2020-21 | ISSUE 4

# ASCII NEWSLETTER

ASSOCIATION OF STUDENTS OF COMPUTER SCIENCE FOR INFORMATION INTERCHANGE

## WHAT'S INSIDE THIS ISSUE



## WELCOME!

We hear the term Machine Learning everywhere. What is that? Why has it become so popular? In this new issue of ASCII we will be delving into the field of Machine Learning and will be answering all such questions.

# Department of Computer Science and Engineering

## Vision

To be acclaimed internationally for excellence in teaching and research in Computer Science & Engineering, and in fostering a culture of creativity and innovation to responsibly harness state-of-the-art technologies for societal needs.

## Mission

Mission 1: To assist students in developing a strong foundation in Computer Science and Engineering by providing analytical, computational thinking and problem solving skills.
Mission 2: To inculcate entrepreneurial skills to develop solutions and products for interdisciplinary problems by cultivating curiosity, team spirit and spirit of innovation.
Mission 3: To provide opportunities for students to acquire knowledge of state-of-the-art in Computer Science and Engineering through industry internships, collaborative projects, and global exchange programmes with Institutions of international repute.
Mission 4: To develop life-long learning, ethics, moral values and spirit of service so as to contribute to the society through technology.
Mission 5: To be a premier research-intensive department by providing a stimulating environment for knowledge discovery and creation.

## Programme Educational Objectives (PEOs)

The Computer Science & Engineering Program graduates will
PEO1: Strive on a global platform to pursue their professional career in Computer Science and Engineering.
PEO2: Contribute to product development as entrepreneurs in inter disciplinary fields of engineering and technology.
PEO3: Demonstrate high regard for professionalism, integrity and respect values in diverse culture, and have a concern for society and environment.

## Programme Outcomes and Programme Specific Outcomes

PO1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2: Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3: Design and development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to Assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of and need for sustainable development.
PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.
PSO1: Adopt Standard Practices: Ability to design and engineer, innovative, optimal and elegant computing solutions to interdisciplinary problems using standard practices, tools and technologies.
PSO2: Research and Innovation: Ability to learn emerging computing paradigms for research and innovation

# MACHINE LEARNING

BY AKSHARA S NAIR
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## WHAT IS ML?

Machine learning is a branch of artificial intelligence that equips the machine to automatically learn, correct its mistakes, and improve from its own experience with minimal human intervention. The algorithm used for machine learning makes predictions or decisions without being programmed to do so. The primary aim is to allow computers to learn automatically.

A large number of organizations like YouTube, Google, and Amazon, implement machine learning for day-to-day tasks, which helps in growing their business. Machine learning is significant as it gives a perspective on patterns in client conduct and business functional examples, and supports the improvement of new products. Machine learning has become a significant competitor differentiator for many organizations.

Machine learning and its application in big industries have drastically changed over the years. It was implemented in actual practice from the mere hypothesis that computers could learn without being further modified, to perform explicit undertakings; and further researches were conducted to check if computers can learn from data. The iterative part of machine learning is significant, taking into account that the configurations of the computer could freely adjust when they are presented with new information. They could grasp patterns from past calculations to deliver dependable, repeatable choices and results. It's a science that is not new – however, it has evolved into something more efficient.

# CLASSIFICATION OF ML

**Supervised algorithm:** Supervised learning algorithm trains the machine model under the guidance of known / flagged / labelled data, which is given to the model. Once the Machine Learning model has been trained, unseen data can be fed into the model to get a future response. Beginning from the analysis of a training dataset, the learning calculation delivers an induced capacity to make expectations about the output value. The model can be fed with new data after adequate training. The learning algorithm can likewise verify its output with correct, expected output and discover errors to alter the model as it needs to be.

**Un-supervised Algorithm:** Un-supervised Algorithm is used when the data used is neither classified nor flagged. In this, the Machine Learning model is self-sufficient to learn on its own. The unlabeled data is fed into the model and it tries to generate the output by finding patterns and relationships.

## DID YOU KNOW?

1. Amazon has reduced 'click to ship' time down to 15 minutes.
2. Netflix is investing heavily to keep users engaged.
3. Google's Deep Learning can benefit health.
4. €150 billion saved on healthcare by 2025.
5. Chatbots are stripped-down AI programs that mimic human speech, and often do rote customer service work.

# WHY IS MACHINE LEARNING IMPORTANT?

Machine learning finds its application in almost every aspect of our lives, for example in social applications like Facebook, Instagram and Twitter. Machine learning algorithms can learn and mend on their own from past experiences. Machine learning is important because of its wide range of applications and its incredible ability to adapt and provide solutions to complex problems efficiently, effectively, and quickly. Over time, it can produce highly precise and accurate data.

The boundless amount of accessible information, reasonable information stockpiling, and the development of more affordable and remarkable handling has impelled the development of machine learning. The future of growing organizations is secure in the hands of Machine Learning as they have the potential to get things done efficiently, quickly, and accurately. Machine learning instruments empower these organizations to detect possible risks against profits. The sensible utilization of machine learning drive results which makes a remarkable influence on an organization's main concerns. New strategies in the field are advancing quickly, extending the utilization of machine learning to unlimited plausible outcomes. Machine learning has been accepted very widely by ventures who rely upon huge amounts of data that require a framework to disintegrate it very proficiently and precisely.


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# A BRIEF NOTE ON MACHINE LEARNING

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ASSISTANT PROFESSOR, DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

“Can machines think” is one of the groundbreaking questions that paved the seeds of artificial intelligence and brought revolutionary changes in computational research. Since then, this research area surprised us with an array of innovations. Today we can think about computers as smart personal assistants, expert decision makers, creative writers, and even intelligent drivers. Most of the areas where human cognitive activities dominated are now replaced with intelligent machines. In fact, now it is hard to find some applications without a term smart/intelligence as a qualifier. As a computer science enthusiast, an interesting question is “how are all these possible”. The answer is Machine Learning, (ML) which makes computers think and learn as humans.

Classic definition of machine learning says ML enables computer to learn from experience without being explicitly programmed (Artur Samuel, 1957). This was a paradigm shift from traditional computer algorithms which process data into information. Current computers are trying to extract knowledge from the data and make intelligent decisions using this knowledge. They learn interesting patterns from the data and make predictions or decisions on future unseen data. It's all about learning from the past and predicting the future. All these predictions are supported by the mathematical pillars such as Linear Algebra, Probability and statistics.

History of machine learning can contemporate with the history of Artificial Intelligence (AI). Earlier models of machine learning used logical and knowledge representations rather than algorithms to discover patterns from the data. In the early 1970s, machine learning took a separate path as a training program to solve practical problems of AI. Many successful vector space and probabilistic models were introduced in the 1980s. The range of applications were also enlarged from simple computer games to real-life applications. Fortunately, the advancements in computational technology, especially the internet, lead to the explosion of data, hence the data-driven machine learning applications. With the revamp of artificial neural networks, the current machine learning applications are completely overruled by deep learning models.

A traditional machine learning algorithm works “trains” from the data, where each data item is described by a set of handcrafted features. The quality of the ML model depends on the quality of the feature representation. When ML models begin to be used in new domains like image processing, text processing, biological data and so on, feature engineering remains an expensive challenge. The deep learning models addressed this challenge by proposing automatic unsupervised representation learning from data. The system processes the data through various layers of neural networks, then it finds the appropriate identifiers to classify the required objects. This boosted the real-time applications with the ability to process multimedia-multidimensional big data.

Today’s ML is not only about algorithms. Every facet of technology and life changed with the development of ML. GPU based computing becomes a necessity to adhere with the complex deep learning models. Companies are now focusing on deep learning enabled hardware and intelligent processors. Due to the popularity of ML applications, most of the cloud providers are now ready with ML/AI components. Researchers combine ML and IoT for intelligent real-time models. Latest neural language models make the language based applications more natural. Massive data mining using ML tools enables personalized suggestions of news, advertisements, music, food and even medicines. ML models can now recreate the history, translate the inscriptions and do a lot to preserve our heritage. They can provide assistive technology for those suffering from disabilities. More and more, they light up some missing links in our imperfect understanding of life.

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# DATA IN ML

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**Data :** It can be any unprocessed fact, value, text, sound or picture that is being interpreted and analyzed. Data is the most important part of Data Analytics, Machine Learning and Artificial Intelligence. Without data, we can't train any model and all modern research and automation will go vain. Big enterprises are spending loads of money just to gather as much data as possible.

## Splitting Data

**Training Data:** The part of data we use to train our model. This is the data which the model actually sees (both input and output) and learn from.

**Validation Data:** The part of data which is used to adjust a model, fit on training dataset along with improving involved hyperparameters.

**Testing Data:** Once our model is completely trained, testing data provides the unbiased evaluation.

## Properties of Data

**Volume :** Scale of Data. With growing world population and technology at exposure, huge data is being generated each and every millisecond.

**Variety :** Different forms of data – healthcare, images, videos, audio clippings.

**Velocity :** Rate of data streaming and generation.

**Value :** Meaningfulness of data in terms of information which researchers can infer from it.

**Veracity :** Certainty and correctness in data we are working on.

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# MACHINE LEARNING IN EVERYDAY LIFE

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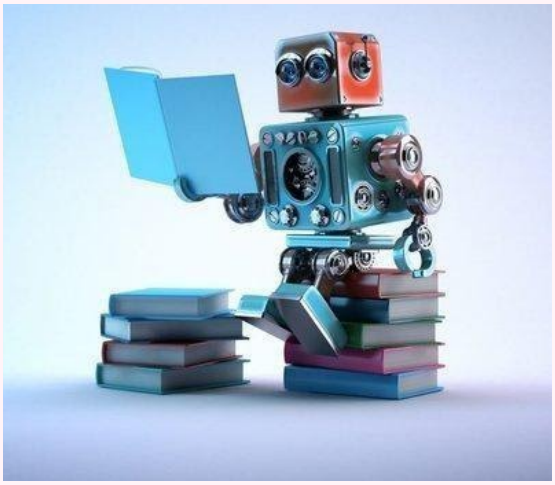
## APPLICATIONS OF MACHINE LEARNING

There is little doubt that machine learning has become one of the most powerful technologies in the last decade. The emphasis on “learning” in machine learning allows computers to make better and better decisions, based on previous experiences.
Advances in this technology have allowed for recent breakthroughs that promote faster and more efficient business intelligence, using abilities ranging from facial recognition to natural language processing.

Machine learning programs can be thought of as individual components, or subprograms, of AI that can operate independently. The goal of true artificial intelligence (a computer or program that thinks and communicates like a human being) has not yet been achieved. However, individual machine learning programs have been trained to specialize in performing certain tasks that are quite useful. For a variety of reasons, machine learning is often referred to as AI. Combinations of a wide variety of machine learning programs, acting as subprograms, have the potential to support the goal of true artificial intelligence.

### Machine Learning in Education



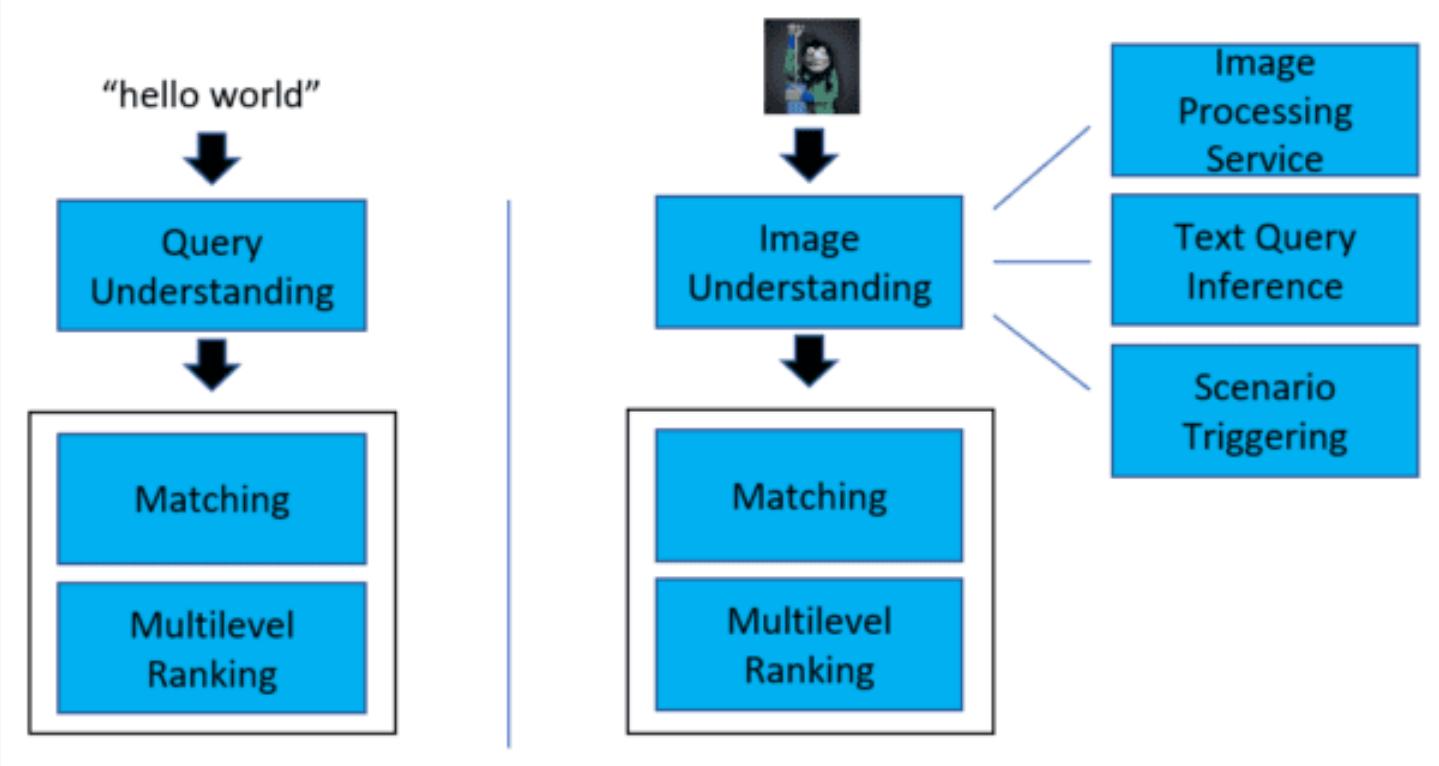
Advances in ML & AI are enabling teachers to realize a far better understanding of how their students are progressing with learning.

ML & AI will make big and positive changes in education helping students to enjoy the training process and have a far better understanding with their teachers. Students will not feel apprehensive towards their teachers and be frightened of being judged.

Teachers can use machine learning to check how much of lessons students are able to consume, how they are coping with the lessons taught and whether they are finding it too much to consume. Of course, this allows the teachers to help their students grasp the lessons. Also, prevent the at-risk students from falling behind or even worse, dropping out.

## Machine learning in Search Engines

Search engines relying on machine learning to improve their services is no secret today. Implementing these, Google has introduced some amazing services such as voice recognition, image search and many more.




Google services like its image search and translation tools use sophisticated machine learning which permit computers to ascertain, listen and speak in much an equivalent way as human do.

Machine learning is that the term for the present innovative applications in AI. How they produce more interesting features is what time will tell us.

## Machine Learning in Health Care

Machine learning, simply put, may be a sort of AI when computers are programmed to interpret information without human intervention.

The foremost common healthcare use cases for machine learning are automating medical billing, clinical decision support and therefore the development of clinical care guidelines.
More importantly, scientists and researchers are using machine learning (ML) to churn out variety of smart solutions which will help in diagnosing and treating an illness.

Patients are set to profit the most because the technology can improve their outcome by analyzing their health records and choosing the best treatment for them. This application has remained a hot topic for the last three years.

Several promising start-ups of this industry are gearing up their effort with a focus on healthcare. These include Nervanasys (acquired by Intel), Ayasdi, Sentient, Digital Reasoning System, among others. Computer vision is most significant contributors in the field of machine learning which uses deep learning. It is an active healthcare application for ML Microsoft's InnerEye initiative. That started in 2010, is currently working on image diagnostic tool.

# TRENDS IN MACHINE LEARNING

## 77% of devices that we presently use are powered by ML


A study uncovers that 77% of devices that we presently use are utilizing ML. From a social event of SMART devices over Netflix proposition through products like Amazon's Alexa, and Google Home, artificial intelligence services are proclaiming innovative solutions for organizations and regular day to day existences. The year 2021 is ready to observe some significant ML and AI trends that would reshape our economic, social, and industrial workings.

As of now, the AI-ML industry is developing at a quick rate and gives sufficient advancement scope to companies to bring the vital change. According to Gartner, around 37% of all companies reviewed are utilizing some type of ML in their business and it is anticipated that around 80% of modern advances will be founded on AI and ML by 2022.

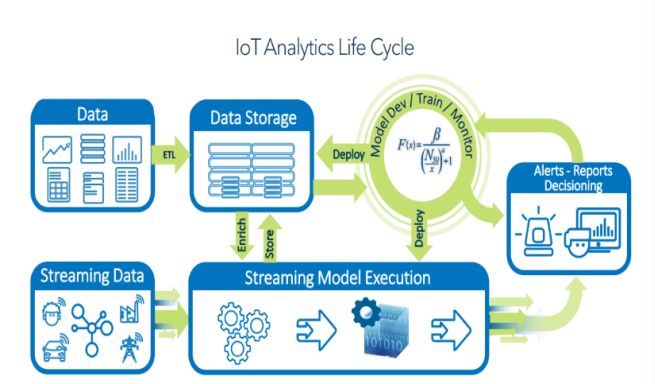
Throughout recent years, there have been a few discoveries in machine learning and AI. Notwithstanding, a couple of organizations have so far been able to apply those to accomplish the essential business objectives. With the surge in demand and interest in these technologies, various new patterns are ascending during this space. Simply if you are a tech capable or related to innovation in some capacity, it is exciting to see what is next inside the space of machine learning.

## Business Forecasting and Analysis

The Internet of Things has been a quickly developing segment recently with economic analyst **Transforma Insights** forecasting that the worldwide IoT market will develop to 24.1 billion devices in 2030, producing $1.5 trillion in income.

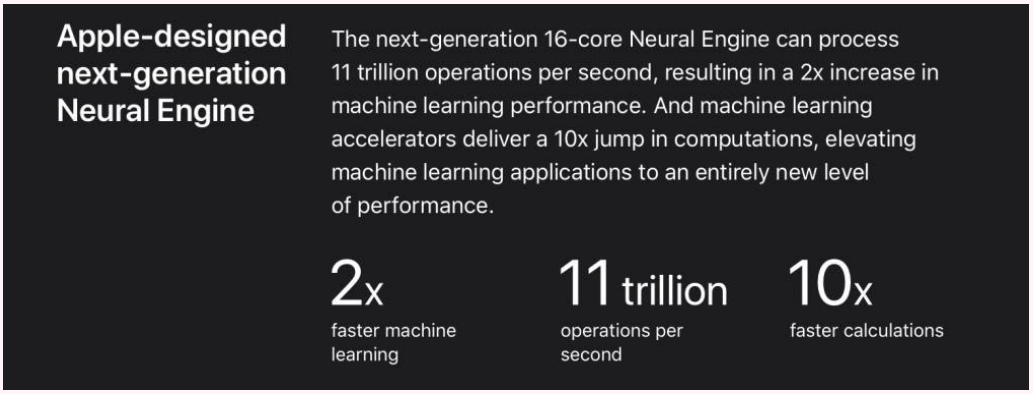
The utilization of machine learning is progressively interlaced with IoT. Machine learning, artificial intelligence, deep learning, for instance, are now being utilized to make IoT devices and services smarter and more secure. In any case, the advantages go both ways given that machine learning and AI require enormous volumes of data to work effectively – precisely what networks of IoT sensors and devices provide.

In an industrial setting, for instance, IoT networks all through a manufacturing plant can gather operational and performance information, which is then analyzed by AI systems to improve production system performance, support effectiveness, and anticipate when machines will require upkeep.




## Faster Computing Power

Artificial intelligence analysts are simply close to the start of understanding the facility of artificial neural networks and the best approach to arrange them.

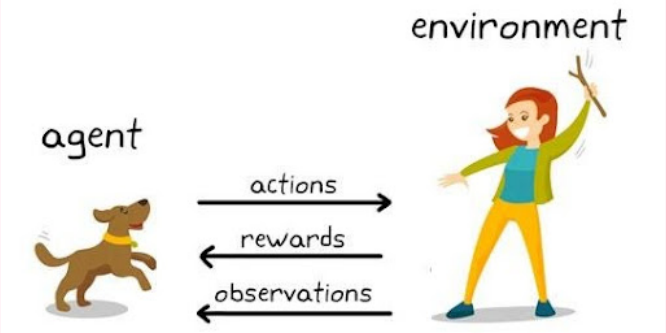



This proposes within the coming year, algorithmic breakthroughs will continue arising at an incredible movement with pragmatic developments and new problem-solving systems. Cloud machine learning solutions are likewise picking up force as third-party cloud service providers encourage deploying ML algorithms in the cloud. Artificial intelligence can address a good scope of inauspicious issues that need finding insights and making decisions. However, without the ability to get a handle on a machine's suggestion, individuals will imagine that it is difficult to accept that proposition. With specific lines, envision continued growth in the interim increasing the transparency and explain ability concerning AI algorithms.

## Reinforcement Leaning

Reinforced Learning (RL) is a subset of machine learning that would lead the industry in the forthcoming years. It is a unique utilization of deep learning that utilizes its own experiences to improve the effectiveness of captured data.

In reinforcement learning, AI programming is set up with various conditions that characterize what sort of activity will be performed by the software. Considering different actions and results, the software self-learns actions to perform to meet the ideal ultimate objective. An ideal illustration of reinforcement learning is a chatbot that addresses simple user queries like greetings, order booking, consultation calls.




Machine Learning Development Companies can utilize RL to make the chatbot more ingenious by adding sequential conditions to it –, for example, distinguishing prospective customers and moving calls to the relevant service agent.

Some of the other applications of RL include robotics for business strategy planning, robot motion control, industrial automation, and aircraft control.

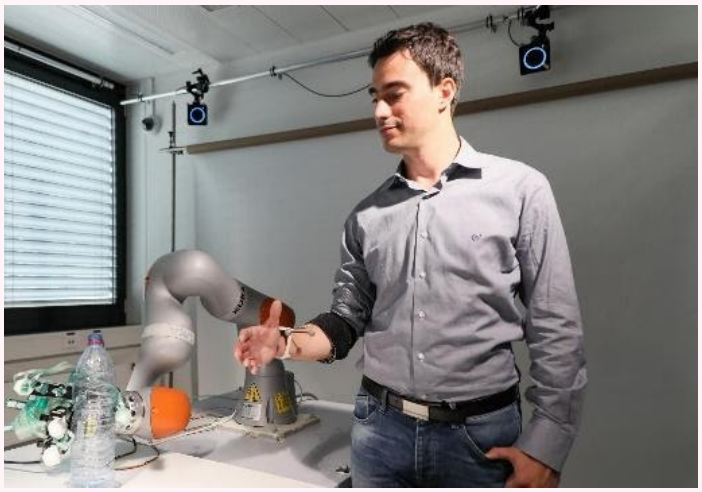
# ADVANCEMENT IN MACHINE LEARNING

## Google Cloud AI Platform Pipelines

Google announced the beta launch of Cloud AI Platform Pipelines, a service designed to deploy robust, repeatable AI pipelines along with monitoring, auditing, version tracking, and reproducibility in the cloud. Google's pitching it as a way to deliver an "easy to install" secure execution environment for machine learning workflows, which could reduce the amount of time enterprises spend bringing products to production.

## An implant uses machine learning to give amputees control over prosthetic hands

Researchers have been working to make mind-controlled prosthetics a reality for at least a decade. Until now scientists have faced a major barrier: they have not been able to access nerve signals that are strong or stable enough to send to the bionic limb. Although it is possible to get this sort of signal using a brain-machine interface, the procedure to implant one is invasive and costly. And the nerve signals carried by the peripheral nerves that fan out from the brain and spinal cord are too small.



A new implant gets around this problem by using machine learning to amplify these signals. A study, published in Science Translational Medicine today, found that it worked for four amputees for almost a year. It gave them fine control of their prosthetic hands and let them pick up miniature play bricks, grasp items like soda cans, and play Rock, Paper, Scissors.

## An AI breakthrough could significantly improve Oculus Quest rendering power

Researchers at Facebook's AI division have come up with a way to provide developers with up to 67% more rendering power on mobile VR hardware with a "simple" software update. Of course, anything dealing with the development of AI and its implementation into practical applications is anything but "simple", but the key here is that the current generation of hardware could see significant improvements in performance through the normal procedure of updating the system software.

In a nutshell, Upload VR unearthed a document from Facebook AI researchers that provides a tangible way to utilize a "super-resolution" algorithm to create a higher resolution image from a lower resolution image. From a practical perspective, this means that Oculus Quest games could be rendered at 70% of their current resolution, helping to provide better framerates and the opportunity for more detailed scenes. The super-resolution AI algorithm will then take the lower resolution game and create a new image that looks significantly sharper and more detailed than it originally was. This utilizes the strengths in mobile processing architectures to overcome an obvious weakness.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# THE INTERSECTION OF ML & IOT

BY ATHMAKURI V V L N BALARAMACHARYULU,
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The Internet of Things has been developing these days in a great way such that the worldwide IoT market will develop to 24.1 billion devices in 2030, producing $1.5 trillion in income. The usage of machine learning is progressively interlinked with IoT. Machine learning, AI (Artificial Intelligence), deep learning, for instance, are now being utilized to make IoT devices and services smarter and more secure and reliable. In any case, Machine learning requires data of great size to work efficiently and precisely IoT sensors and devices provides it. In an industrial aspect, for instance, operational and performance information can be gathered from the manufacturing plant of IoT networks, which is then analyzed by AI systems to improve production system performance, support effectiveness and anticipate when machines will require upkeep. Green Horizons project created by IBM's China Research Lab is an example in this case which aims to control the pollution levels to more breathable standards. In this project, sensors of IoT networks collect emission data from vehicles, pollen levels, airflow direction, weather and traffic signals and many others, and then ML algorithms play an important role to find the best way to reduce these emissions. The intersection of ML and IoT can also be seen in the field of Smart vehicles, say for example self-driving cars where cars need to be extremely accurate and all the parts need to communicate with each other in milliseconds on the road. This indicates and tells how important the combination of these technologies is. Gartner, one of the global IT service management companies, even predicts that more than 80% of enterprise IoT projects will use Artificial Intelligence and Machine Learning by 2022 in some form, which is much higher than the 10% of projects using it currently.

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# LIVING IN THE ERA OF DEEP FAKES

BY AKASH GUNA R.T (CB.EN.U4CSE19302) CSE - D

Computer Hardware has grown exponentially over the years providing common men access to highly potent computers. This has led to vast improvements in the Artificial Intelligence discipline, the emergence of Deep Learning is the prime example of the same. Deep learning is a data-centric methodology that requires high computational capacities to solve problems. Computer Vision uses the prowess of Deep Learning for various modern-day tasks ranging from object detection to segmentation. We are aware of a popular Snapchat age filter that converts the face of a young person to an older version of himself, a deep learning network called Generative Adversarial Networks (GAN) is responsible for such image generations. The images generated by GANs known as deepfakes is a blend of two words 'Deep Learning' and 'Fake'.

## How are Deep Fakes Created

A GAN in the context of an image contains two networks Generator and Discriminator, generator generates fake images and a discriminator tries to predict if the image is fake or real when provided a mixture of real and generated images. In a usual training loop of GANs, the generator eventually outsmarts the discriminator by generating hyper-realistic images. Thus, the images generated by GANs are not differentiable by a human until looked into for minute details. StyleGAN a GAN proposed by NVIDIA research is capable of producing high-quality images of people that do not exist! Although training such a GAN is a humongous task, it is possible to reproduce such GANs on our personal computers. The image above shows images of which one is a real person and the other a person generated by GAN could you find who is real?

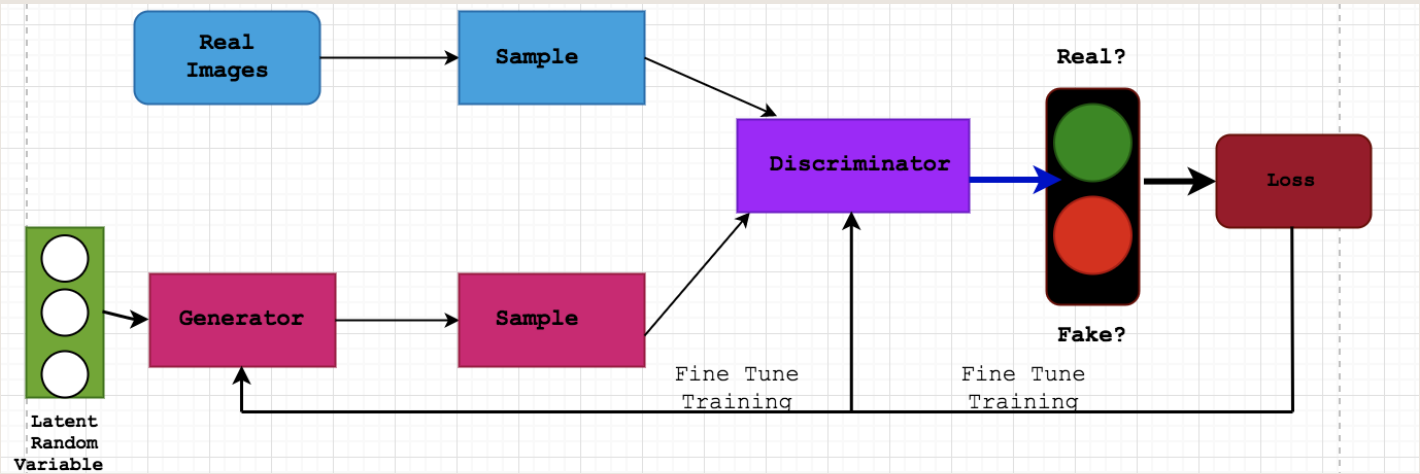


Fig: GAN Architecture

## Deep Fakes – The Good Part:

Deep Fakes in general generate media depicting scenarios that are inexistent, this technology can be used for various image enhancement and restoration purposes. For instance, a GAN could be used to identify the face of a criminal by examining low-resolution security camera footage. Deep Fakes can visualize interiors of your home automatically provided an empty room, Deepfakes can create innovative automobile designs, GANs could restore your old photos digitally and could also colorize them. There are many more ways Deepfakes could be used productively in today's world. In the future, GANs might also be able to generate future events based on present data, imagine being able to upload your selfie to a GAN and it plays a video of your future! it's fascinating, isn't it?

## Why Do we need Real-Time Deep Fake Detection?

There have been multiple instances of Deep Fake videos being misused to create confusion and defame a personality. A deepfake video depicting Obama speaking ill of Trump emerged online, though it was not intended to defame him it could have been certainly used for the same. The possibility of recreating any scenario from a single picture of a person is scary and could lead to distrust among people. A Politician could conduct a campaign to defame his opponent powered by deepfakes. Cyber phishing could easily derail organizations who have security issues owing to the present COVID situation, a morphed video of the CEO asking to transfer money to an account was sent to the CTO of the company and money was stolen! Communication between people has become fairly easy and has also increased the spread of misinformation the emergence of deep fakes has only made it worse. Thus, we need robust real-time Deepfake Detection to prevent people from believing misinformation.

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# ADVANCEMENT OF MACHINE LEARNING IN THE FIELD OF MEDICINE

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LOKESH SAIPUREDDI (CB.EN.U4CSE19348) CSE - D

One of the technologies that has become popular with time is Machine Learning. Now the question arises of what is machine learning ? Machine is the study of computer algorithms that improve automatically through the experience and by the use of data.

**Machine Learning is the field of study that gives the computer ability to learn without being explicitly programmed - Arthur Samuel**

In the year 1950, Alan Turing who was popularly known as Father of Modern computer, published a landmark Paper on 'Computer Machinery and Intelligence'. This paper was the start of Computer Intelligence and later the term Machine Learning was coined by Arthur Samuel in 1959. Nowadays, due to the availability of bulk data and the exponential growth in computational power led to an unparalleled surge of interest in the field of machine learning. However, From Tech giants to small companies every company is trying to include Machine Learning in their technology to produce effective solutions. With rapid developments of artificial intelligence (AI) technology, the use of AI to mine clinical data has become a major trend in the medical industry. Recent applications of deep learning in medical image analysis involve various computer vision-related tasks such as classification, detection and segmentation.

Since the pandemic has arrived, there is a critical shortage in qualified and trained paramedics and medical doctors amid this unrelenting global pandemic. This is where the Deep Learning models come into the picture. These models are incorporated into medical imaging and are successful in analysing various kinds of imaging techniques like Computed Tomography (CT), Ultrasound images, Magnetic Resonance Imaging (MRI), Positron Emission Tomography (PET) and pathological tests.

In recent times Google announced that it is having a partnership with researchers and patients to solve real world health related problems. This technology is a combination of machine learning and neuroscience to build a robust machine learning algorithm into neural networks which are capable of mimicking the human brain.

In addition to this AI is being used by healthcare professionals for a better understanding of day to day patterns of their patients, and with this understanding they are able to provide better feedback, support and even help them in prescribing the exact medication resulting in betterment of medical facilities.

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# THE INVISIBLE THREAT TO OCEAN WILDLIFE AND HOW MACHINE LEARNING CAN HELP

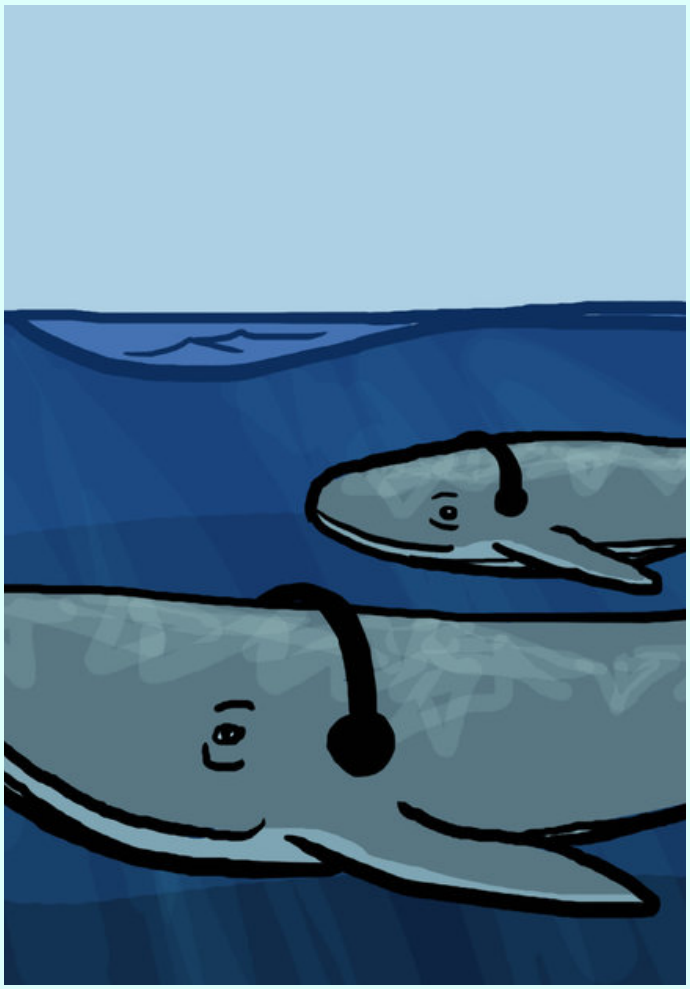
SWETHA MANUKONDA
(CB.EN.U4CSE19355) CSE - D

Climate change and plastic pollution are the biggest threats to our oceans and the aquatic life they sustain. Bleaching of coral reefs, generation of toxic algae and acidification of water are some of the direct effects of climate change caused by increase in the oceanic temperature. These drastic changes in the underwater environment coupled with the massive amounts of plastic discharged into the waters have adverse effects on marine life. Unfortunately, in addition to this ocean wildlife faces yet another threat - noise pollution or acoustic pollution.

This noise pollution is caused by human activities like military sonars, oil exploration and industrial shipping. Though seemingly invisible, these activities produce incredibly disruptive sounds that have harmful effects on sea creatures, with sound waves travelling at speeds 4.3 times faster in water than in air. Cetaceans (whales, dolphins and porpoises) rely on their hearing for feeding, breeding, communication and navigation. Sonar can interfere with these processes and even displace them from their habitats. This applies to all sea creatures, who use sound in one way or another to survive. Sonar can cause hearing loss and internal bleeding in whales causing them to lose their sense of direction and wash up on shore or in the worst possible case killing them.

Passive acoustic monitoring (PAM) allows us to measure, monitor and determine the sources of sound underwater. These tools enable scientists to listen in on the sounds generated by aquatic animals in their habitats through collected data or in real time. With computer algorithms we can then determine animal presence, their behaviours like breeding or feeding, vocal activity, habitat use and animal number. Long term collection of PAM data could possibly help us in identifying the patterns exhibited by various species.

Advancements in technology have significantly reduced the cost of data storage and we find ourselves in a familiar scenario: with massive amounts of data that would take too long to scour and analyse manually or even with regular algorithms. That's how machine learning comes into the picture. ML algorithms like gaussian mixture models, classification and regression trees and deep learning are being used extensively with underwater acoustic data. Machine learning has proven to be the economical approach with better consistency over manual methods.

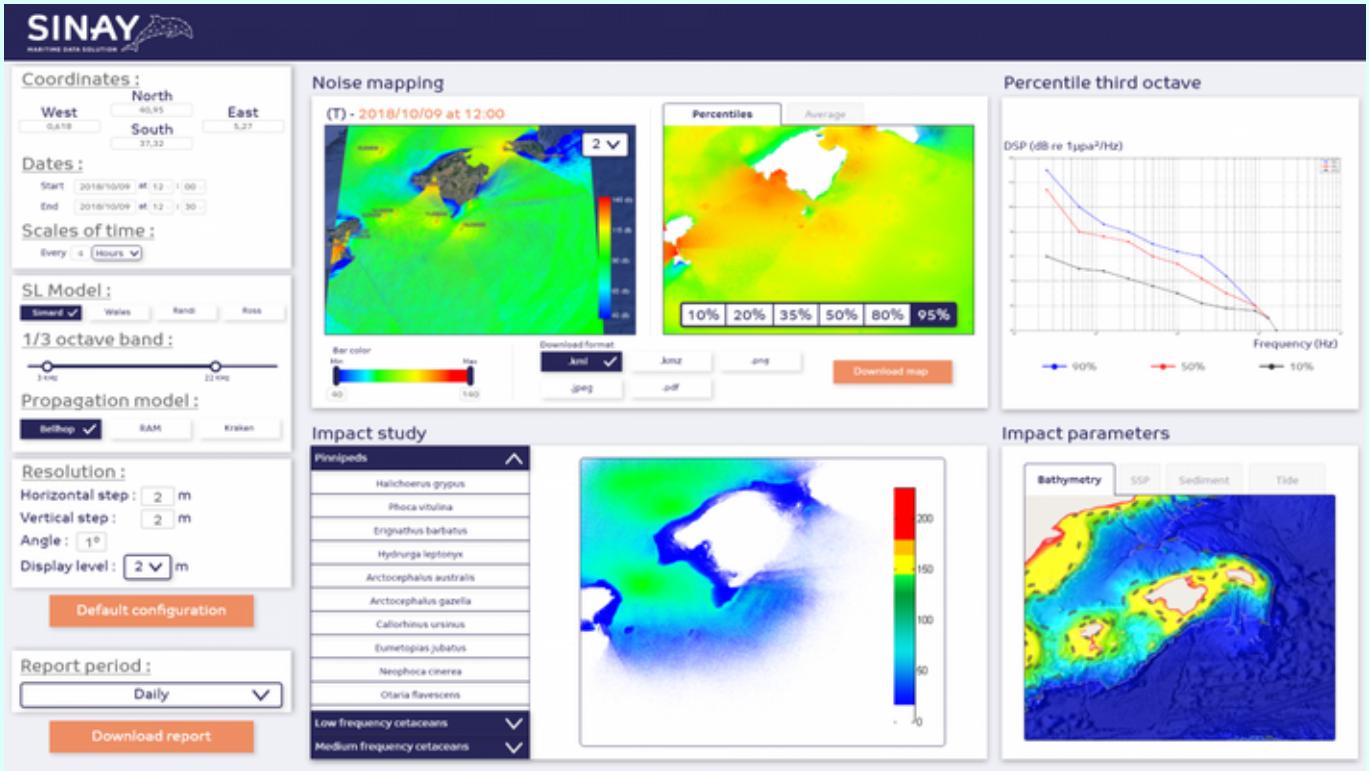


For example, a deep neural network model with multiple layers can be trained over a dataset of signals from a particular species of aquatic animal to identify characteristics that distinguish it from other calls or signals. These signals can further be classified by the behaviour they represent like feeding, navigation or communication with offspring. Over a period of time we can use the data to observe patterns and make conclusions on important questions like the whereabouts of a sea creature during a particular season or the effect of environmental changes on their behavior.

Machine learning models can be trained on not only just acoustic data but also data generated from other sensors like cameras, chemical sensors and satellite imagery. The objective is to identify the locations where a certain species of aquatic animal may reside (particularly those vulnerable to disruptive sounds) and make observations on their behaviour and migration patterns. The insights we extract can be used to help corporations and governments make conscious decisions on naval activity, oil exploration and construction projects to help protect and conserve marine life.

The ocean is constantly dealing with the negative consequences of man-made activities. It has significantly reduced the impact of climate change by absorbing the excess heat and CO2 but at the cost of harming its ecosystems. The sea has become a discharge site for plastic, toxic waste and other harmful chemicals by the factories of huge corporations. Life for sea creatures becomes chaotic, troublesome and even deadly because of human activities emanating loud noises. Using our technological resources we can learn more about the ocean and its aquatic life and use that information to make decisions that can help save our oceans.

Sinay is one such company whose mission is to reduce environmental impact while increasing business efficiency. It involves collecting vast amounts of data and applying smart AI algorithms based on advanced machine learning. Their environmental modules include air quality and water quality monitoring, a sea life impact module and an underwater acoustics impact module that is coming soon.





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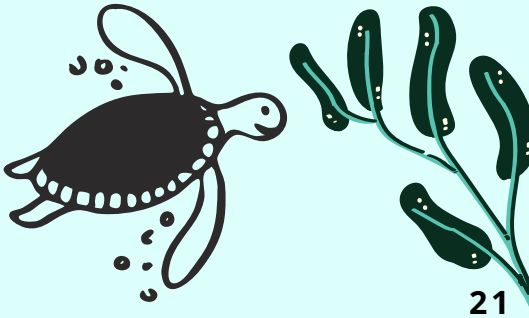
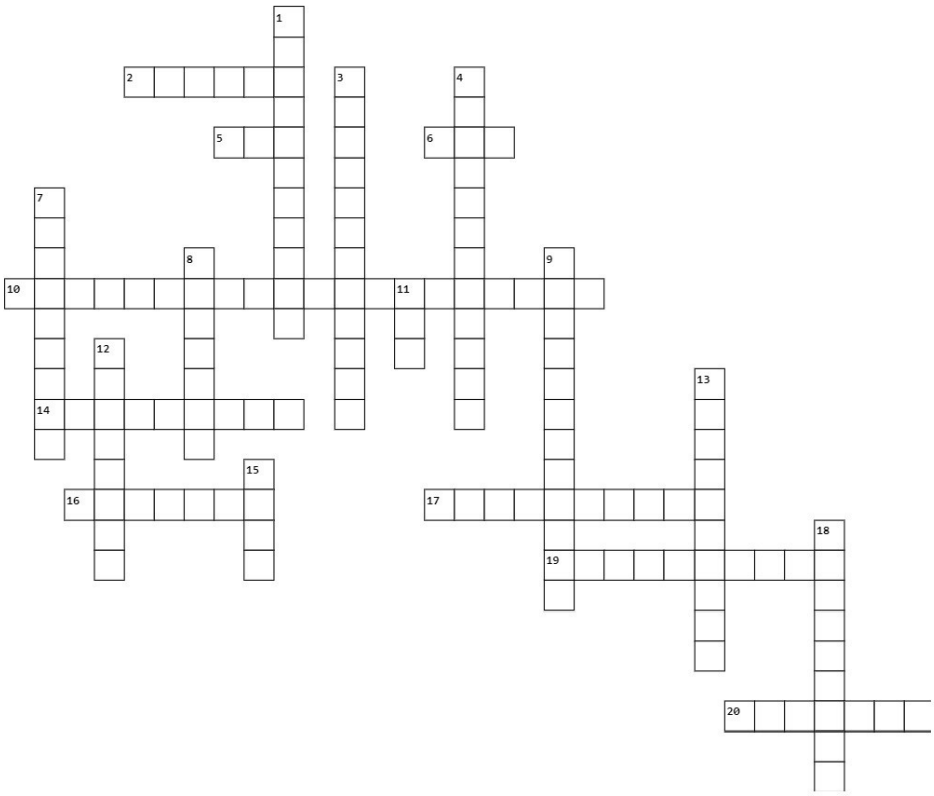


# *Finally it's time for some recreation!*



**Across**

**2. a question-answering computer system capable of answering questions posed in natural language, developed in IBM**

**5. a type of microprocessor designed to accelerate machine vision tasks**

**6. In addition to neuronal and synaptic state, these type of neural networks incorporate the concept of time into their operating model**

**10. the impossibility of listing all the preconditions required for a real-world action to have its intended effect**

**14. gauges whether a computer-based synthesized voice can tell a joke with sufficient skill to cause people to laugh**

**16. a computer program that plays the board game Go**

**17. the study of mathematical models of strategic interaction between rational decision-makers**

**19. a type of computer software in which source code is released under a license in which the copyright holder grants users the rights to study, change, and distribute the software to anyone and for any purpose**

**20. a computer program or an artificial intelligence which conducts a conversation via auditory or textual methods**

**Down**

**1. a hypothetical point in the future when technological growth becomes uncontrollable and irreversible, resulting in unfathomable changes to human civilization**

**3. a multidisciplinary branch of engineering that focuses on the engineering of both electrical and mechanical systems**

**4. an ensemble learning method for classification, regression and other tasks that operates by constructing a multitude of decision trees at training time**

**7. a graphical breakdown of a question that dissects it into its different components vertically and that progresses into details as it reads to the right**

**8. a term used to refer to data sets that are too large or complex for traditional data-processing application software to adequately deal with**

**9. a class of algorithms for pattern analysis, whose best known member is the support vector machine (SVM)**

**11. a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality**

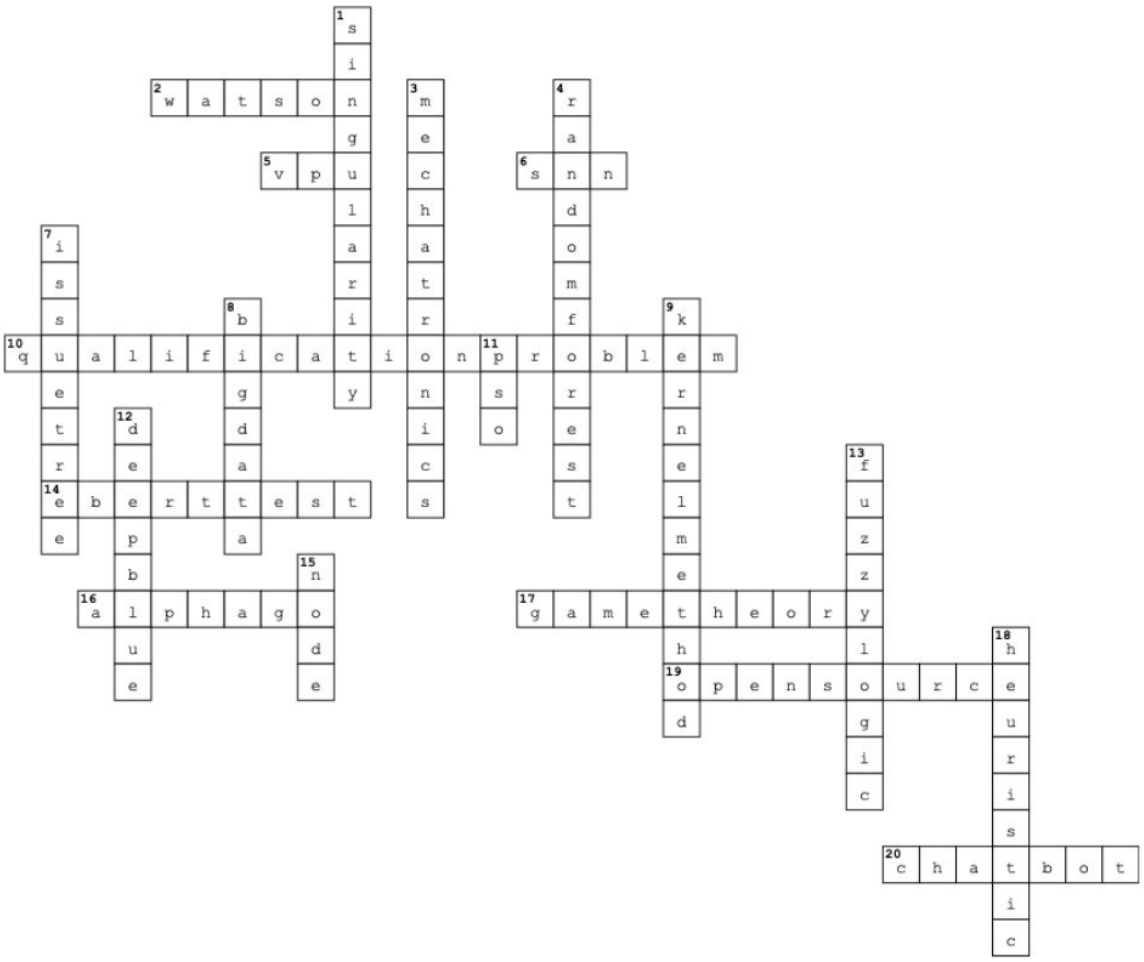
**12. was a chess-playing computer developed by IBM**

**13. a simple form for the many-valued logic, in which the truth values of variables may have any degree of "Truthfulness" that can be represented by any real number in the range between 0 (as in Completely False) and 1 (as in Completely True) inclusive**

**15. a basic unit of a data structure, such as a linked list or tree data structure**

**18. a technique designed for solving a problem more quickly when classic methods are too slow, or for finding an approximate solution when classic methods fail to find any exact solution**

# IN CASE YOU WERE WONDERING WHERE THE SOLUTION IS



# LOGIC PUZZLES

**DHARANEISH V C (CB.EN.U4CSE20315) CSE - D**

HEY FOLKS! NAMASTE! HERE ARE SOME LOGIC PUZZLES TO SOLVE AND SHARPEN YOUR MIND.

## LEVEL-1

**Each inhabitant of a remote village always tells the truth or always lies. A villager will give only a "Yes" or a "No" response to a question a tourist asks. Suppose you are a tourist visiting this area and come to a fork in the road. One branch leads to the ruins you want to visit; the other branch leads deep into the jungle. A villager is standing at the fork in the road. What one question can you ask the villager to determine which branch to take?**

The question is "If I were to ask you whether the right branch leads to the ruins, would you answer, yes?"
If the ruins are that direction, a truthful villager will say yes (because they would say yes to the hypothetical question) and a liar will say yes (because in fact they would say no to the hypothetical question).
If the ruins are NOT in that direction, the truthful villager will say no (because they would say no to the hypothetical) and the liar will say no (because they would say yes to the hypothetical).

# LEVEL-2

**An explorer is captured by a group of cannibals. There are two types of cannibals—those who always tell the truth and those who always lie. The cannibals will barbecue the explorer unless he can determine whether a particular cannibal always lies or always tells the truth. He is allowed to ask the cannibal exactly one question.**

Explain why the question “Are you a liar?” does not work.
If you ask the Truth Teller "are you a Liar?"
The Truth Teller will say "No".
Because he is telling the truth. He is not a Lair.

And if you ask the Liar, "are you a liar?"
The Lair will also say "No".
Because he is lying. He is a Liar.

If they both say no, you can't tell who is lying and who is telling the truth.

Find a question that the explorer can use to determine whether the cannibal always lies or always tells the truth.

There can be two questions asked.

Are you a cannibal?

"Are you a cannibal?" works because the Truth Teller will tell you "Yes" because he is telling the truth, he is a cannibal.

And the Lair will tell you "No". But you know they are all cannibal. So you know he is lying.

Am I an explorer?

"Am I an explorer?" works, because the Truth Teller will say "Yes".

And the liar will say "no". But you know he is lying, because he is a cannibal not an explorer.

Clever Question: Is it true that 2+2 = 4?

# LEVEL-3

**When three professors are seated in a restaurant, the hostess asks them: "Does everyone want coffee?" The first professor says: "I do not know." The second professor then says: "I do not know." Finally, the third professor says: "No, not everyone wants coffee." The hostess comes back and gives coffee to the professors who want it. How did she figure out who wanted coffee?**

If the first professor did not want coffee, then he would know that the answer to the hostess's question was "no." Therefore the hostess and the remaining professors know that the first professor did want coffee. Similarly, the second professor must want coffee. When the third professor said "no," the hostess knows that the third professor does not want coffee.

**Give a try:** When planning a party, you want to know whom to invite. Among the people you would like to invite are three touchy friends. You know that if Jasmine attends, she will become unhappy if Samir is there, Samir will attend only if Kanti will be there, and Kanti will not attend unless Jasmine also does. Which combinations of these three friends can you invite so as not to make someone unhappy?

**SOLUTION**: Kanti and Jasmine; Jasmine alone; No one

# LEVEL-4

**In [Sm78] Smullyan posed many puzzles about an island that has two kinds of inhabitants, knights, who always tell the truth, and their opposites, knaves, who always lie. You encounter two people A and B. What are A and B if A says "B is a knight" and B says "The two of us are opposite types?"**

(Refer: https://en.wikipedia.org/wiki/Knights_and_Knavesa)
(Refer: What is the Name of this Book? The Riddle of Dracula and Other Logical puzzles by Raymond Smullyan)

**SOLUTION**: Let p and q be the statements that A is a knight and B is a knight, respectively, so that ¬p and ¬q are the statements that A is a knave and B is a knave, respectively.
We first consider the possibility that A is a knight; this is the statement that p is true. If A is a knight, then he is telling the truth when he says that B is a knight, so that q is true, and A and B are the same type. However, if B is a knight, then B's statement that A and B are of opposite types, the statement $(p \wedge \neg q) \vee (\neg p \wedge q)$, would have to be true, which it is not, because A and B are both knights. Consequently, we can conclude that A is not a knight, that is, that p is false.
If A is a knave, then because everything a knave says is false, A's statement that B is a knight, that is, that q is true, is a lie. This means that q is false and B is also a knave. Furthermore, if B is a knave, then B's statement that A and B are opposite types is a lie, which is consistent with both A and B being knaves.

We can conclude that both A and B are knaves.

# SOMETHING MORE INTERESTING

**This is a famous logic puzzle, attributed to Albert Einstein, and known as the zebra puzzle. Wikipedia says that only 2% of the world population is able to solve it.**

**Five men with different nationalities and with different jobs live in consecutive houses on a street. These houses are painted different colour. The men have different pets and have different favorite drinks. Determine who owns a zebra and whose favorite drink is mineral water (which is one of the favorite drinks) given these clues:**

1. The Englishman lives in the red house.
2. The Spaniard owns a dog.
3. The Japanese man is a painter.
4. The Italian drinks tea.
5. The Norwegian lives in the first house on the left.
6. The green house is immediately to the right of the white one.
7. The photographer breeds snails.
8. The diplomat lives in the yellow house.
9. Milk is drunk in the middle house.
10. The owner of the green house drinks coffee.
11. The Norwegian's house is next to the blue one.
12. The violinist drinks orange juice.
13. The fox is in a house next to that of the physician.
14. The horse is in a house next to that of the diplomat.

**[Hint:** Make a table where the rows represent the men and columns represent the colour of their houses, their jobs, their pets, and their favorite drinks and use logical reasoning to determine the correct entries in the table**.]**

**There are many similar problems in the name of Zebra Puzzle and everything have to be solved by similar approach.**

**(Refer: Discrete mathematics and its applications by Kenneth H. Rosen)**

# The Brain Bucket

Our student team, Brain Bucket wins the European Urban Mobility Hackathon 2021.

Amrita Students, Gokul Raj J, VSSK Chaitanya, Bavesh Ram S, and Darshan M from our School of Engineering, Coimbatore campus are the team that also had a string of super successes in 2020. This year they won the Urban Mobility Hackathon 2021 organized by the City of Riga, funded by the European Institute of Innovation and Technology (EIT) Urban Mobility, an initiative of the European Union.

This global hackathon was held virtually from 15 to 17 April, 2021 and had a prize money of 3000 Euros. The focus of EIT Urban Mobility is to accelerate positive change on mobility to make urban spaces more livable. The student team presented a Smart head gear that can be built on a modular approach based on requirements which can be used by Two-wheeler Delivery Personnel in gig economy, motorcycle users, cyclists and children hoping to bring about an improvement in general road behavior and safety.


Congratulations Gokul Raj J, VSSK Chaitanya, Bavesh Ram S, Darshan M and faculty mentor Dr. Prashant R Nair.

**AMRITA VISHWA VIDYAPEETHAM, AMRITA SCHOOL OF ENGINEERING, COIMBATORE**

**DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING**

**B.Tech CSE - (2017 - 2021) Batch**

# "Outstanding Project Award"

| Student Roll no | Name | Project Title | Guide Name |
|---|---|---|---|
| CB.EN.U4CSE17201 | Addala Srikantha Namratha | Flowgramming | Mr. Ritwik M |
| CB.EN.U4CSE17114 | Gali Mary Sanjana | | |
| CB.EN.U4CSE17651 | Rajkumar S | | |
| CB.EN.U4CSE17430 | Kiran S Raj | AI based Segmented Anomaly Detection | Dr. Priyanka Kumar |
| CB.EN.U4CSE17421 | G. Ravikumar | | |
| CB.EN.U4CSE17326 | Indra Kumar V | | |
| CB.EN.U4CSE17113 | G Dinesh Balaji | Sentiment analysis of Vaccination for COVID 19 | Dr.Bagavathi Sivakumar.P. |
| CB.EN.U4CSE17154 | K.V.Sreenivas Prasad | | |
| CB.EN.U4CSE17211 | Asritha Cherukuri | | |
| CB.EN.U4CSE17411 | Choda Naga Srinivasa Varun | | |
| CB.EN.U4CSE17123 | R Kailash | Distributed Facility Location for Vaccine Distribution | Dr.Vidhya Balasubramanian |
| CB.EN.U4CSE17136 | Nithish C | | |
| CB.EN.U4CSE17152 | Singam Sai Manu | | |
| CB.EN.U4CSE17155 | Sreeramji K S | | |

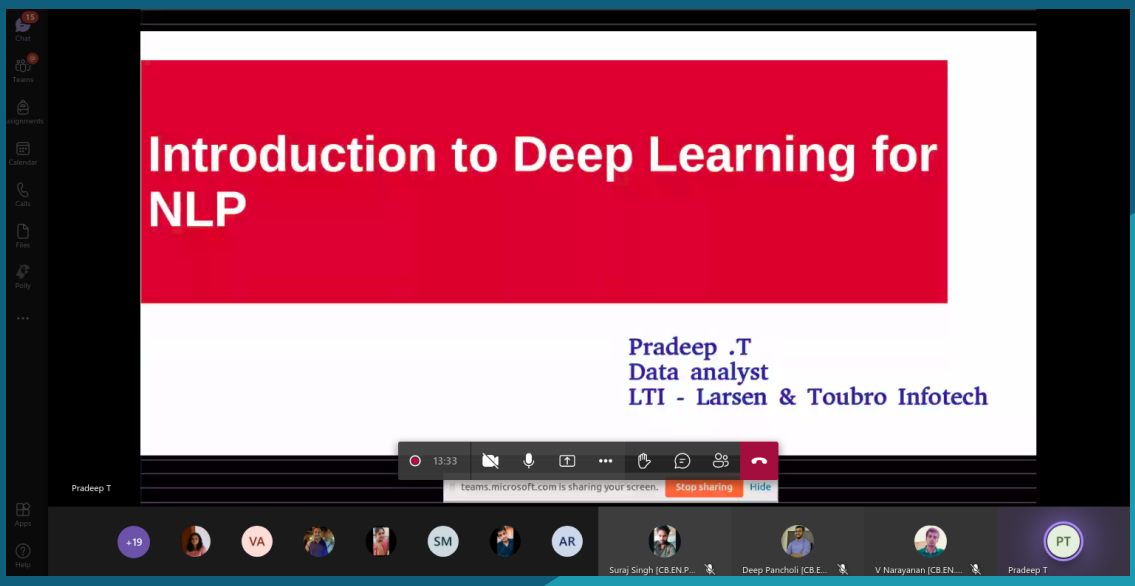
| | | | |
|---|---|---|---|
| CB.EN.U4CSE17140 | Prashanth S. | Body Weight Estimation using 2D Body Images | Ms R. Aarthi |
| CB.EN.U4CSE17129 | K. Sai Trinadh | | |
| CB.EN.U4CSE17158 | T.S.S Bharadwaj | | |
| CB.EN.U4CSE17109 | Lokesh Varma | | |
| CB.EN.U4CSE17035 | Konjeti B V N S Sumanth | Modernized Recognition, Evaluation System and Resemblance of Image using NLP, Image Processing and Facial Recognition | Dr G. Jeyakumar |
| CB.EN.U4CSE17068 | Sriram | | |
| CB.EN.U4CSE17642 | Nagarjuna G | | |
| CB.EN.U4CSE17015 | Avinash | | |

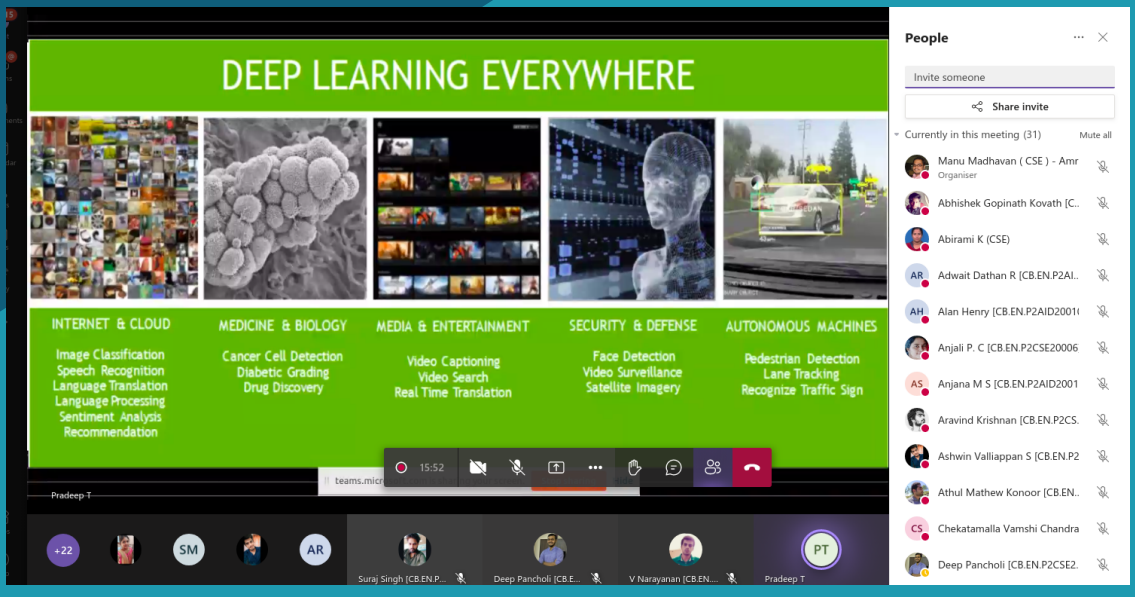
On behalf of the department of Computer Science, we congratulate the student teams and the project guides for their wonderful team work.

AMRITA SCHOOL OF ENGINEERING
DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

# WORKSHOP ON INTRODUCTION TO DEEP LEARNING FOR NATURAL LANGUAGE PROCESSING

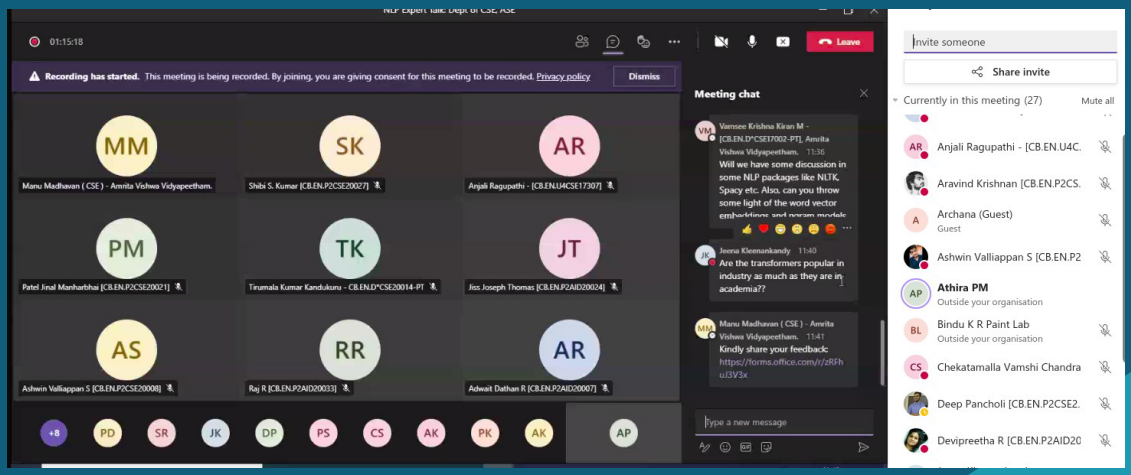
As part of the M.Tech course 19AI705/18CSE704 Natural Language Prcessing, Dept of CSE organized an online workshop, Introduction to Deep Learning for Natural Language Processing on 26th April 2021, 7:00-9:00PM through Microsoft Teams. Mr. Pradeep T, senior data analyst at L&T Infotech was the resource person. The workshop covered basics of deep learning, various DL models and demonstrated the used of these models for text classification task. The workshop was attended by M.Tech students and faculty members of CSE.

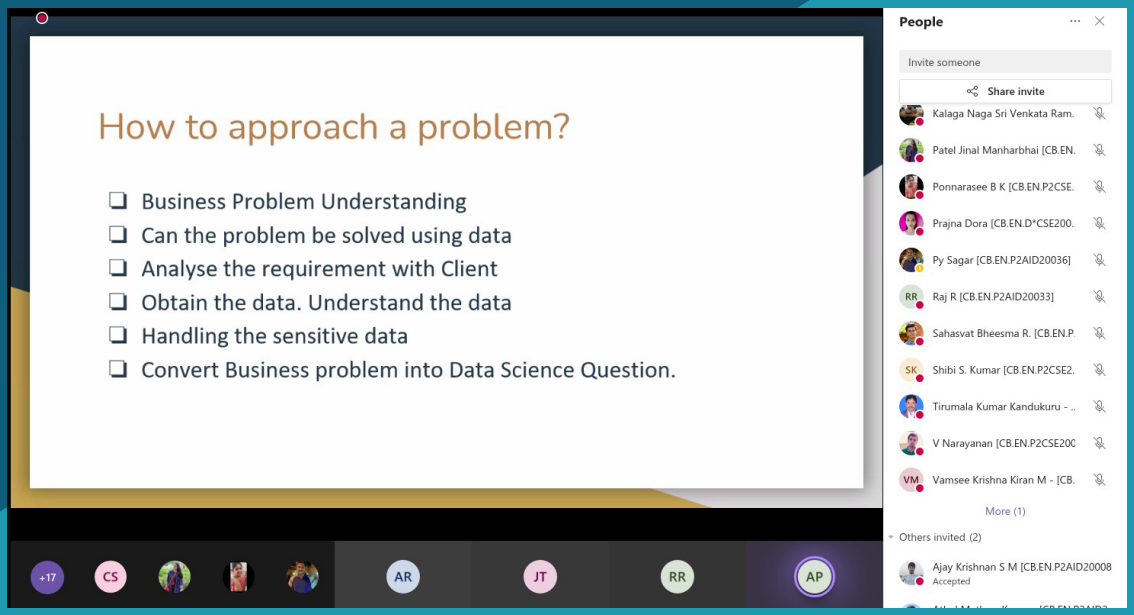


# NLP EXPERT TALK - REPORT

As part of the M.Tech course 19AI705/18CSE704 Natural Language Processing, Dept of CSE organized an expert talk on NLP Project: From ideation to Production was conducted on 29th May 2021, 10:30-11:30 PM through Microsoft Teams. Ms. Athira P M, senior ML/DL Engineer at Integra Software Solutions, Chennai was the resource person. The talk discussed industrial perspectives of NLP based projects in various stages of development, from requirement analysis to deployment. The workshop was attended by M.Tech, B.Tech students, research scholars and faculty
members of CSE.



# NEW FACULTY IN DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

**Dr.Manu Madhavan**

**Short Biography:**

Dr.Manu Madhavan currently serves as Assistant Professor at the Department of Computer Science & Engineering, School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore Campus. He completed his Ph.D. from the Department of Computer Science and Engineering, National Institue of Technology Calicut.

**https://www.amrita.edu/faculty/m-manu**

**Dr.Rimjhim Padam Singh**

**Short Biography:**

Dr.Rimjhim Padam Singh currently serves as an Assistant Professor (Sr. Gr.) in the Department of Computer Science, Amrita School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore. She did her doctoral thesis on A Light-weight Sample Consensus Based Approach for Efficient Change Detection in Video Sequence Images at Visvesvaraya National Institute of Technology, Nagpur and received her Ph.D degree in 2021. She received her B. Tech and M.Tech Degree from RTM Nagpur University in 2013 and 2015 respectively. Her research areas include image and video processing, motion analysis and text mining.

**https://www.amrita.edu/faculty/rimjhim-padam-singh**

**Dr. M. Anbazhagan**

**Short Biography:**

Dr. M. Anbazhagan is an Assistant Professor in the Department of Computer Science and Engineering at Amrita School of Engineering, Amrita Vishwa Vidyapeetham University – Coimbatore. He graduated with both his Under-Graduation and Post-Graduation in Computer Science and Engineering from Anna University. He received his Ph.D. from the National Institute of Technology, Tiruchirappalli. Recommender Systems, Machine Learning, and Deep Learning are his current research areas of interest.

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**Ms. Neethu M R**

**Short Biography:**

Neethu M R , currently serving as Faculty associate in the department of Computer Science and Engineering, School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore. She received her B.Tech in Computer Science and Engineering from University of Calicut (Jawaharlal College of engineering and technology, Lakkidi, Palakkad). And she completed her M.Tech in Computer Science and Engineering from School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore. She is currently pursuing her PhD in Computer Science and Engineering from School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore. Her areas of research include Information security, Machine learning and Block chain.

**https://www.amrita.edu/faculty/neethu-nr**

**Dr. R. Krishankumar**

**Short Biography:**

Dr. R. Krishankumar currently serves as Assistant Professor in the Department of Computer Science and Engineering, Amrita School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore. Prior to this, he served as a research fellow in the junior and senior grade by acquiring funds from University Grants Commission India. He completed his UG and Ph.D. in 2014 and 2020, respectively. His research interest includes multi-criteria decision-making and soft computing. He has published papers in SCIE indexed journals with Q1/Q2 ranks.

**https://www.amrita.edu/faculty/r-krishankumar**

**Ms. Deepika T.**

**Short Biography:**

Deepika T. currently serves as Faculty Associate at the Department of Computer Science and Engineering, School of Engineering, Amrita Vishwa Vidyapeetham, Coimbatore. She received her B. Tech (Information Technology) from PSNA College of Engineering and Technology, Dindigul, and M.E degree (Computer Science and Engineering) from RVS College of Engineering and Technology, Dindigul. She is currently pursuing a doctoral study in Computer Science and Engineering, Amrita School of Engineering, Coimbatore. Her research area includes Cloud Computing and Machine Learning.

**https://www.amrita.edu/faculty/t-deepika**

**Assistant Professor Jeena Kleenankandy**

**Short Biography:**

Ms. Jeena Kleenankandy is a Faculty Associate in the Department of Computer Science and Engineering at Amrita School of Engineering, Amrita Vishwa Vidyapeetham University – Coimbatore. She has completed her research work under Dr. K A Abdul Nazeer in the Department of Computer Science and Engineering, NIT Calicut and is waiting for her final examination. Her current research interest is in Deep Learning and Natural Language Processing focusing on its application in various cross-domains.

**https://www.amrita.edu/faculty/jeena-kleenankandy**

**Ms. Aswathi T**

**Short Biography:**

Aswathi T. is an Assistant Professor in the Department of Computer Science and Engineering at Amrita School of Engineering, Amrita Vishwa Vidyapeetham University – Coimbatore. She graduated with Post-Graduation in Computer Science and Communication Engineering from VIT University Vellore and Under-Graduation in Computer science and Engineering form University of Calicut. She is pursuing her Ph.D. from the Amrita Vishwa Vidyapeetham University – Coimbatore. Her research area of interest includes Machine learning, Deep Learning, and Medical image processing.

**https://www.amrita.edu/faculty/aswathi-t**

# Team at work :

## Faculty coordinators

- Dr. D. Venkataraman
- Mrs. T. Bagyammal
- Ms. Jeena

## ASCII executive members

- Sai Priyadarshini, CB.EN.U4CSE17250 (IV Year)
- Adithi Narayanan, CB.EN.U4CSE18205 (III Year)
- Roopa Vidhya, CB.EN.U4CSE18143 (III Year)
- Nirmal K, CB.EN.U4CSE19038 (II Year)
- Sumithra S, CB.EN.U4CSE19247 (II Year)
- Mahima Lolla, CB.EN.U4CSE19128 (II Year)
- Varadharajan K, CB.EN.U4CSE19257 (II Year)

## Editors: (CSE D II Year)

- Soorya S, CB.EN.U4CSE19352
- V.Nithin Krishna, CB.EN.U4CSE19360
- Pavani G, CB.EN.U4CSE19344