AISSMS

INSTITUTE OF INFORMATION TECHNOLOGY

ADDING VALUE TO ENGINEERING

Approved by AICTE New Delhi, Recognized by the Government of Maharashtra
and Affiliated to Savitribai Phule Pune University.
Accredited by NAAC with A grade

NEURA

The Era of Artificial Intelligence

Vision

To create globally recognized AI&DS Engineers for sustainable development.

Mission

To meet the current & future demands of the nation in AI&DS.

To produce high-quality students technically superior, professionally & ethically strong.

To inculcate the interdisciplinary skill set required to fulfill a societal need.

Program Education Objectives (PEOs)

PEO1: Graduates will have the capabilities to apply AI&DS knowledge to develop feasible systems.

PEO2: Graduates will be able to handle the challenges of rapidly changing technology.

PEO3: Equip the graduates with strong technical knowledge, competency in soft skills, lifelong learning skills that allow them to contribute ethically to the need of society.

Program Specific Outcomes (PSOs)

PSO1 Problem Solving and Programming Skills: Graduates will be able to apply the knowledge of Artificial Intelligence and Data Science to enable computers, devices, and robots to perform intellectual tasks.

PSO2 Professional Skills: Graduates will be able to apply the knowledge of artificial intelligence and data Science to multidisciplinary areas to meet the needs of industry and society.

PSO3 Successful Career: Graduates will be able to become entrepreneurs and to pursue higher studies / career in software industries.

Program Outcomes (POs)

Graduates will be able to :

Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems. [Engineering knowledge]

Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences. [Problem analysis]

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. [Design/development of solutions]

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. [Conduct investigations of complex problems]

Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations. [Modern tool usage]

Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues, and the consequent responsibilities relevant to professional engineering practice. [The engineer and society]

Understand the impact of professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development. [Environment and sustainability]

Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice. [Ethics]

Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings. [Individual and team work]

Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and draft effective reports and design documentation, make effective presentations, and give and receive clear instructions. [Communication]

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. [Project management and finance]

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. [Life-long learning]

Message from HoD

This is an exciting period for the newly formed Artificial Intelligence and Data Science profession as the rapidly changing technology creates many opportunities and challenges. Department of Artificial Intelligence and Data Science Engineering is prepared to meet the challenges in shaping the education of the 21st Century by providing unique educational and research opportunities in the forefront of Data Science, Artificial Intelligence, Web Development and many more. The vision of the department is to create globally recognized AI&DS Engineers for sustainable development. While the mission is to meet the current & future demands of the nation in the area of AI&DS and to produce high- quality students technically superior, professionally & ethically strong and to inculcate the interdisciplinary skill set required to fulfill a societal need.

The department is doing relentless efforts for the same. The students are being prepared for the use of conceptual and practical understanding of core domain areas in not just enhanced programming skills disseminating their analytical abilities but also practically everything that revolves around data concept. Our aim is to provide our students the lifelong learning skills that enable them to grow in their professions and advance to positions of responsibility by effective Industry-Institute Interaction. As the department works diligently to realize its mission of providing the best learning, teaching and research opportunities to students and academicians alike, it continues to supply students with the basics of modern knowledge and high values.The research activities of our faculty lead to an extraordinary enrichment of the experience of our students that is realized at undergraduate levels. The research training provided to our undergraduate students creates the next generation of scholars well-prepared to advance knowledge and transfer technology. The extension of research opportunities to an ever- increasing group of undergraduate students adds a dimension of experience to the undergraduate education that simply cannot be duplicated in the classroom.

Our students learn the joy as well as the rigours of new discovery, and acquire skills of inquiry, evaluation, and communication that provide a foundation for the next phases of their careers and lives. Amongst students' creativity, collective work and competition domestically, regionally and internationally thrive. I would ask you to take advantage of this great opportunity and join us in our endeavor to actively contribute to the overall improvement of this increasingly globalized society.

Dr. Suresh Limkar
Head of Department
Artificial Intelligence and Data Science Branch

Message from Faculty Coordinator

“I am very happy to present you to our 1st Departmental Neura 2021-22 technical magazine. It provides opportunity & platform for the young students to show their talent which can be beneficial to any other to boost their technical knowledge. Students get inspired to do study on latest technology in IT field before submitting their articles.

I would like to thank Principal Sir Dr.P.B.Mane & HoD Sir Dr S.V.Limkar for their support encouraging us to represent a such wonderful magazine. Special thanks to Technical team to passionate and valuable involvement in making of this magazine. I congratulate all the participants for sharing their articles in the magazine.”

Mrs. Pooja Bhondve
Assistant Professor
Artificial Intelligence and Data Science Department

Message from the Editors

“We being the students of AI and Data Science are lucky to not only witness, but also actively participate and contribute to this AI based technological revolution.
It gives me immense pleasure to bring to you the first ever edition of NEURA, the official technical magazine of Artificial Intelligence and Data Science Department.

The word ‘neura’ has been derived from neural networks, the core building blocks which enable self aware, evolutionary and intelligent behaviour in living beings, and in today’s day and age, even in computers!”

Atharva Taras
Editor - Design and Media
S.E. Artificial Intelligence and Data Science

“We have perspired to create the first issue of the official technical magazine of the department Artificial Intelligence and Data Science.

It marks the beginning of large scale sophistication and evolution of high scale self-awareness. It marks the transcendence of new generation of technology, which provides immense growth in socialization, providing economical and social growth.”

Presenting NEURA

Aditya Patil
Co Editor - Documentation
S.E. Artificial Intelligence and Data Science

IN THIS ISSUE

IOT (Internet of Things) In Healthcare

The Indian healthcare landscape has witnessed growth in recent years, with the country lagging in numerous health indicators. Currently the world's second most populous country, India accounts for 20% of the global disease burden with a high infant mortality rate of 40 deaths per 1,000 live births and maternal mortality rate of 174 deaths per 1 lakh live births.

The impediments to the healthcare system's growth include an ageing and burgeoning population, a lack of adequate infrastructure and shortage of medical professionals, poor accessibility to quality healthcare in remote and rural areas, increasing incidence of chronic disease and rising cost of care.

The Internet of Things (IoT) enabled connectivity has the potential to catapult this ailing healthcare system into an integrated, efficient, and patient-centric system.

This will help in changing the current focus of curative care to wellness and wellbeing, thereby reducing the burden of healthcare cost through holistic measures.

With the integration of medical "things" — devices, smart sensors, mHealth apps, artificial intelligence (AI), etc. — via the Internet, the possibilities are endless.

To mention a few, IoT is being used to track the progression and treatment of diseases, to monitor patients' health conditions and accordingly alter their medication levels, to track medicines usage data to ensure adherence to treatment plans, and to provide real-time information on symptoms.

Data to predict and avert health complications, enabling healthcare providers to readily devise personalized and preventive health care solutions, optimally use medical procedures and drugs, and provide optimal treatment during illness.

The healthcare space in India is conducive to the adoption of IoT, with factors that support and facilitate IOT implementation in healthcare. These include a talent pool of doctors, scientists, mathematicians, engineers, and usability designers converging to achieve improved health outcomes for citizens.

The use of electronic health records (EHRs) is also gaining momentum. Smart watches, fitness bands, monitoring patches, and heart rhythm detectors are examples of IoT-enabled devices that already exist to capture and monitor healthcare data.

Along with these favorable advances, however, there are certain challenges in adopting IoT in healthcare. These include storing, handling, and safeguarding enormous amounts of health data.

Patient privacy issues, including data privacy, stem from integrating various devices that monitor, exchange, and transmit data for processing. Additionally, there are legal and regulatory challenges, as there is a lack of transparency and data security guidelines regarding the accessibility or usage of data.

Incompatibility and non-interoperability of various medical and health monitoring devices in terms of their hardware, software and firmware, non-unified cloud services, different operating systems, obsolete technologies, etc. is another challenge that needs to be addressed.

IoT is positioned to usher in a new era of holistic healthcare solutions, with a focus on preventive and therapeutic care.

Health and wellness management solutions focus on recording, sharing and analysis of real-time health data to predict and avert health complications, enabling healthcare providers to readily devise personalized and preventive health care solutions, optimally use medical procedures and drugs, and provide optimal treatment during illness.

These solutions include individualized alerts and reminders, personalized tips and recommendations based on health status, advice on healthy dietary choices, emergency services, etc.

IoT is also enabling healthcare technology to be more user-friendly for people, with interfaces that make it easy for users to understand what an application can do for them in their everyday lives.

For instance, a single app that can monitor blood pressure, body weight, body temperature, blood sugar, etc. would be very user-friendly even though these parameters have been traditionally measured using a variety of smart devices with distinct functions.

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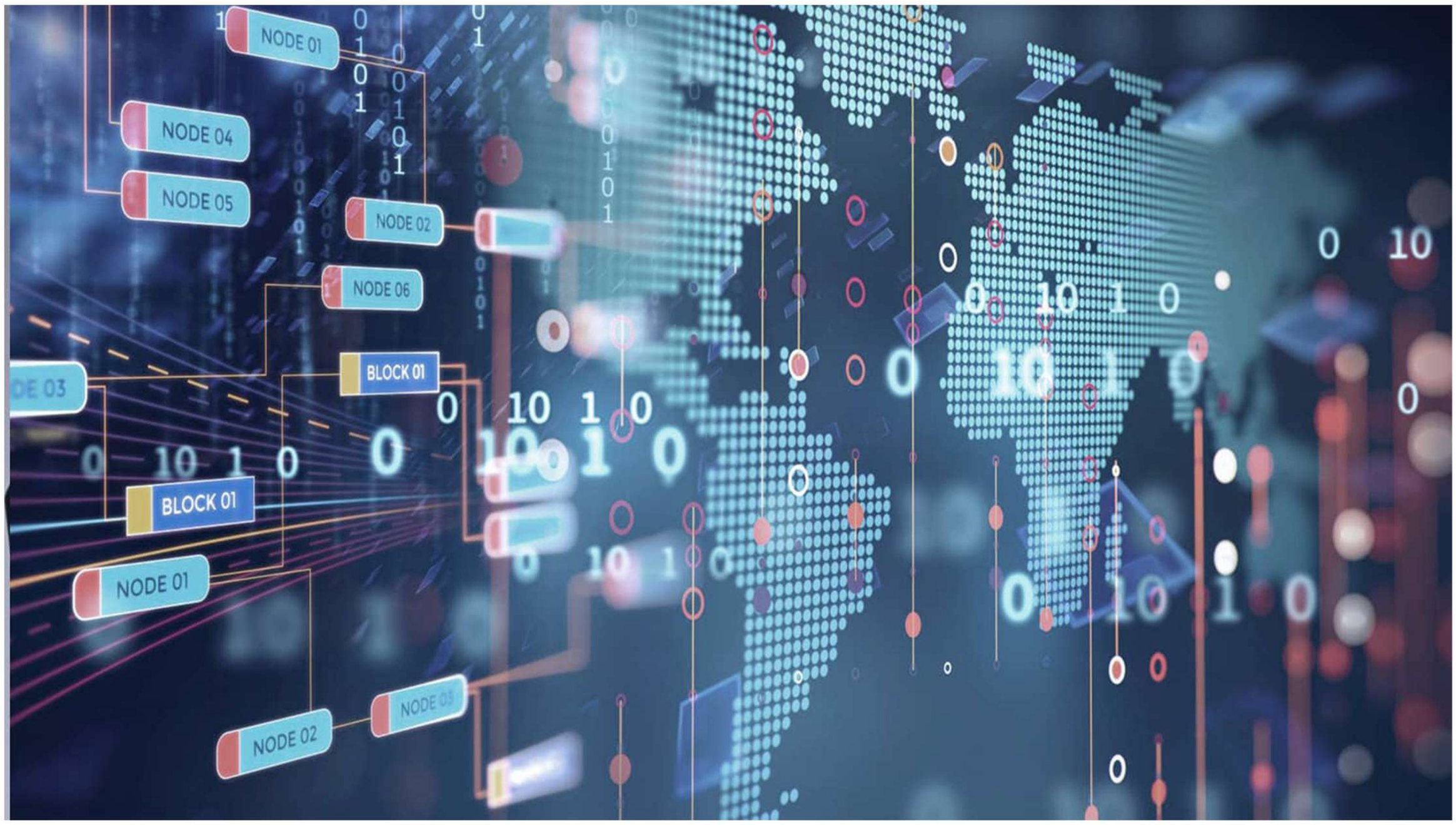
SMART HOMES - DOMESTICATION OF IOT

IoT has changed the way we carry out simple tasks, and it has made our lives convenient since we can control devices around us by the touch of a screen on our smartphones. Before IoT, people would physically get up to do things around the house, such as turn on the water heater or turn the lights on.

IoT also includes mobile devices; since they can communicate with others and manage data, it is a device everywhere. Everyone carries a smartphone all day. You can control objects using a mobile device.
Today, you can get brilliant smart refrigerators with work-in cameras, so you can look at their substance while you are shopping. In the future, you will see fridges that detect you are coming up short on supplies and send an essential food rundown to your cell phone. Stores could then push suggestions to add food and different things, considering previous purchases and average purchasing patterns. When strolling through the supermarket, reminders will get sent to your smartphone to ensure you never need to make that second trip back to the store.

Using IoT can decimate costs for firms that are operating in the economy. Organizations use IoT for innovative management and for observing scattered data. Thus, they can handle the latter from far-off places as they feed data into applications and information stockpiling (data storage).

IoT gives the benefit of realizing things ahead of time. Because of the minimal expense of IoT, it is now possible to screen and manage previously inaccessible activities. The monetary aspect is the best benefit since this innovation could replace people responsible for observing and keeping up with provisions. Therefore, expenses can decrease and get optimized.



BLOCKCHAIN

Blockchain will generate $3.1 trillion (about $9,500 per person in the US) (about $9,500 per person in the US) (about $9,500 per person in the US) (about $9,500 per person in the US) in new business value by 2030, but with the technology set to be ready for more mainstream adoption through 2023, organizations should be exploring the technology now. This is especially the case because large multinational corporations and digital giants are looking to capture larger market shares by implementing blockchain components like specifically distributed ledger technology to reinforce a centralized approach to business.

Blockchain allows participants who may not know each other to do business safely and directly — in theory without the need for a lawyer, bank, broker, or government to mediate the deal.
The blockchain confirms the identity of participants, validates the transactions, and ensures that everyone plays by its rules. The wide range of assets that can be traded and participants that can take part — including machines — creates huge commercial possibilities.
For example, once the technology is fully matured and integrated with complementary technologies such as AI and IOT, autonomous agents acting on behalf of a driver could negotiate insurance rates directly with multiple car insurance companies using data from sensors.
Governments have also been exploring potential applications, and although many are still nascent, some interesting use cases have emerged.

For example, a Utah county in the U.S. has explored blockchain for its municipal elections. And blockchain solutions are also enabling a higher level of accountability and ability to measure the real impact of policies.
In the financial services industry, blockchain opens opportunities for cross-border payments, trade finance, securities settlement efficiency and more secure identity systems. But the real transformation will occur with the creation of new digital assets and the decentralization of finance.

As with all technologies, blockchain is not without its challenges. For example, established laws may still need to be revised or put in place to accommodate blockchain use cases, and financial reporting and compliance is still unclear. The technology also lacks legal, tax and accounting frameworks, native interoperability, and scalability, and limited or inadequate governance models and standards are currently in place.

Many versions of blockchain are being built within existing operating models, where the original intention was to disrupt and disintermediate centralized entities, operations, processes, and business models using open source and democratized engagement.
The timing and launch of bitcoin seemed intentionally designed to disrupt the financial and banking industries. However, due to customer mindsets, established and effective solutions, and limiting technology, it seems unlikely to succeed in the way originally intended. In other industries where blockchain could be disruptive, risk-averse companies are keeping a tight hold on the risk factors, resulting in incremental improvements instead of game-changing disruption. The lack of executive understanding is also a critical inhibitor.

Companies looking to utilize blockchain technology will be able to remove the central authority figure altogether. Achieving transformative change in this sector will take time due to the usual adoption and technical challenges mentioned above — but the potential for blockchain-complete and enhanced-blockchain solutions is already leading blockchain natives (companies born on the blockchain) to create new and impactful business models.

-Aditya Patil

CYBER WARFARE

Cyber warfare is usually defined as a cyber-attack that targets a country. It has the potential to create havoc on government and civilian infrastructure and disrupt critical systems, resulting in damage to the country. It is an Internet-based conflict that involves the penetration of computer systems and networks of other nations. These attackers have the resources and expertise to launch massive Internet-based attacks against other nations to cause damage or disrupt services, such as shutting down a power grid. This allows countries with minimal military presence to be as strong as other nations in cyberspace.

The main purpose of cyberwarfare is to gain an advantage over opposition, whether they are nations or competitors. A nation can continuously invade other nations' infrastructure, steal defense secrets, and gather information about technology to bridge the gaps in its industries and military. Besides industrial and militaristic surveillance, cyberwar can destroy the infrastructure of other nations and cost lives in the targeted nations. For example, an attack can disrupt the power grid of a major city. Traffic would be disrupted. The exchange of goods and services can be stopped. Patients cannot get the care needed in emergency situations. Access to the Internet may also be disrupted. By affecting the power grid, the attack can affect the everyday life of ordinary citizens.

Furthermore, compromised sensitive data can give the attackers the ability to extort personnel within the government. The information may allow an attacker to pretend to be an authorized user to access sensitive information. If the government cannot defend against cyberattacks, the citizens may lose confidence in the government's ability to protect them. Cyberwarfare can destabilize a nation and affect the citizens' faith in their government.

An example of a major cyber-attack involved the Stuxnet malware that was designed to damage Iran's nuclear plant. Stuxnet malware did not hijack targeted computers to steal information. It was designed to damage physical equipment that was controlled by computers. It used stolen digital certificates, so the attack appeared legitimate to the system.

As seen above, cyber warfare can damage valuable resources and wreck the whole country's economic condition. It is best practice to take necessary measures to ensure the protection of our data. Below are some ways in which we can do the same:
☒Create a policy that clearly outlines company rules, job duties, and expectations.
☒Restrict access to networking closets, server locations, as well as fire suppression.
☒Employees should be thoroughly researched with background checks.
☒Perform regular backups and test data recovery from backups.
☒Use next generation routers, firewalls, and other security appliances. Use enterprise level antimalware and antivirus software.
☒Educate users and employees in secure procedures.
☒Encrypt all sensitive company data including email.

Cyber attacks are going to continue. They are cheap and can be remarkably effective. So, in this fast-paced growing digital world cyber threats are hard to deny, therefore it is particularly important to learn how to defend from them and spread awareness regarding Cyber Security.

-Sunanda Gandhi

CLOUD COMPUTING

Cloud computing is a general term for anything that involves delivering hosted services over the internet. These services are divided into three main categories or types of cloud computing: infrastructure as a service (IaaS), platform as a service (PaaS) and software as a service (SaaS).

A cloud can be private or public. A public cloud sells services to anyone on the internet. A private cloud is a proprietary network or a data center that supplies hosted services to a limited number of people, with certain access and permissions settings. Private or public, the goal of cloud computing is to provide easy, scalable access to computing resources and IT services.

Cloud infrastructure involves the hardware and software components required for proper implementation of a cloud computing model. Cloud computing can also be thought of as utility computing or on-demand computing.
An internet network connection links the front end, which includes the accessing client device, browser, network, and cloud software applications, with the back end, which consists of databases, servers, and computers. The back-end functions as a repository, storing data that is accessed by the front end.
Communications between the front and back ends are managed by a central server. The central server relies on protocols to facilitate the exchange of data. The central

The central server relies on protocols to facilitate the exchange of data. The central server uses both software and middleware to manage connectivity between different client devices and cloud servers. Typically, there is a dedicated server for each individual application or workload.
Cloud computing relies heavily on virtualization and automation technologies. Virtualization enables the easy abstraction and provisioning of services and underlying cloud systems into logical entities that users can request and utilize. Automation and accompanying orchestration capabilities provide users with a high degree of self-service to provision resources, connect services and deploy workloads without direct intervention from the cloud provider's IT staff.

Private cloud services are delivered from a business's data center to internal users. With a private cloud, an organization builds and maintains its own underlying cloud infrastructure. This model offers the versatility and convenience of the cloud, while preserving the management, control, and security common to local data centers. Internal users might or might not be billed for services through IT chargeback. Common private cloud technologies and vendors include VMware and OpenStack.
In the public cloud model, a third-party cloud service provider (CSP) delivers the cloud service over the internet. Public cloud services are sold on demand, typically by the minute or hour, though long-term commitments are available for many services. Customers only pay for the central processing unit cycles, storage, or bandwidth they consume. Leading public CSPs (Cloud Service Provider) include AWS (Amazon Web Services), Microsoft Azure, IBM, and Google Cloud Platform (GCP), as well as IBM, Oracle and Tencent.
A hybrid cloud is a combination of public cloud services and an on-premises private cloud, with orchestration and automation between the two. Companies can run mission-critical workloads or sensitive applications on the private cloud and use the public cloud to handle workload bursts or spikes in demand. The goal of a hybrid cloud is to create a unified, automated, scalable environment that takes advantage of all that a public cloud infrastructure can provide, while still maintaining control over mission-critical data.

In conclusion, cloud computing is a recent new technological development that has the potential to have a profound impact on the world. It has many benefits that it provides to its users and businesses. But there are other challenges cloud computing must overcome. People are very skeptical about whether their data is secure and private. There are no standards or regulations worldwide provided data through cloud computing. Europe has data protection laws but the US, being one of the most technologically advanced nations, does not have any data protection laws. Users also worry about who can disclose their data and have ownership of their data. But once there are standards and regulations worldwide, cloud computing will revolutionize the future.

-Aditya Patil

PHISHING or FISHING?

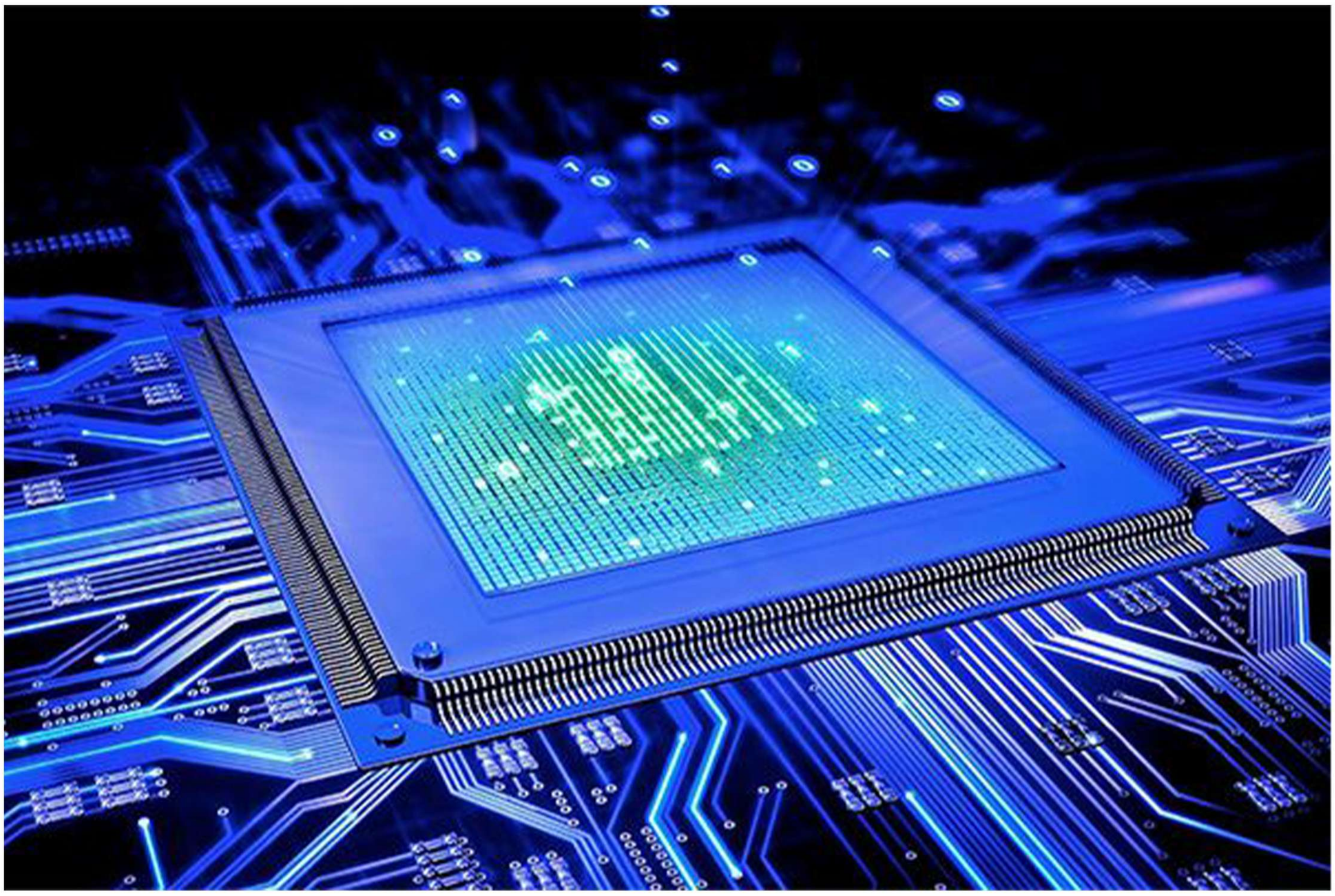
Now imagine you get a mail from the PM office of India saying you are getting an opportunity to work with Mr. Narendra Modi; what will be your reaction? I would be super elated until I see another link in the mail saying I will have to pay a certain amount to get the opportunity. And now, this will be super disappointing for me.
This cybersecurity breach, in informal language, is called phishing. Phishing is a cybercrime in which a target is contacted by email, telephone, or text message by someone posing as a legitimate institution to lure individuals into providing sensitive data such as personally identifiable information, banking, credit card details, and passwords. There are many ways to make easy money, and hackers choose this path of phishing. They make money from the small percentage of recipients that respond to the message. Some spread malicious code onto the computer used by the operator.

Let us face it: the future is now. We are already living in a cyber society, so we need to stop ignoring it or pretending that it is not affecting us. In 2021, RiskIQ estimated that businesses worldwide lose $1,797,945 per minute due to cybercrime—and that the average breach costs a company $7.2 per minute. 96% of phishing attacks arrive by email. Another 3% are performed through malicious websites and just 1% via phone. The upsurge in phishing attacks means email communications networks are plagued with cybercrime. Symantec research suggests that throughout 2020, 1 in every 4,200 emails was a phishing email. When we talk about these losses, it is not only a financial casualty; companies lose their well-built reputations, and few victims end up forfeiting their lifetime savings just by clicking on the link.

There are 3 Ps in cyber security; Perception, Protection, and Precision. Perception or awareness about diverse types of phishing like Instant Messaging, Spamming, Web-based Delivery is necessary. Not responding to ingenuine links is required. Protection is done by securing websites with a valid Secure Socket Layer (SSL) certificate beginning with 'HTTPS.' Another way of safeguarding can be using trusted security software like McAfee and Avast. Coming to precision, whenever you receive such mail, make sure you notice the attachments and hyperlinks to check authenticity. If an offer is too good to be true, trust your instincts and do not reply to the mail.

Technology trust is a good thing, but control is a better one. Knowing your cyber environment is today's need equivalent to comprehending a foreign language.

-Anshika Singh



AI MODELS MICROPROCESSOR PERFORMANCE

In modern computer processors, cycles of computations are made in the order of 3 trillion times per second. Keeping track of the power consumed by such intensely fast transitions is important to maintain the entire chip's performance and efficiency. If a processor draws too much power, it can overheat and cause damage. Sudden swings in power demand can cause internal electromagnetic complications that can slow the entire processor down.

By implementing software that can predict and stop these undesirable extremes from happening, computer engineers can protect their hardware and increase its performance. But such schemes come at a cost. Keeping pace with modern microprocessors typically requires precious extra hardware and computational power.

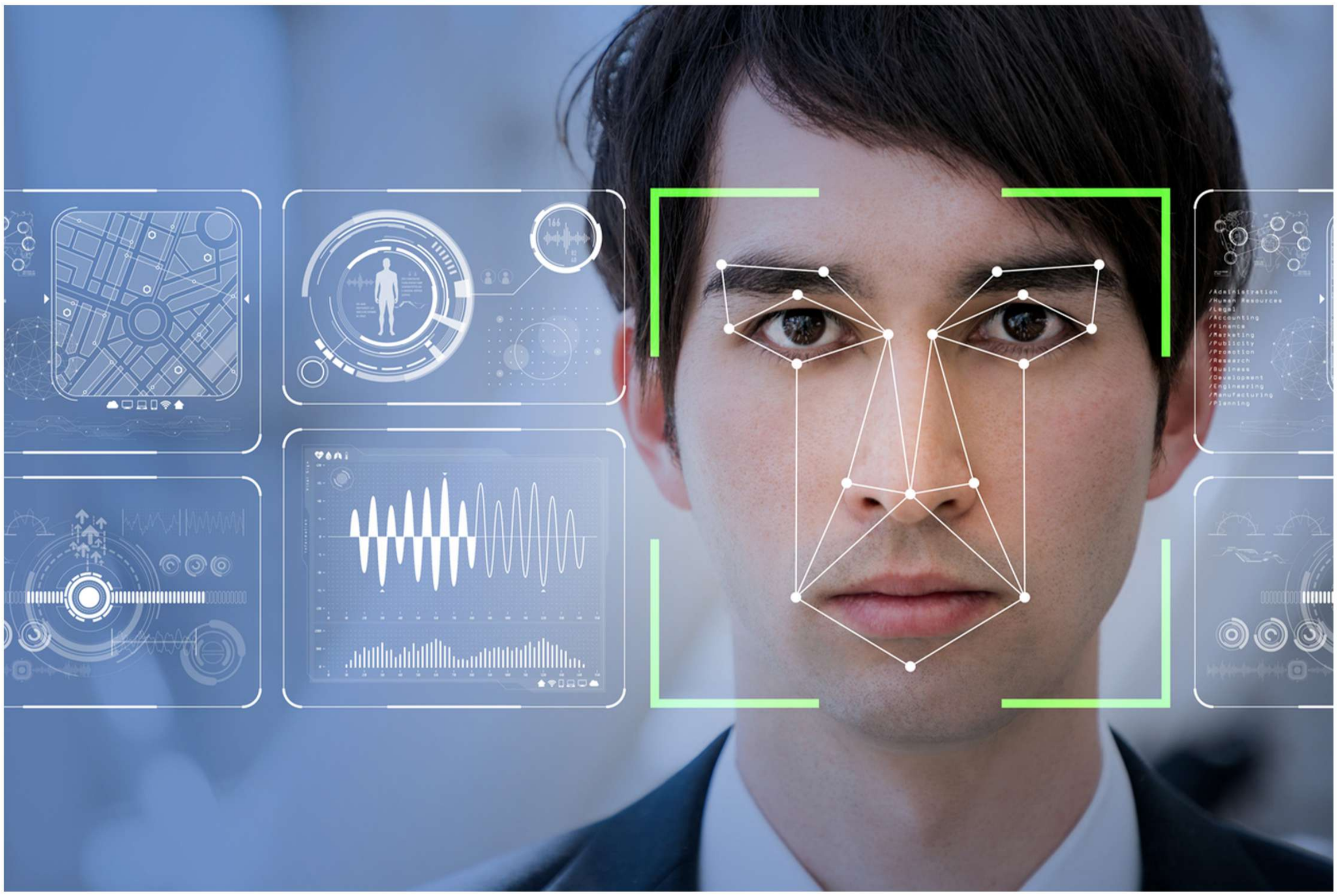
"APOLLO approaches an ideal power estimation algorithm that is both accurate and fast and can easily be built into a processing core at a low power cost," Xie said. "And because it can be used in any type of processing unit, it could become a common component in future chip design."
The secret to APOLLO's power comes from artificial intelligence. The algorithm developed by Xie and Chen uses AI to identify and select just 100 of a processor's millions of signals that correlate most closely with its power consumption.

It then builds a power consumption model off those 100 signals and monitors them to predict the entire chip's performance in real-time.
Because this learning process is autonomous and data driven, it can be implemented on most any computer processor architecture -- even those that have yet to be invented. And while it does not require any human designer expertise to do its job, the algorithm could help human designers do theirs.

"After the AI selects its 100 signals, you can look at the algorithm and see what they are," Xie said. "A lot of the selections make intuitive sense, but even if they don't, they can provide feedback to designers by informing them which processes are most strongly correlated with power consumption and performance."
The work is part of a collaboration with Arm Research, a computer engineering research organization that aims to analyze the disruptions impacting industry and create advanced solutions, many years ahead of deployment. With the help of Arm Research, APOLLO has already been validated on some of today's highest performing processors. But according to the researchers, the algorithm still needs testing and comprehensive evaluations on many more platforms before it is adopted by commercial computer manufacturers.

"Arm Research works with and receives funding from some of the biggest names in the industry, like Intel and IBM, and predicting power consumption is one of their major priorities," Chen added. "Projects like this offer our students an opportunity to work with these industry leaders, and these are the types of results that make them want to continue working with and hiring Duke graduates."

-Atharva Taras



AI LIGHT-FIELD CAMERA READS 3D FACIAL EXPRESSIONS

Unlike a conventional camera, the light-field camera contains micro-lens arrays in front of the image sensor, which makes the camera small enough to fit into a smart phone, while allowing it to acquire the spatial and directional information of the light with a single shot. The technique has received attention as it can reconstruct images in a variety of ways including multi-views, refocusing, and 3D image acquisition, giving rise to many potential applications.

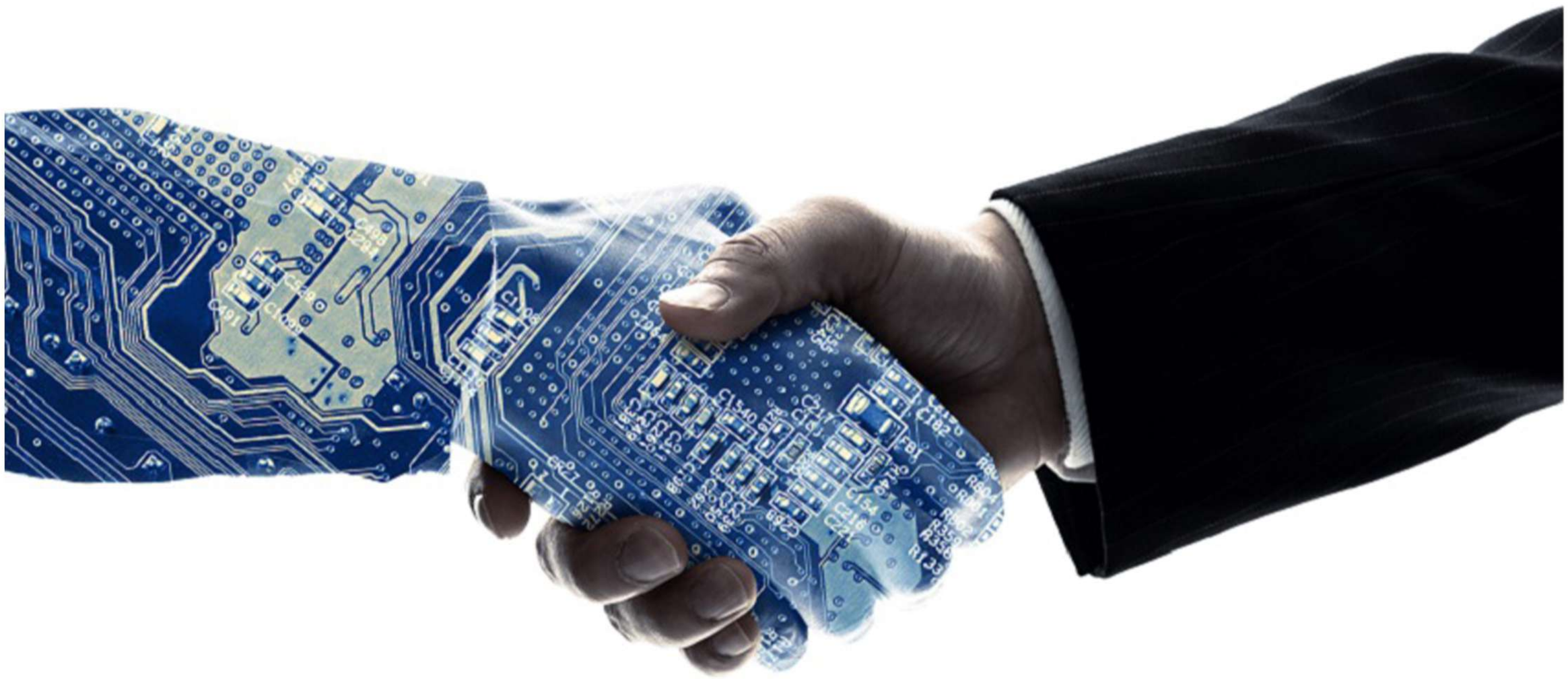
The joint research team applied a vertical-cavity surface-emitting laser (VCSEL) in the near-IR range to stabilize the accuracy of 3D image reconstruction that previously depended on environmental light. When an external light source is shone on a face at 0-, 30-, and 60-degree angles, the light field camera reduces 54% of image reconstruction errors. Additionally, by inserting a light-absorbing layer for visible and near-IR wavelengths between the micro-lens arrays, the team could minimize optical crosstalk while increasing the image contrast by 2.1 times.

The team could overcome the limitations of existing light-field cameras and was able to develop their NIR-based light-field camera (NIR-LFC), optimized for the 3D image reconstruction of facial expressions. Using the NIR-LFC, the team acquired high-quality 3D reconstruction images of facial expressions expressing various emotions regardless of the lighting conditions of the surrounding environment.

The facial expressions in the acquired 3D images were distinguished through machine learning with an average of 85% accuracy -- a statistically significant figure compared to when 2D images were used. Furthermore, by calculating the interdependency of distance information that varies with facial expression in 3D images, the team could identify the information a light-field camera utilizes to distinguish human expressions.

It has the potential to become the new platform to quantitatively analyze the facial expressions and emotions of humans. It could be applied in various fields including mobile healthcare, field diagnosis, social cognition, and human-machine interactions.

-Atharva Taras



MEASURING TRUST IN AI

Many people feel the rapid development of technology often outpaces that of the social structures that implicitly guide and regulate it, such as law or ethics. AI exemplifies this as it has become so pervasive in everyday life for so many, overnight. This proliferation, coupled with the relative complexity of AI compared to more familiar technology, can breed fear and mistrust of this key component of modern living. Who distrusts AI and in what ways are matters that would be useful to know for developers and regulators of AI technology, but these kinds of questions are not easy to quantify.

Researchers at the University of Tokyo, led by Professor Hiromi Yokoyama from the Kavli Institute for the Physics and Mathematics of the Universe, set out to quantify public attitudes toward ethical issues around AI. There were two questions in particular the team, through analysis of surveys, sought to answer: how attitudes change depending on the scenario presented to a respondent, and how the demographic of the respondent themself changed attitudes.

Ethics cannot really be quantified, so to measure attitudes toward the ethics of AI, the team employed eight themes common to many AI applications that raised ethical questions: privacy, accountability, safety and security, transparency and explain ability, fairness and non-discrimination, human control of technology, professional responsibility, and promotion of human values. These, which the group has termed "octagon measurements," were inspired by a 2020 paper by Harvard University researcher Jessica Fjeld and her team.

Survey respondents were given a series of four scenarios to judge according to these eight criteria. Each scenario looked at a different application of AI. They were: AI-generated art, customer service AI, autonomous weapons, and crime prediction.

The survey respondents also gave the researchers information about themselves such as age, gender, occupation, and level of education, as well as a measure of their level of interest in science and technology by way of an additional set of questions. This information was essential for the researchers to see what characteristics of people would correspond to certain attitudes.

"Prior studies have shown that risk is perceived more negatively by women, older people, and those with more subject knowledge. I was expecting to see something different in this survey given how commonplace AI has become, but surprisingly we saw similar trends here," said Yokoyama. "Something we saw that was expected, however, was how the different scenarios were perceived, with the idea of AI weapons being met with far more skepticism than the other three scenarios."

The team hopes the results could lead to the creation of a universal scale to measure and compare ethical issues around AI. This survey was limited to Japan, but the team has already begun gathering data in several other countries.

"With a universal scale, researchers, developers and regulators could better measure the acceptance of specific AI applications or impacts and act accordingly," said Assistant Professor Tilman Hartwig. "One thing I discovered while developing the scenarios and questionnaire is that many topics within AI require significant explanation, more so than we realized. This goes to show there is a huge gap between perception and reality when it comes to AI.

-Atharva Taras

SELF-DRIVING CARS: FUTURE AHEAD

A self-driving car is a vehicle capable of sensing its environment and operating without human involvement. A human passenger is not required to take control of the vehicle at any time, nor is a human passenger required to be present in the vehicle at all. A self-driving car can go anywhere, a traditional car does everything that an experienced human driver does.

The Society of Automotive Engineers (SAE) currently defines 6 levels of driving automation ranging from Level 0 (fully manual) to Level 5 (fully autonomous).
How do self-driving cars work?
Self-driving cars rely on sensors, actuators, complex algorithms, machine learning systems, and powerful processors to execute software. These cars create and maintain a map of their surroundings based on a variety of sensors situated in different parts of the vehicle. Radar sensors monitor the position of nearby vehicles. Video cameras detect traffic lights, read road signs, track other vehicles, and look for pedestrians. Lidar (light detection and ranging) sensors bounce pulses of light off the car's surroundings to measure distances, detect road edges, and identify lane markings. Ultrasonic sensors in the wheels detect curbs and other vehicles when parking. Sophisticated software then processes all this sensory input, plots a path, and sends instructions to the car's actuators, which control acceleration, braking, and steering. Hard-coded rules, obstacle avoidance algorithms, predictive modeling, and object recognition help the software follow traffic rules and navigate obstacles.

What are the benefits of self-driving cars?
There are some benefits of self-Driving cars which make them environmentally friendly.
Reducing traffic congestion (30% fewer vehicles on the road).
Reducing transportation costs by 40% (in terms of vehicles, fuel, and infrastructure).
Improving walkability and livability.
Freeing up parking lots for other uses (schools, parks, community centers).
Reducing urban CO2 emissions by 80%.

Challenges of Self-Driving cars?
Today, we see driverless cars a reality after a constant research and development effort for the past fifty plus years. Still, there are a lot of challenges in designing a fully autonomous system for driverless cars.

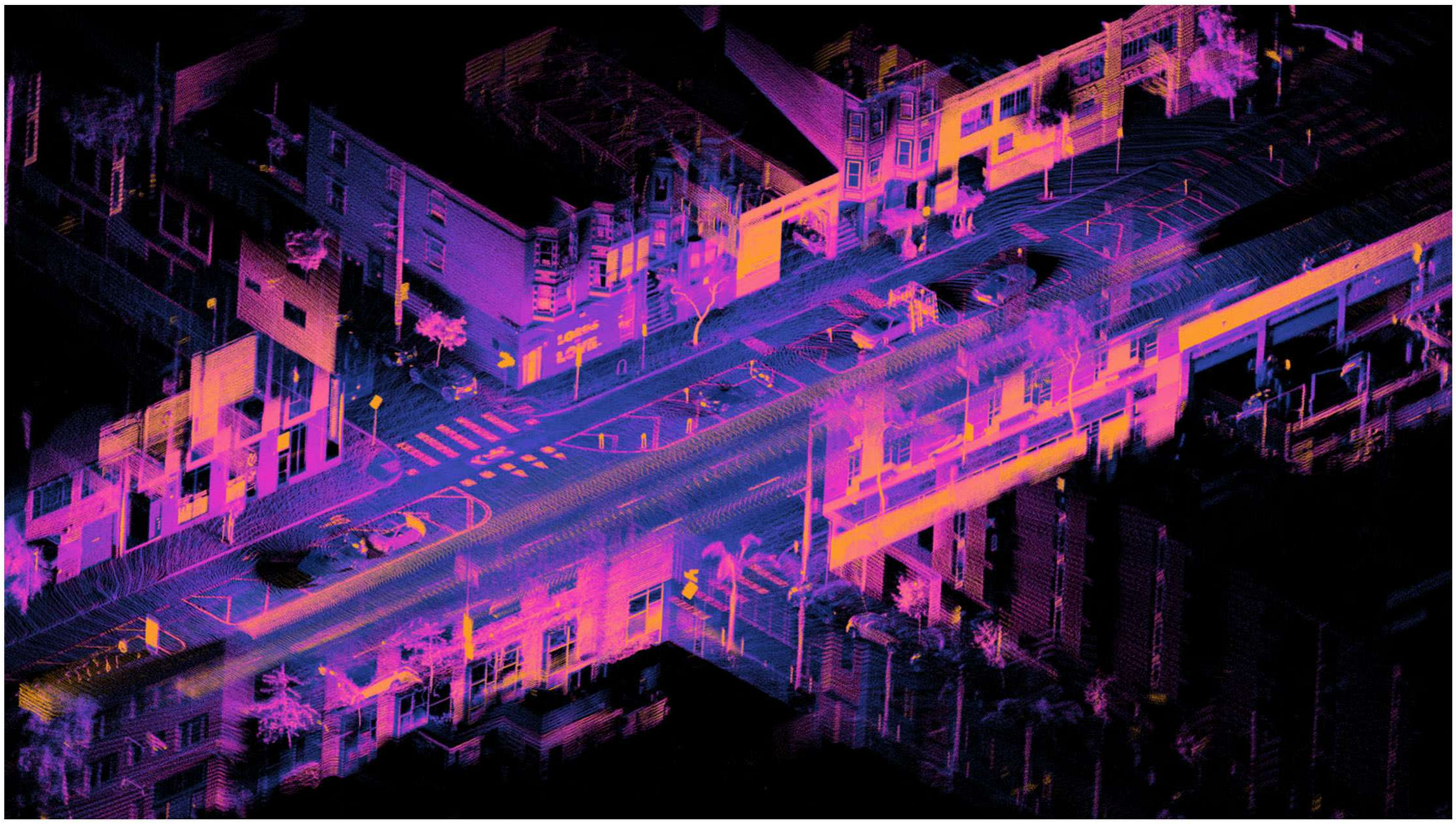
13.Road Condition:
Road conditions can be highly unpredictable and vary from place to place. There are smooth, wide, and well-marked highways in some places. In other places, the road conditions are highly deteriorated. Lanes are not marked, there are potholes and mountains. And tunnel roads where external signals for direction are not very clear and likewise.

14.Weather conditions:
What happens when an autonomous car drives in heavy precipitation? If there is a layer of snow on the road, lane dividers disappear. How will the cameras and sensors track lane markings if the markings are obscured by water, oil, ice, or debris?

15.Traffic conditions:
It would be necessary for self-driving cars to drive in every type of traffic condition, while interacting with other self-driving vehicles on the road and navigating around many humans. Traffic could be well managed and self-regulated, but sometimes people break the rules. An object may turn out somewhere unexpected. Especially in dense traffic, even a few centimeters in a minute do matter. One cannot simply wait endlessly for the traffic to clear and have some precondition for moving forward. If more of such cars on the road are waiting for traffic to get cleared, that may result in a traffic deadlock.

16.Accident liability:
Who is liable for accidents caused by an autonomous car? The manufacturer? The human passenger? The latest blueprints suggest that a fully autonomous Level 5 car will not have a dashboard or a steering wheel, so a human passenger would not even have the option to take control of the vehicle in an emergency.

-Tejas Tekawde



AI'S ABILITY TO UNDERSTAND 3D SPACE USING 2D IMAGES

AI programs receive visual input from cameras. So, if we want AI to interact with the world, we need to ensure that it can interpret what 2D images can tell it about 3D space. In this research, we are focused on one part of that challenge: how we can get AI to accurately recognize 3D objects -- such as people or cars -- in 2D images, and place those objects in space.

While work may be important for autonomous vehicles, it also has applications for manufacturing and robotics. In the context of autonomous vehicles, most existing systems rely on lidar -- which uses lasers to measure distance -- to navigate 3D space. However, lidar technology is expensive. And because lidar is expensive, autonomous systems do not include many redundancies. For example, it would be too expensive to put dozens of lidar sensors on a mass-produced driverless car.

But if an autonomous vehicle could use visual inputs to navigate through space, you could build in redundancy. Because cameras are significantly less expensive than lidar, it would be economically feasible to include additional cameras -- building redundancy into the system and making it both safer and more robust.
That is one practical application. The fundamental advance of this work: that it is possible to get 3D data from 2D objects."

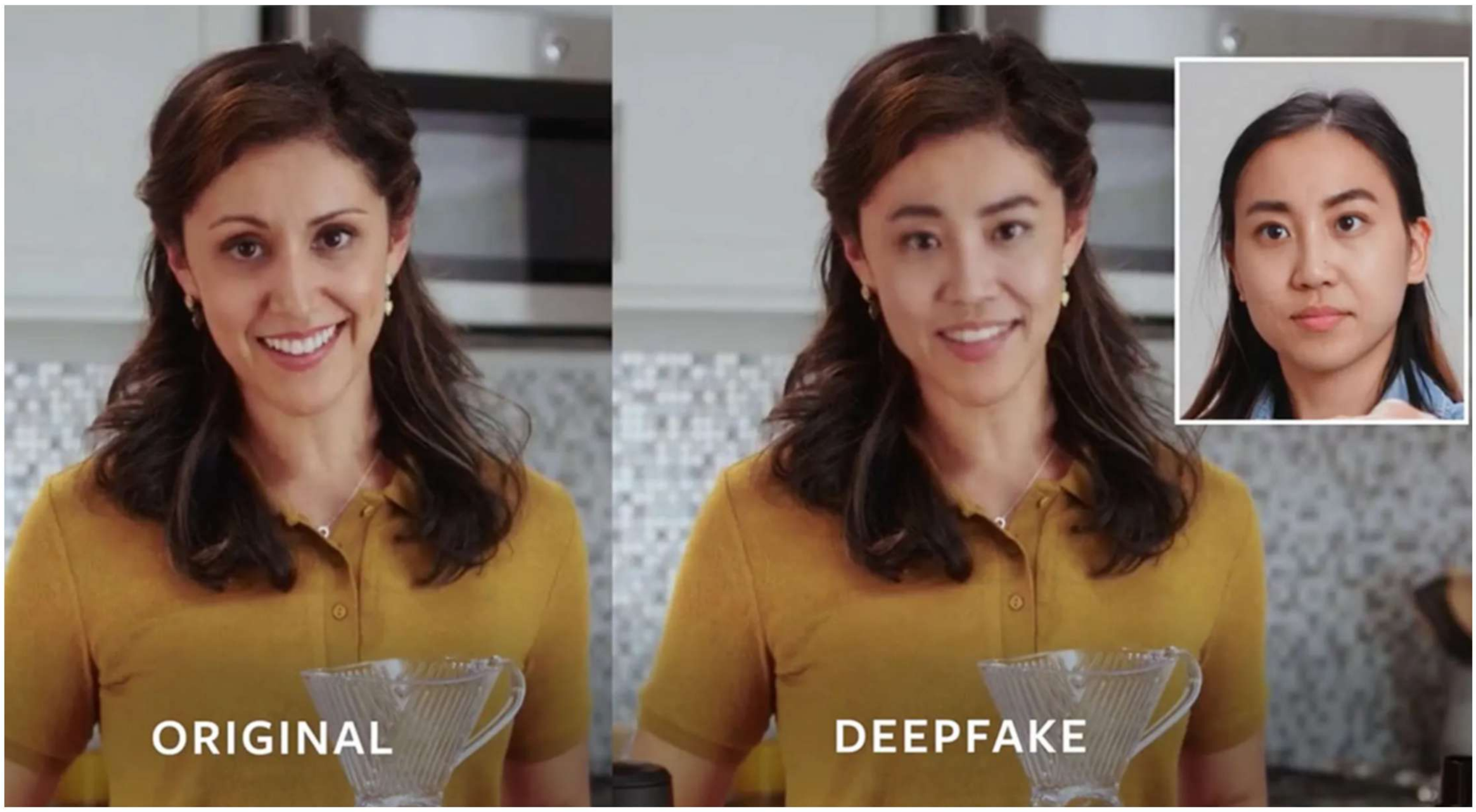
MonoCon can identify 3D objects in 2D images and placing them in a "bounding box," which effectively tells the AI the outermost edges of the relevant object.

MonoCon builds on a substantial amount of existing work aimed at helping AI programs extract 3D data from 2D images. Many of these efforts train the AI by "showing" it 2D images and placing 3D bounding boxes around objects in the image. These boxes are cuboids, which have eight points -- think of the corners on a shoebox. During training, the AI is given 3D coordinates for each of the box's eight corners, so that the AI "understands" the height, width, and length of the "bounding box," as well as the distance between each of those corners and the camera. The training technique uses this to teach the AI how to estimate the dimensions of each bounding box and instructs the AI to predict the distance between the camera and the car. After each prediction, the trainers "correct" the AI, giving it the correct answers. Over time, this allows the AI to get better and better at identifying objects, placing them in a bounding box, and estimating the dimensions of the objects.

"What sets our work apart is how we train the AI, which builds on previous training techniques," Wu says. "Like the previous efforts, we place objects in 3D bounding boxes while training the AI. However, in addition to asking the AI to predict the camera-to-object distance and the dimensions of the bounding boxes, we also ask the AI to predict the locations of each of the box's eight points and its distance from the center of the bounding box in two dimensions. We call this 'auxiliary context,' and we found that it helps the AI more accurately identify and predict 3D objects based on 2D images.
"The proposed method is motivated by a well-known theorem in measure theory, the Cramér-Wold theorem. It is also potentially applicable to other structured-output prediction tasks in computer vision."

The researchers tested MonoCon using a widely used benchmark data set called KITTI. At the time we submitted this paper, MonoCon performed better than any of the dozens of other AI programs aimed at extracting 3D data on automobiles from 2D images. MonoCon performed well at identifying pedestrians and bicycles, but was not the best AI program at those identification tasks.

-Atharva Taras



DEEPFAKE

Deep fake (also spelled deepfake) is a type of artificial intelligence used to create convincing images, audio and video hoaxes. The term, which describes both the technology and the resulting bogus content, is a portmanteau of deep learning and fake.
An example use case includes when a health charity in the UK used a deepfake to have David Beckham deliver an anti-malaria message. This message was also delivered in nine languages.

Deepfake content is created by using two competing AI algorithms -- one is called the generator and the other is called the discriminator. The generator, which creates the phony multimedia content, asks the discriminator to determine whether the content is real or artificial.

Together, the generator and discriminator form something called a generative adversarial network (GAN). Each time the discriminator accurately identifies content as being fabricated it provides the generator with valuable information about how to improve the next deepfake.

The first step in establishing a GAN is to identify the desired output and create a training dataset for the generator. Once the generator begins creating an acceptable level of output, video clips can be fed to the discriminator.
As the generator gets better at creating fake video clips, the discriminator gets better at spotting them. Conversely, as the discriminator gets better at spotting fake video, the generator gets better at creating them.

Until recently, video content has been more difficult to alter in any substantial way. Because deepfakes are created through AI, however, they don't require the considerable skill that it would take to create a realistic video otherwise. Unfortunately, this means that just about anyone can create a deepfake to promote their chosen agenda. For example, a deepfake could be used to spread false information via a presidential candidate. Microsoft, however, has worked on an AI-powered deepfake detection software for this purpose. The tool can automatically analyze videos and photos to provide a confidence score that the media has been manipulated.

Another possible danger deepfakes introduce is that people will take such videos at face value, and after realizing its, fake people will stop trusting in the validity of any video content at all.

Companies view deepfakes as cause for attention and concern, and it's easy to see why. Almost anyone can access deepfake technology to make a convincing video of someone saying things they never said.

But this focus on negative implications has led most companies to overlook a new opportunity. Ultimately, these technologies are about creating realistic but synthetic data that can have real value. There are applications for industries ranging from entertainment to education to health and life sciences. With the proper technological and ethical approaches, synthetic data capabilities can drive significant business value. And today, much of that value is still untapped.

Like every technology, generative approaches create risks for business and society. When companies apply them to address business challenges and opportunities, they must do so responsibly. To maintain trust with consumers, regulators, and the public, companies must incorporate ethical considerations into their decision-making process from the start.

As deepfakes become more common, society collectively will most likely need to adapt to spotting deepfake videos in the same way online users are now attuned to detecting other kinds of fake news.

There are a handful of indicators that give away deepfakes:
Current deepfakes have trouble realistically animating faces, and the result is video in which the subject never blinks, or blinks far too often or unnaturally. However, after researchers at University of Albany published a study detecting the blinking abnormality, new deepfakes were released that no longer had this problem.

- Soham Nale

NFT (Non Fungible Token)

NFT stands for a non-fungible token, which means that hidden in those quirky artworks, there is a unique and non-interchangeable unit of data stored on a digital ledger using blockchain technology to establish proof of ownership. Essential the same, or similar technology used for cryptocurrencies like bitcoin and ether is used to guarantee the uniqueness of each NFT and to prove who owns it.

Unlike a unit of bitcoin, however, each NFT is completely unique, so it cannot be exchanged like-for-like. The file stores extra information that elevates it above pure currency and brings it into the realm of, well, anything, really. As a result, NFTs (Non-Fungible Token) (Non-Fungible Token) (Non-Fungible Token) (Non-Fungible Token) have become collectable digital assets that hold value, just like how physical art holds value. Any kind of easily reproduced digital file can be stored as an NFT to identify the original copy. The NFTs you are most likely to have seen or read about tend to be minted from trippy futuristic motion artworks, NFTs can be made from any kind of photography, art, music, or video file. Even tweets and memes have been made into NFTs. You can make NFTs from anything unique that can be stored digitally and holds value. They are like any other collector's item, like a painting or a vintage action figure, but instead of buying a physical item, you are instead paying for a file and proof that you own the original copy. If you wandered into a gift shop of an art gallery, you would find several replicated prints of famous masterpieces, well there are some NFTs that act the same way. There are parts of the blockchain that are valid, but they would not hold the same value as the original.

NFTs will come with a license to the digital asset it points to, but this does not automatically confer copyright ownership. The copyright owner may reproduce work and the NFT owner gains no royalties.

NFTs are having a moment among artists, gamers, and brands across all kinds of sectors. In fact, every day brings a new player to the NFT marketplace. For artists, stepping into the NFT space adds another possibility for selling art, and provides fans with a way to support it.

Meanwhile, NFTs are shaking up the concept of in-game purchases in video games. Up until now, any digital assets bought inside a game still belonged to the game company – with gamers buying them to temporarily use while playing the game. But NFTs mean that the ownership of assets has shifted to the actual buyer. That means that they can be bought and sold across the gaming platform with extra value applied based on who has owned them along the way. Whole games are now being made based entirely around NFTs.

There is a lot of money being made in the NFT market, but you will have heard there's also great controversy, not least due to the impact on climate. The creation of blockchain assets, NFTs included, uses a horrendous amount of computing power – and so a huge amount of energy. Some are worried about the very real impact the craze could have on the environment.

CryptoArt.wtf, a site set up to calculate the carbon footprint of NFTs (which is now offline), calculated that a piece of NFT art named 'Coronavirus' consumed an incredible 192 kWh in its creation. That is equivalent to one European Union resident's entire energy consumption for two weeks.

- Aditya Patil

CRYPTOCURRENCY MINING

Most people think of crypto mining simply as a way of creating new coins. Crypto mining, however, also involves validating cryptocurrency transactions on a blockchain network and adding them to a distributed ledger. Most importantly, crypto mining prevents the double-spending of digital currency on a distributed network.

Like physical currencies, when one member spends cryptocurrency, the digital ledger must be updated by debiting one account and crediting the other. However, the challenge of a digital currency is that digital platforms are easily manipulated. Bitcoin's distributed ledger, therefore, only allows verified miners to update transactions on the digital ledger. This gives miners the extra responsibility of securing the network from double-spending. Meanwhile, new coins are generated to reward miners for their work in securing the network. Since distributed ledgers lack a centralized authority, the mining process is crucial for validating transactions. Miners are, therefore, incentivized to secure the network by participating in the transaction validation process that increases their chances of winning newly minted coins.

Crypto mining is like mining precious metals. While miners of precious metals will unearth gold, silver, or diamonds, crypto miners will trigger the release of new coins into circulation. For miners to be rewarded with new coins, they need to deploy machines that solve complex mathematical equations in the form of cryptographic hashes. A hash is a truncated digital signature of a chunk of data. Hashes are generated to secure data transferred on a public network. Miners compete with their peers to zero in on a hash value generated by a crypto coin transaction, and the first miner to crack the code gets to add the block to the ledger and receive the reward.

Each block uses a hash function to refer to the previous block, forming an unbroken chain of blocks that leads back to the first block. For this reason, peers on the network can easily verify whether certain blocks are valid and whether the miners who validated each block properly solved the hash to receive the reward.
Over time, as miners deploy more advanced machines, the difficulty of equations on the network increases. At the same time, competition among miners rises, increasing the scarcity of the cryptocurrency as a result.

Mining cryptocurrencies require computers with special software specifically designed to solve complicated, cryptographic mathematic equations. In technology's early days, cryptocurrencies like Bitcoin could be mined with a simple CPU (Central Processing Unit) chip on a home computer. Over the years, however, CPU chips have become impractical for mining most cryptocurrencies due to the increasing difficulty levels.

Today, mining cryptocurrencies require a specialized GPU (graphics processing units) or an application-specific integrated circuit (ASIC) miner. In addition, the GPUs (graphics processing units) in the mining rig must be always connected to a reliable internet connection. Each crypto miner is also required to be a member of an online crypto mining pool as well.

GPU mining is another method of mining cryptocurrencies. It maximizes computational power by bringing together a set of GPUs under one mining rig. For GPU mining, a motherboard and cooling system is required for the rig.

Given the ever-increasing costs of GPU and ASIC mining, cloud mining is becoming increasingly popular. Cloud mining allows individual miners to leverage the power of major corporations and dedicated crypto mining facilities.

For aspiring crypto miners, curiosity, and an ardent desire to learn are simply necessary. Crypto mining space is constantly changing as modern technologies emerge. The professional miners who receive the best rewards are constantly studying the space and optimizing their mining strategies to improve their performance.

- Aditya Patil

ETHICAL MANNERS

A person's habits and character tell a lot about his ethics. It deals with the content of moral judgement. The mind of the people conditioned as per the accepted moral and ethical values. A child needs to be taught what behavior is accepted in society. This should be done so that there will be a proper path that one should follow. Once a person has an idea of what is right and wrong, deciding based on it will help him/her to develop. There is a significant impact on one character by the people who surround him. So, it is necessary to have a good and friendly environment. Apart from self-improvement, good ethics also help in professional life as well. Whether you own any business or are an employee, good ethics always gives an extra edge to overcome any situation.

Examples of work ethics include obeying the rules and regulations set by the authorities. Proper behavior, good dressing and language are also included along with this every person you interact should be treated with respect.

Ethics is what guides us to tell the truth and keep our promises. Most people blindly follow the ethics defined by society. They stick to habits that are considered good as per ethical norms. However, there are some who question these values and go by what they think is right or wrong.

- Atharva Khandke

DEEP LEARNING FRAMEWORKS

Deep Learning uses multilayered neural networks capable of identifying important features by themselves and learning from large amounts of data to solve the complex problems.

Deep Learning fanatic? need to create your own neural networks or use the ability of transfer learning to use the prevailing ones? Here we have a list of the most well documented, supported and valuable deep learning frameworks!

TensorFlow: Developed by the team at Google Brain, this can be a foremost common framework for building neural networks. Simple abstraction, measurability and integration with apps makes it one of the easiest choices!

Keras: This user-friendly and open-source library is good for research as it offers simple APIs, modularity and extensibility.

PyTorch: This wonderful framework offers scalable distributed training and performance optimisation in research and production using the “torch distributed” backend.

Theano: This framework has tight integration with NumPy and is centred around the CUDA cores offered by NVIDIA.

DeepLearning4j: This framework is suggested for Java, Scala, C++ and C users. It is best known for distributed training which happens in clusters.

Caffe: Caffe is written in C++ with a Python Interface and is usually used for image detection and classification.

Chainer: Written strictly in Python, it is best far-famed for running on multiple GPUs with little effort.

Microsoft CNTK: Designed for speed and efficiency, this framework builds a neural network as a series of computational steps via a direct graph.

- Ms. Priyanka Shahane
Assitant Professor
AI and DS Department