर सा निपती गंगा।
खारे पानी में द्वेष ढूंढ
उसे पाक करती गंगा।
बैठ कुंठित मनु को
लहरों की मुख से मांझी बनाती गंगा,
लुप्त जी को नाविक बनाती गंगा।

सौम्या श्रुति
Computer Science & Engineering (2020-24)
Neotia Institute of Technology Management and Science

অ্যাক্সিডেন্ট

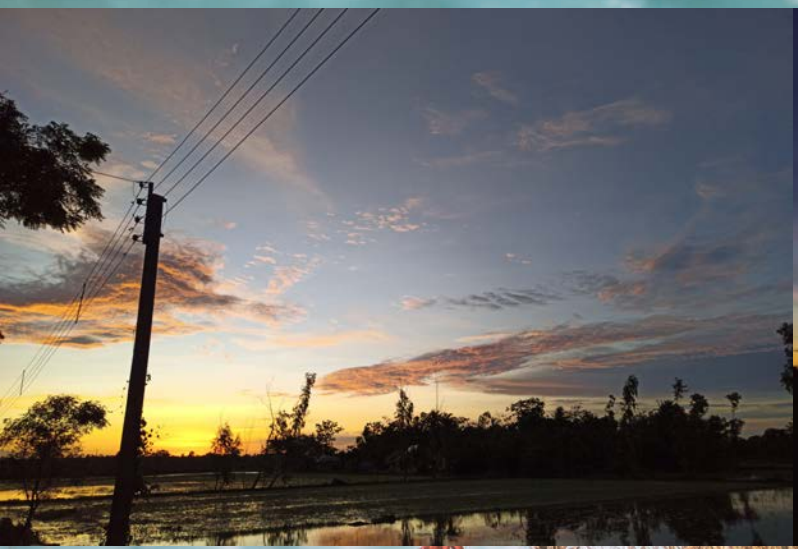
— এই যাহ্ যাহ্..... ইশ্, কুকুর ছানাটা যে চাপা পড়লো!
— ও ছাড়ুন তো, কিস্যু হবে না ওদের। যত্তোসব আপদের দল। এতো জায়গা থাকতে ঠিক দেখুন রাস্তার ওপরেই বসে থাকবে।

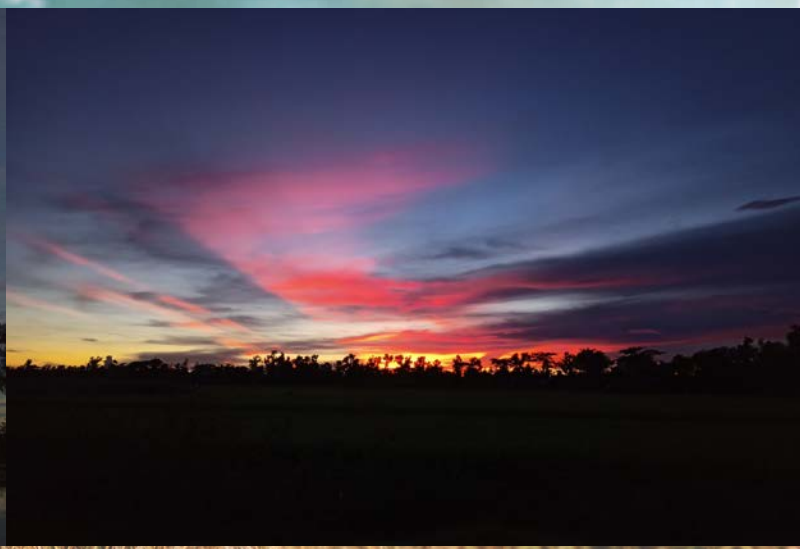
শ্যামল বাবু গাড়ি চালান। সারাদিন কতো মানুষকে তাদের গন্তব্যে পৌঁছে দেন। দিনের শেষে বাড়ি ফিরে ছোট্ট মেয়ে পিউ'র হাসি মুখটা যখন দেখেন তখন সারা দিনের ক্লান্তি ভুলে যান, মনে হয় যেন পৃথিবীর সব সুখ তার কাছে আছে। মেয়ের গায়ে এতোটুকু আঁচ আসতে দেন না শ্যামল বাবু।

আজ বাড়ি ফিরে রোজের মতো পিউ দৌড়ে এসে 'বাবা' বলে জড়িয়ে ধরলনা দেখে শ্যামল বাবু নিজেই গেলেন মেয়ের কাছে। পিউ লক্ষ্মী মেয়ের মতো চুপ করে বসে আছে, চোখ দুটো ছলছল করছে। কাছে যেতেই বাবাকে জড়িয়ে ধরে ফুপিয়ে কাঁদতে লাগলো পিউ। শ্যামল বাবুর স্ত্রী বললেন, আজ বিকেলে পিউ খেলতে যাওয়ার সময় হঠাৎ করেই একটা চলন্ত বাইক অস্বাভাবিক ভাবে এসে প্রায় ধাক্কা মারতে যাচ্ছিল তাকে। ভয় পেয়ে পড়ে গিয়ে তার হাতে পায়ে লেগেছে। ঠাকুরের কৃপায় একটুর জন্য বেঁচে গেছে। ড্রাইভার গুলো কেমন দায়িত্বজ্ঞানহীনের মতো গাড়ি চালায়। আর একটু হলেই যে কি হত...

শ্যামল বাবু দেখলেন তাঁর স্ত্রী পিউকে জড়িয়ে ধরে আছেন, তাঁর ভয়ার্ত চোখে জল চিকচিক করছে। তখনি শ্যামল বাবুর আরো একটা ঘটনা মনে পড়ে গেল। লাস্ট প্যাসেঞ্জারকে পৌঁছতে যাওয়ার পথে সদ্য খেলতে শেখা তিনটে কুকুর ছানা রাস্তার ধারে মায়ের সঙ্গে খেলতে খেলতে রাস্তার ওপর চলে এসেছিল। আর তিনি পরোয়া না করেই গাড়িটা চালিয়ে নিয়ে চলে যান। প্যাসেঞ্জার ভদ্রলোক তাকে বলতে গেলে থামিয়ে দিয়েছিলেন। ফেরার পথে দেখলেন সেই জায়গায় একটা কুকুর ছানার নিষ্প্রাণ রক্তাক্ত দেহ আগলে বসে আছে মা কুকুরটি। শ্যামল বাবু অবশ্য দেখতে পাননি সেই নির্বাক মায়ের করুণ চোখে জল ছিল কিনা। শ্যামল বাবুর বুকের ভিতরটা কেমন মোচড় দিয়ে উঠলো। তিনি তাঁর আদরের কন্যাটিকে বুকে জড়িয়ে ধরলেন।

Tanaya Das
Biotechnology (2019-22)
The Neotia University





SUBHAM JANA
EE, TNU

ঝরাপাতা

এক ভোরের ঝরাপাতা
যা সর্বদা বিরাজ করতো ,দেশ মায়ের কোলে ।
সেই পূর্বদিনের সবুজ , কোমল পাতা,
আজ ঝরাপাতা ।

চারিদিকে ছড়িয়ে পড়েছে সেই পাতা ঝরা রক্ত
মায়ের কোল আজ রক্তাক্ত , লাল রঙে রাঙা ।
আমার দেশমায়ের এক প্রতিবেশী রাষ্ট্র
মায়ের কোল শূন্য করার কাজে ব্যস্ত ।

আমরা কী বসে বসে শুধুই দেখব ?
আর কিছুই কী করার নেই ?
আমরা কী পারিনা প্রতিবেশীকে শাস্তি দিতে ?
হ্যাঁ , আমরা পারি
মায়ের চোখের জল মোছাতে ।

দোমড়ানো , মোচড়ানো ঝরাপাতা
কিছুদিন পরেই চলে যাবে আমাদের চোখের আড়ালে
মায়ের চোখ থেকে চলে যাবে ঘুম
মায়ের চোখ থেকে ঝরে পড়বে উষ্ম শিশির কণা ।

আমরা জানি মানবিকতার জয়গান গাইতে ।
আমরা পারি মা কে যন্ত্রণা মুক্ত করতে
একদিন সেই সূর্য উঠবে , যেই সূর্যের আলোয়
আমরা দেখবো পাতা ঝরাহীন সবুজ বটবৃক্ষ ।

নদীর জল রইবে না লাল , শোনা যাবে না বন্ধুকের আওয়াজ ,
পাখির মধুর কণ্ঠে চারিদিক হয়ে উঠবে কুহেলিত
মাটি থাকবে না লাল হয়ে , মাটি হবে সবুজ
আর ঝবে না পাতা ,ঝরবে না উষ্ম শিশির কণা ।

Soumyadip Adak
Computer Science & Engineering (2020-24)
Neotia Institute of Technology Management and Science

Background Picture -
SUBHAM JANA(E.E)

আমার আমি

-সোহম সরকার

জীবনের পিছিল পথে হেঁটে চলা,
একা এক পথিক আমি ;

মুছে যাওয়া দিনগুলির অপষ্টতা আমি ,
ভেঙ্গে যাওয়া স্বপ্নের টুকরো আমী ।

স্বপ্ন আঁকা তুলি ঝেড়ে ফেলে দেওয়া রং ,
দিনের শেষে ডুবে যাওয়া সূর্যের ক্লান্তি আমি ।

আচমকা , ঝড়ের মুখে পড়ে নিভে যাওয়া প্রদীপ তথা,
তৃষ্ণাকাতর চাতকের করুন হাহাকার ও আমি !

স্বপ্ন দেখার কাঙাল , পাগল দুটি চোখ আমি ,
হাসতে হাসতে কেঁদে ফেলার কুরুন বেদনা আমি ,

রাস্তার পাশে পড়ে থাকা ধুলো মলিন ফুল ;
কুয়াশার ভরা শীতের রাতে বুক ফাটা বেদনার অশ্রু আমি ;

কোনো উদাস মনের দীর্ঘ নিশ্বাস আমি
হয়তো তোমার হতাসার নিরুপায় কারণটাও আমিই ।।

Sohom Sarkar
Electronics Communication & Engineering (2020-24)
Neotia Institute of Technology Management and Science

SUBHAM JANA
EE, TNU

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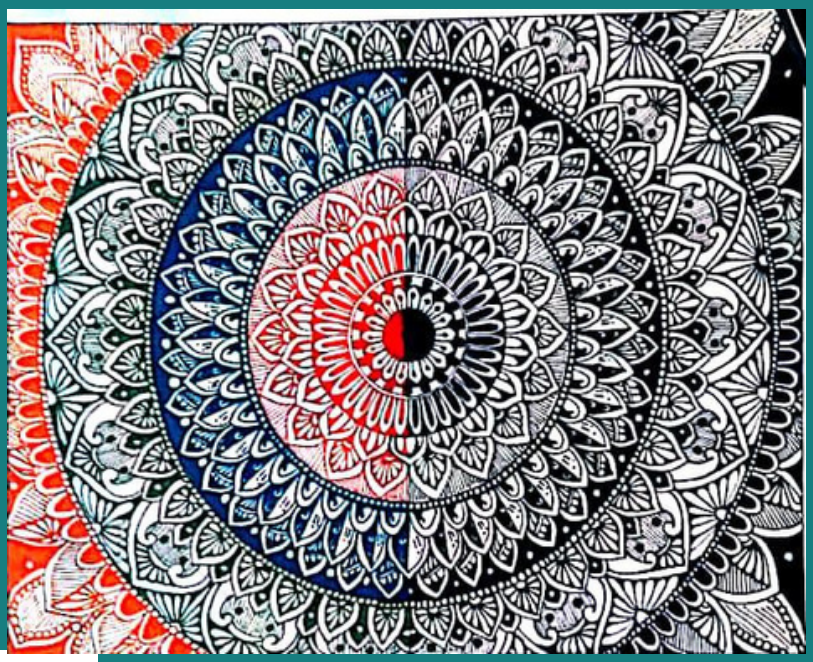
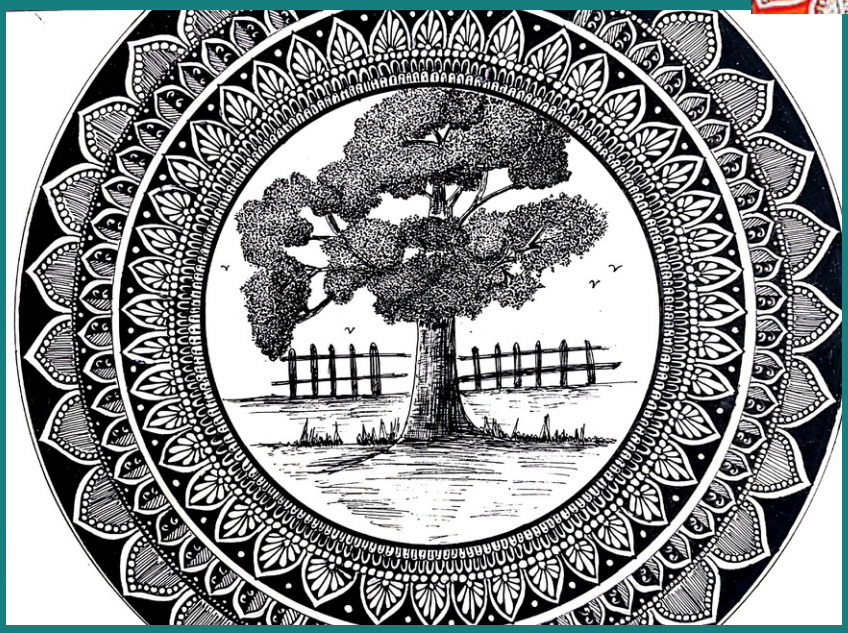
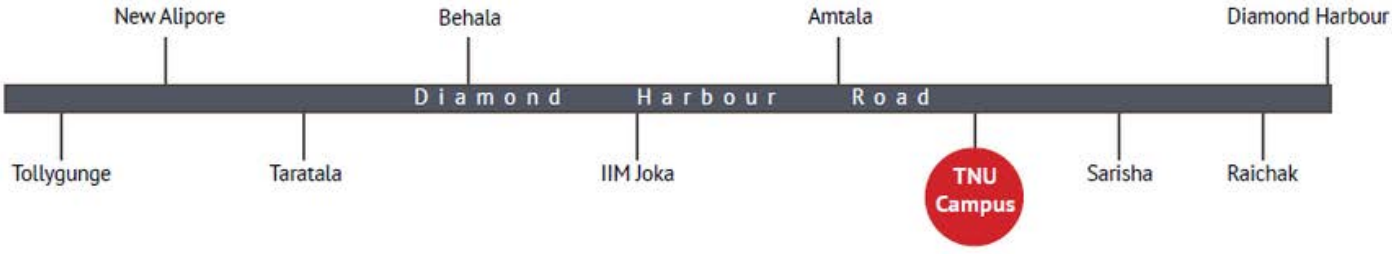
EE, TNU





Swagata Nanda Mandal
CSE, TNU



AmbujaNeotia

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