Dr. MAHALINGAM COLLEGE OF ENGINEERING AND TECHNOLOGY
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Udumalai Road, Pollachi - 642 003. Tamilnadu.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

DIGIFLASH PROUDLY PRESENTS

DIGITIMES

2019 - 2020 ISSUE 1

NOVEMBER, 2019

VISION OF THE DEPARTMENT

To develop engineers with global employability, entrepreneurship capability, research focus and social responsibility

MISSION OF THE DEPARTMENT

- To develop internationally competent engineers in dynamic IT field by providing state-of-art academic environment and industry driven curriculum.
- To motivate and guide students to take up higher studies and establish entrepreneurial ventures.
- To enrich the department through committed and technically sound faculty team with research focus in thrust areas.
- To undertake societal problems and provide solutions through technical innovations and projects in association with the industry, society and professional bodies.

Programme Educational Objectives (PEOs)

PEO 1: Domain Expertise - Possess expertise and emerge as key players in IT integrated domains.

PEO 2: Computing Skills and Ethics - Employ computing skills to solve societal and environmental issues in an ethical manner.

PEO 3: Lifelong Learning and Research - Involve in lifelong learning and research to meet the demands of global technology.

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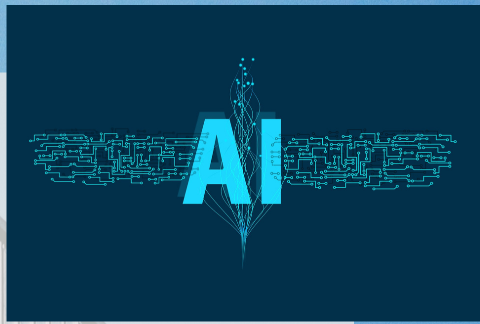
ARTIFICIAL INTELLIGENCE



Priyadharshini K   16BCS001

Machine code that mimics human and animal intelligence is at the heart of artificial intelligence (AI). Professionals in artificial intelligence (AI) create algorithms and programme machines to do human-like activities. Artificial intelligence (AI) is already widely used to detect credit card fraud, identify disease outbreaks, and improve satellite navigation. The Institute of Electrical and Electronics Engineers Computer Society forecasts that numerous AI concepts will be extensively implemented in 2021 in their annual technology prediction report. Reliability and safety for intelligent autonomous systems, AI for digital manufacturing, and trustworthy and explainable AI and machine learning are all purported AI breakthroughs.

As of 2020, computer and information research scientists earned median annual pay of $126,830, with the Bureau of Labor Statistics expecting much faster-than-average growth for the profession from 2019 through 2029. Machine learning engineers make an average yearly pay of $112,840, according to PayScale, with late-career professionals earning an average annual salary of $162,000 as of June 2021.

Career Opportunities

* Machine Learning Engineer
* Senior Data Scientist
* Artificial Intelligence/Machine Learning ·Research Scientist
* Deep Learning Engineer
* Algorithm Engineer

EDGE COMPUTING

Ajith Kumar N 17BCS017

In contrast to cloud computing, which processes and stores data in massive data centres far away from the end user, edge computing keeps computer data close to the user. Experts predict that the cloud will not totally disappear, but rather will coexist with edge computing as it puts processing closer to consumers, speeding everything from factory output to self-driving car reaction.

Edge computing is used in technologies such as autonomous vehicles, video conferencing, and augmented reality.

Edge computing, for example, reduces the delay of waiting for a server in the cloud to respond when an autonomous car makes a split-second choice to brake and avoid a collision.

Software engineers, especially edge computing software developers, are expected to expand by 22% between 2019 and 2029, according to the BLS, with a median annual pay of $110,140 in 2020. Workers with edge computing skills are employed in industries such as telecommunications, security, and oil and gas.

Career Opportunities

* Edge Computing Specialist
* Software Developer
* Application Developer
* Computer Network Architect ·Computer Systems Analyst

QUANTUM COMPUTING

Aishvarya B 16BCS059

Quantum computing makes use of high-performance computers to address issues at the atomic and subatomic levels. Quantum computers, unlike traditional computers, use quantum bits, also known as qubits, to execute calculations and store data. Quantum computers can now crunch data and solve problems considerably faster than they could before. While big tech companies like Google and IBM are making progress in quantum computing, the field is still in its early stages. Banking, transportation, and agriculture are some of the other areas that could profit from quantum computing.

Quantum computing could be used to locate the most effective truck delivery routes, establish the most efficient flight schedule for an airport, or quickly and cheaply produce novel treatments. Quantum computing holds promise for developing sustainable technology and solving environmental issues, according to scientists. A master's or doctoral degree is commonly required for quantum computing jobs. Quantum computing workers can earn up to $160,000 per year, according to ZipRecruiter, with an average yearly pay of $96,900 as of May 2021. Many potential quantum computing jobs may not yet exist because quantum computing is a new computer science expertise.

Career Opportunities

* Quantum Computer Architect
* Quantum Software Developer
* Quantum Algorithm Researcher
* Quantum Computer Research Scientist

ROBOTICS

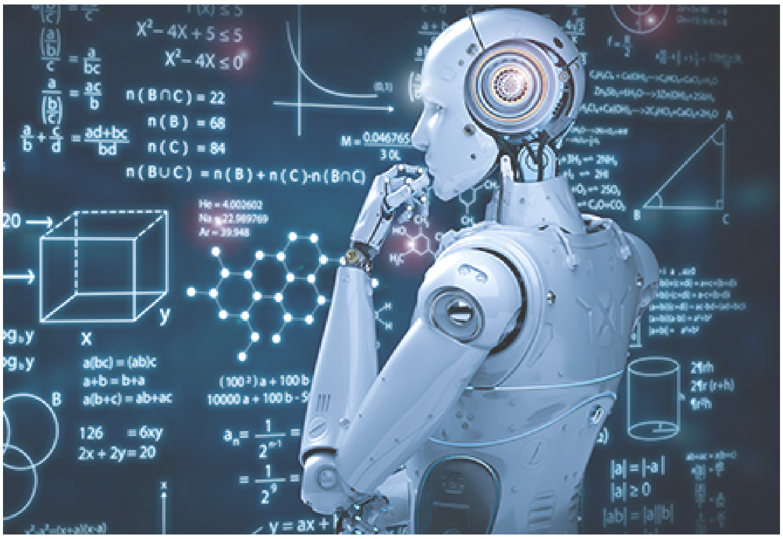
Kayalvizhi V 16BCS085

Robotics is a field that studies and develops robots in order to make life easier. Robotics is a multidisciplinary field that includes computer science, electrical engineering, and mechanical engineering. Artificial intelligence, machine learning, and other computer science technologies are used in robotics. In industries such as manufacturing, farming, and food preparation, robots attempt to improve safety and efficiency.

Robotics are used to build cars, do dangerous activities such as bomb dispersal, and perform intricate procedures.

Career Opportunities

* Robotics Engineer
* Algorithm Engineer
* Robotics Research Scientist
* Software Engineer
* Data Scientist



CYBER SECURITY

Aishvarya B 16BCS059

Cyber security is concerned with preventing cyber threats and attacks on computer systems and networks. As businesses continue to store data in the cloud and conduct business online, the need for better protection grows. Cyber attacks cause enormous financial losses to individuals, corporations, and governments. The Colonial Pipeline, for example, lost $5 million in May 2021 due to a ransomware attack in the eastern United States, which resulted in higher gas costs for consumers.

Cyber security experts work for consulting firms, computer firms, businesses and financial institutions. Apple, Lockheed Martin, and Capital One are among the major employers. A bachelor's degree is required for the finest cybersecurity employment; however, some firms prefer a master's degree.

Career Opportunities

* Information Security Analyst
* Chief Information Security Officer
* Information Security Consultant

BIO-INFORMATICS

Saranya S 17BCS029

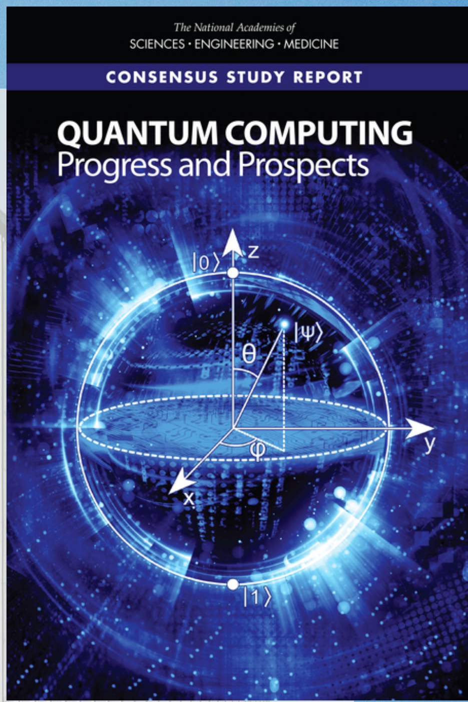
Professionals in bioinformatics examine, preserve, and analyse biological data. Bioinformatics is a multidisciplinary discipline that combines computer science and biology to hunt for patterns in genetic material such as DNA, genes, RNA, and protein sequences. Bioinformatics professionals create the methodologies and software tools that enable these activities to be completed. Bioinformatics computer science technologies serve the medical and pharmaceutical, industrial, environmental/government, and information technology industries considerably.

Bioinformatics aids doctors in preventative and precision medicine by allowing them to detect ailments early and treat them more effectively. The Bureau of Land Management, the Department of Defense, hospitals, and research institutes are all major employers of bioinformatics experts. A bachelor's degree is required for bioinformatics occupations. A master's or PhD may be required for administrative, teaching, or supervising employees.

Career Opportunities

* Bioinformatics Research Scientist
* Bioinformatics Engineer
* Biomedical Researcher
* Bioengineer/Biomedical Engineer
* Biostatistician
* Biologist
* Computational Biologist
* Agriculturalist
* Software Programmer
* Data Scientist

QUANTUM ALGORITHMS CONQUER A NEW KIND OF PROBLEM



Sridhar M 16BCS008

In 1994, a mathematician figured out how to make a quantum computer do something that no ordinary classical computer could. The work revealed that, in principle, a machine based on the rules of quantum mechanics could efficiently break a large number into its prime factors a task so difficult for a classical computer that it forms the basis for much of today's internet security.

A surge of optimism followed. Perhaps, researchers thought, we'll be able to invent quantum algorithms that can solve a huge range of different problems. But progress stalled. "It's been a bit of a bummer trajectory," said Ryan O'Donnell of Carnegie Mellon University. "People were like, 'This is amazing, I'm sure we're going to get all sorts of other amazing algorithms.' Nope." Scientists discovered dramatic speedups only for a single, narrow class of problems from within a standard set called NP, meaning they had efficiently verifiable solutions — such as factoring.

That was the case for nearly three decades. Then in April, researchers invented a fundamentally new kind of problem that the quantum computer should be able to solve exponentially faster than a classical one. It involves calculating the inputs to a complicated mathematical process, based solely on its jumbled outputs. Whether the problem stands alone or is the first in a new frontier of many others has yet to be determined."There is a sense of excitement," a computer scientist at the Massachusetts Institute of Technology. "A lot of people are thinking about what else is out there."

Computer scientists try to understand what quantum computers do better by studying mathematical models that represent them. Often, they imagine a model of a quantum or classical computer paired with an idealized calculating machine called an oracle. Oracles are like simple mathematical functions or computer programs, taking in input and spitting out a predetermined output. They might have a random behaviour, outputting "yes" if the input falls within a certain random range (say, 12 to 67) and "no" if it doesn't. Or they might be periodic, so that an input between 1 to 10 returns "yes," 11 to 20 yields "no," 21 to 30 produces "yes" again, and so on.

Let's say you have one of these periodic oracles and you don't know the period. All you can do is feed it numbers and see what it outputs. With those constraints, how fast could a computer find the period? In 1993, Daniel Simon, then at the University of Montreal, found that a quantum algorithm could calculate the answer to a closely related problem exponentially faster than any classical algorithm.

The result enabled Simon to determine one of the first hints of where dramatic superiority for quantum computers could be expected. But when he submitted his paper to a leading conference, it was rejected. The paper did, however, interest a junior member of the conference's program committee Peter Shor, who at the time was at Bell Laboratories in New Jersey. Shor went on to find that he could adapt Simon's algorithm to calculate the period of an oracle if it had one. Then he realized he could adapt the algorithm once again, to solve an equation that behaves similarly to a periodic oracle: the equation that describes factoring, which is periodic.

Shor's result was historic. The quantum algorithm he discovered could rapidly reduce gigantic numbers into their constituent prime factors, something that no known classical algorithm can do. In the years that followed, researchers discovered other efficient quantum algorithms. Some of them, like Shor's algorithm, even provided an exponential advantage, but no one could prove a dramatic quantum advantage on any NP problem that wasn't periodic.

This dearth of progress led two computer scientists, Scott Aaronson of the University of Texas, Austin, and Andris Ambainis of the University of Latvia, to make an observation. Proofs of quantum advantage always seemed dependent on oracles that had some kind of nonrandom structure, such as periodicity. In 2009, they conjectured that there couldn’t be dramatic speedups on NP problems that were random, or unstructured. No one could find an exception.

Their conjecture put a bound on the powers of quantum computers. But it said only that there were no dramatic speedups for a specific type of unstructured NP problem those with yes or no answers. If a problem involved figuring out more specific, quantitative answers, which is known as a search problem, the conjecture didn’t apply. With that in mind, researchers Takashi Yamakawa of NTT Social Informatics Laboratories and Mark Zhandry of NTT Research and Princeton University decided to experiment with a specific search problem, introduced in 2005 by Oded Regev.

Imagine a set of weather vanes that are all pointing in the same direction. Give each of them a measured shove, then let a gusty wind influence their direction. Regev wanted to determine, based on their final directions, where they all pointed initially. Problems like this came to be called “learning with errors,” because the shove and the wind act like a source of random error in the original direction. There is evidence that it is hard to solve for both classical and quantum algorithms.

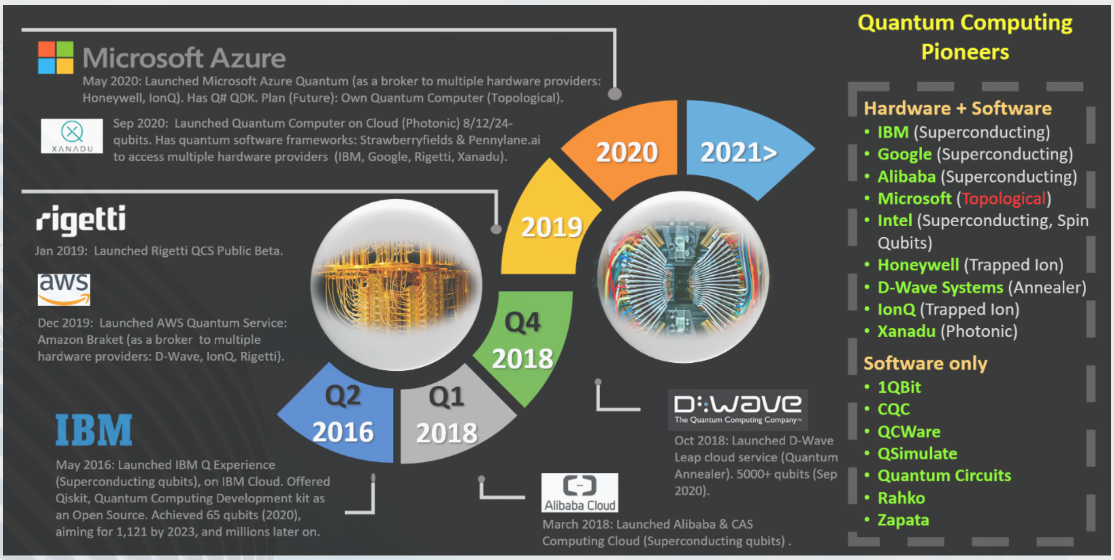
Yamakawa and Zhandry tweaked the setup. They modified the strength of those starting shoves, making them more predictable. They also caused the wind to be determined by a random oracle so that it was even more random in certain cases but completely dormant in others.

With these modifications, the researchers discovered that a quantum algorithm could efficiently find the initial direction. They also proved that any classical algorithm must be slower by an exponential factor. Like Shor, they then adapted their algorithm to solve a real-world version of the problem, which replaces the oracle with an actual mathematical equation.

Computer scientists are still working to understand and build on the problem. Vaikuntanathan compares it to a different one that arises when doing data compression: When information is being squeezed down, two bits can accidentally be squeezed into the same place, overwriting them. The problem of predicting those collisions in advance, so that you can avoid them, bears some resemblance. “That’s a class of problems which look like this,” he said. “Maybe these problems can be solved quantumly.”

There were hopes that an unstructured problem like the new one might be solvable even on today’s fledgling versions of quantum computers, thereby providing a means to test them. The thinking was that unstructured problems might take fewer resources to the program, or be less sensitive to noise since they are already random. But so far, the new problem still appears too advanced for existing quantum computers to solve. “It’s a weird problem. I had not thought to define it,” said Aaronson. “But in retrospect, it has some very nice features.”

The result provides the first example of dramatic quantum advantage on an unstructured NP problem. Could there be many other problems that the quantum world changes from practically unsolvable to solvable? There is no more reason to think so. “It’s somewhat overturned our beliefs about what kinds of problems quantum computers could be good at,” said O’Donnell.



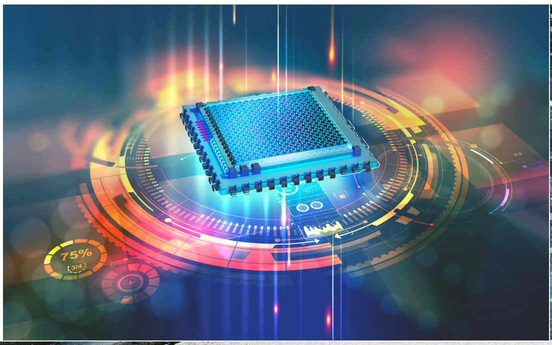
VIRTUAL WORLDS & AI LEARNS

Nandhini V 16BCS042

In 2009, a computer scientist then at Princeton University named Fei-Fei Li invented a data set that would change the history of artificial intelligence. Known as ImageNet, the data set included millions of labelled images that could train sophisticated machine-learning models to recognize something in a picture. The machines surpassed human recognition abilities in 2015. Soon after, Li began looking for what she called another of the "North Stars" that would give AI a different push toward true intelligence.

She found inspiration by looking back in time over 530 million years to the Cambrian explosion when numerous animal species appeared for the first time. An influential theory posits that the burst of new species was driven in part by the emergence of eyes that could see the world around them for the first time. I realized that vision in animals never occurs by itself but instead is "deeply embedded in a holistic body that needs to move, navigate, survive, manipulate and change in the rapidly changing environment," she said. "That's why it was very natural for me to pivot towards a more active vision [for AI]."

Today, Li's work focuses on AI agents that don't simply accept static images from a data set but can move around and interact with their environments in simulations of three-dimensional virtual worlds.



This is the broad goal of a new field known as embodied AI, and Li's not the only one embracing it. It overlaps with robotics, since robots can be the physical equivalent of embodied AI agents in the real world, and reinforcement learning has always trained an interactive agent to learn using long-term rewards as an incentive. But Li and others think embodied AI could power a major shift from machines learning straightforward abilities, like recognizing images, to learning how to perform complex humanlike tasks with multiple steps, such as making an omelette.

"Naturally, we get more ambitious, and we say, 'Okay, how about building an intelligent agent?' And at that point, you're going to think of embodied AI," said Jitendra Malik, a computer scientist at the University of California, Berkeley.

Work in embodied AI today includes any agent that can probe and change its environment. While in robotics the AI agent always lives in a robotic body, modern agents in realistic simulations may have a virtual body, or they may sense the world through a moving camera vantage point that can still interact with their surroundings. "The meaning of embodiment is not the body itself, it is the holistic need and functionality of interacting and doing things with your environment," said Li.

This interactivity gives agents a whole new and in many cases, better — way of learning about the world. It's the difference between observing a possible relationship between two objects and being the one to experiment and cause the relationship to happen yourself.

Armed with this new understanding, the thinking goes, and greater intelligence will follow. And with a suite of new virtual worlds up and running, embodied AI agents have already begun to deliver on this potential, making significant progress in their new environments.

"Right now, we don't have any proof of intelligence that exists that is not learning through interacting with the world," said Viviane Clay, an embodied AI researcher at the University of Osnabrück in Germany.

DEEP LEARNING

Varshni N 18BCS022

For more than 250 years, mathematicians have been trying to “blow up” some of the most important equations in physics: those that describe how fluids flow. If they succeed, then they will have discovered a scenario in which those equations break down a vortex that spins infinitely fast, perhaps, or a current that abruptly stops and starts, or a particle that whips past its neighbours infinitely quickly. Beyond that point of blowing up the “singularity”, the equations will no longer have solutions. They will fail to describe even an idealized version of the world we live in, and mathematicians will have reason to wonder just how universally dependable they are as models of fluid behaviour.

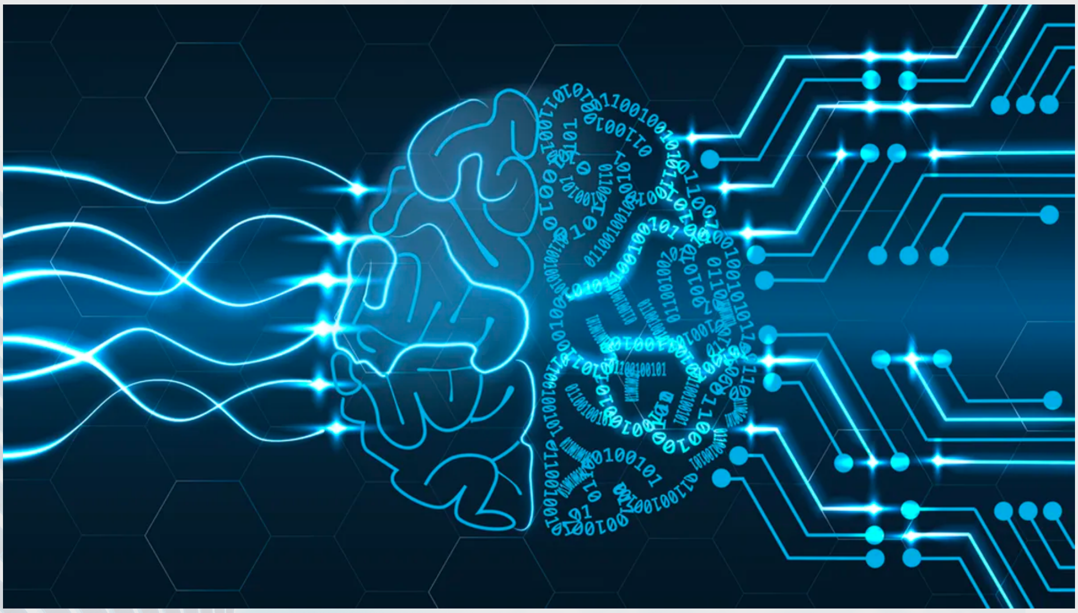
But singularities can be as slippery as the fluids they’re meant to describe. To find one, mathematicians often take the equations that govern fluid flow, feed them into a computer, and run digital simulations. They start with a set of initial conditions, then watch until the value of some quantity velocity, say, or vorticity (a measure of rotation) begins to grow wildly, seemingly on track to blow up.

Yet computers can’t definitively spot a singularity, for the simple reason that they cannot work with infinite values. If a singularity exists, computer models might get close to the point where the equations blow up, but they can never see it directly. Indeed, apparent singularities have vanished when probed with more powerful computational methods.

Such approximations are still important, however. With one in hand, mathematicians can use a technique called computer-assisted proof to show that a true singularity exists close by. They've already done it for a simplified, one-dimensional version of the problem.

Now, in a preprint posted online earlier this year, a team of mathematicians and geoscientists has uncovered an entirely new way to approximate singularities one that harnesses a recently developed form of deep learning. Using this approach, they were able to peer at the singularity directly. They are also using it to search for singularities that have eluded traditional methods, in hopes of showing that the equations aren't as infallible as they might seem.

The work has launched a race to blow up the fluid equations: on one side, the deep learning team; on the other, mathematicians who have been working with more established techniques for years. Regardless of who might win the race if anyone is indeed able to reach the finish line the result showcases how neural networks could help transform the search for new solutions to scores of different problems.



NEURAL NETWORKS

Abirami S 18BCS028

In the winter of 2011, Daniel Yamins, a postdoctoral researcher in computational neuroscience at the Massachusetts Institute of Technology, would at times toil past midnight on his machine vision project. He was painstakingly designing a system that could recognize objects in pictures, regardless of variations in size, position and other properties something that humans do with ease. The system was a deep neural network, a type of computational device inspired by the neurological wiring of living brains.

"I remember very distinctly the time when we found a neural network that actually solved the task," he said. It was 2 a.m., a tad too early to wake up his adviser, James DiCarlo, or other colleagues, so an excited Yamins took a walk in the cold Cambridge air. "I was really pumped," he said.

It would have counted as a noteworthy accomplishment in artificial intelligence alone, one of many that would make neural networks the darlings of AI technology over the next few years. But that wasn't the main goal for Yamins and his colleagues. To them and other neuroscientists, this was a pivotal moment in the development of computational models for brain functions.

DiCarlo and Yamins, who now runs his lab at Stanford University, are part of a coterie of neuroscientists using deep neural networks to make sense of the brain's architecture. In particular, scientists have struggled to understand the reasons behind the specializations within the brain for various tasks. They have wondered not just why different parts of the brain do different things, but also why the differences can be so specific: Why, for example, does the brain have an area for recognizing objects in general but also for faces in particular? Deep neural networks are showing that such specializations may be the most efficient way to solve problems.

Similarly, researchers have demonstrated that the deep networks most proficient at classifying speech, music and simulated scents have architectures that seem to parallel the brain's auditory and olfactory systems. Such parallels also show up in deep nets that can look at a 2D scene and infer the underlying properties of the 3D objects within it, which helps to explain how biological perception can be both fast and incredibly rich. All these results hint that the structures of living neural systems embody certain optimal solutions to the tasks they have taken on.

These successes are all the more unexpected given that neuroscientists have long been sceptical of comparisons between brains and deep neural networks, whose workings can be inscrutable. "Honestly, nobody in my lab was doing anything with deep nets [until recently]," said the MIT neuroscientist Nancy Kanwisher. "Now, most of them are training them routinely."

VIRTUAL REALITY

Saparna S 16BCS056

Research shows that virtual tourist can fulfil their travelling experience that is, virtual tourism destinations can give visitors the chance to enhance their perceptions and the virtual world is displayed as a source of useful information.

Tourism planning and management can be benefited from VR technology, as it possesses unique testing capabilities. An understanding of visitors' patterns of space, time, and place is a very important element in developing management plans. 3D visualizations are excellent tools for doing so. Furthermore, as VR technology continues to evolve, the entertainment industry has found a way to make these evolutions very useful by marketing entertaining tourist attractions.

VR technology is initiated for tourists to enhance the experience previews of sites, destinations, and attractions, such as hotels, cruise ships, and similar, as a part of the marketing strategy. A virtual conative image that most often results in potential purchase intention is yielded through Web-mediated virtual information.

A large trend in the sector is identified in provisions of virtual tours as well, including the handling of virtual objects, and a realistic picture of the site. This is most commonly used in heritage areas, hotels, and museums, including the zoo, VR exhibits cultural centres globally, viewing of heritage sites, and so on.

CRYPTO-CURRENCY

Vijayaraj K 16BCS037

A cryptocurrency is a digital currency, which is an alternative form of payment created using encryption algorithms. The use of encryption technologies means that cryptocurrencies function both as a currency and as a virtual accounting system. To use cryptocurrencies, you need a cryptocurrency wallet. These wallets can be software that is a cloud-based service or is stored on your computer or your mobile device.

The wallets are the tool through which you store your encryption keys that confirm your identity and link to your cryptocurrency. Cryptocurrencies run on a distributed public ledger called blockchain, a record of all transactions updated and held by currency holders.

Units of cryptocurrency are created through a process called mining, which involves using computer power to solve complicated mathematical problems that generate coins. Users can also buy the currencies from brokers, and then store and spend them using cryptographic wallets.

If you own cryptocurrency, you don't own anything tangible. What you own is a key that allows you to move a record or a unit of measure from one person to another without a trusted third party.

Although Bitcoin has been around since 2009, cryptocurrencies and applications of blockchain technology are still emerging in financial terms, and more uses are expected in the future. Transactions including bonds, stocks, and other financial assets could eventually be traded using the technology.

Cryptocurrencies are usually built using blockchain technology. Blockchain describes the way transactions are recorded into "blocks" and time stamped. It's a fairly complex, technical process, but the result is a digital ledger of cryptocurrency transactions that's hard for hackers to tamper with.

RIDDLES

1) The more you code, the more of me there is. I may be gone for now but you can't get rid of me forever. What am I?

2) I'm a language for everything yet I have no real identity of my own. Good luck trying to compile me. What am I?

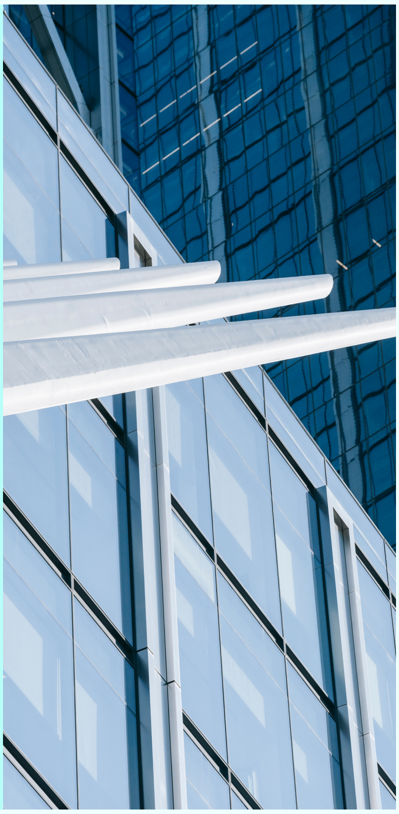
3) As a developer I'm your eyes, showing you the result of your code in your language of choice. What am I?

4) I'm fundamental and used to build larger structures. While you'll find many different kinds of me, we all just mess with information in different ways. What am I??

5) As a developer, you usually get mad at me because I complain a lot, although I'm usually right. What am I?

6) I'm sent before I'm ready, I'll break before you know it and you can't find me many places. What am I?

ANSWERS



- A bug
- A Pseudocode
- A print statement
- A data structure
- A compiler
- A beta release

ABOUT DIGITIMES

DigiFlash is the student association of Computer Science and Engineering Department, MCET, Pollachi. The objective of our association is to innovate, create and sharpen the minds of the students to compete globally. It is a platform to improve the student's knowledge and also create opportunities to interact with leading industry persons. Digiflash is organizing number of Co-Curricular activities including special lectures by Experts, Workshops, Technical Seminars, Coding Events, Paper & Poster Presentations and Webinars. Digitimes is a part of Digiflash. A magazine that features the latest Technological advancements in the field of Computing.

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