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Tech e Bytes

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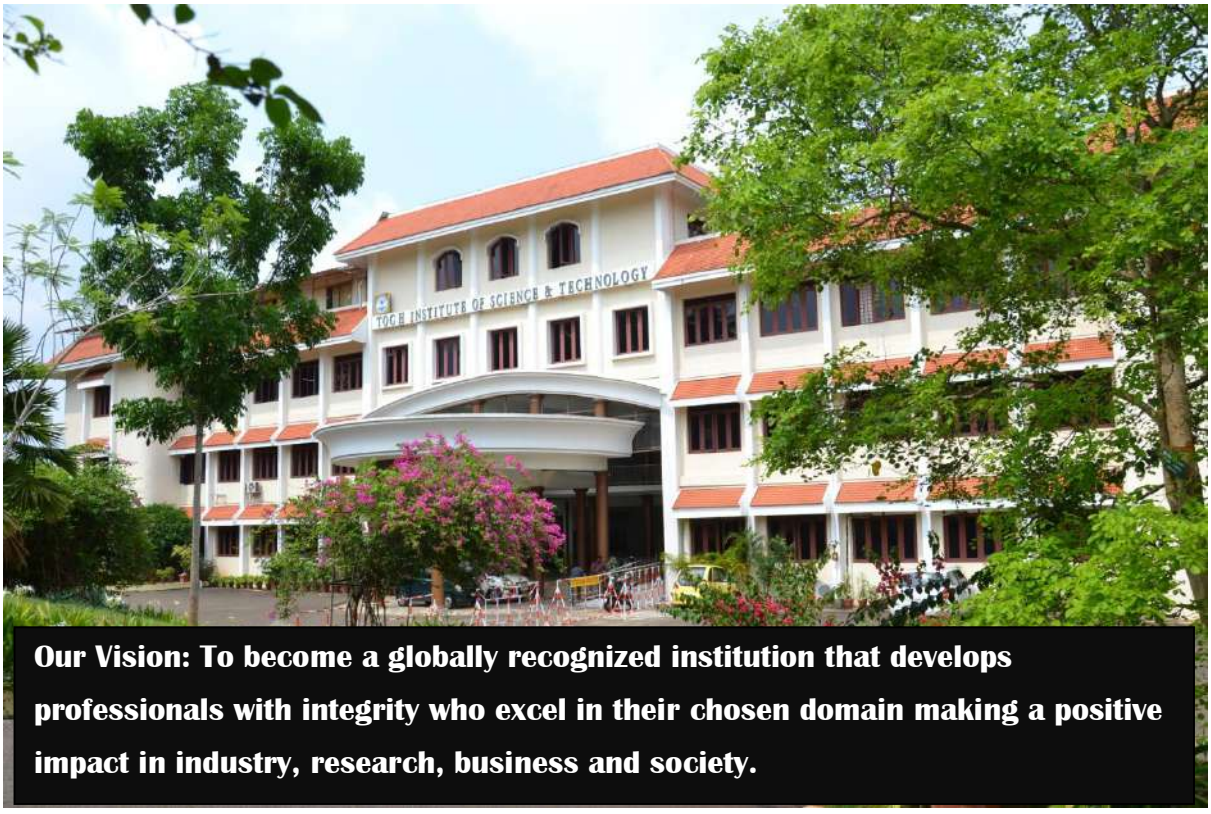
"WE DON'T DO DIFFERENT THINGS, WE DO THINGS DIFFERENTLY"



Our Vision: To become a globally recognized institution that develops professionals with integrity who excel in their chosen domain making a positive impact in industry, research, business and society.

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

VISION OF CSE DEPARTMENT

To acquire global excellence in the field of Computer Science and Engineering, nurturing in professionals, technical competence, innovative skills, professional ethics and social commitment.

MISSION OF CSE DEPARTMENT

- To equip students with a strong foundation in the area of Computer Science and Engineering using effective teaching -learning practices.
- To provide state-of-the-art infrastructure to suit academic, industry and research needs at the global level.
- **To engage students and faculty in interdisciplinary research that promotes innovative ideas for sustainable development.**
- **To incorporate skill enhancement programmes for students and faculty to cope with the contemporary developments in technology.**
- **To inculcate effective communication skills, professional ethics and social commitment among professionals through value added programs.**

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of Computer Science & Engineering will

1. Evolve as globally competent computer professionals, researchers and entrepreneurs possessing collaborative and leadership skills, for developing innovative solutions in multidisciplinary domains.
2. Excel as socially committed computer engineers having mutual respect, effective communication skills, high ethical values and empathy for the needs of society.
3. Involve in lifelong learning to foster the sustainable development in the emerging areas of technology.

PROGRAM SPECIFIC OUTCOMES (PSOs)

Student of the Computer Science and Engineering program will:

- **PSO1**: **Professional Skills:** Attain the ability to design and develop hardware and software based systems, evaluate and recognize potential risks and provide creative solutions.
- **PSO2**: **Successful Career and Entrepreneurship:** Gain knowledge in diverse areas of Computer Science and experience an environment conducive in cultivating skills for successful career, entrepreneurship and higher studies.

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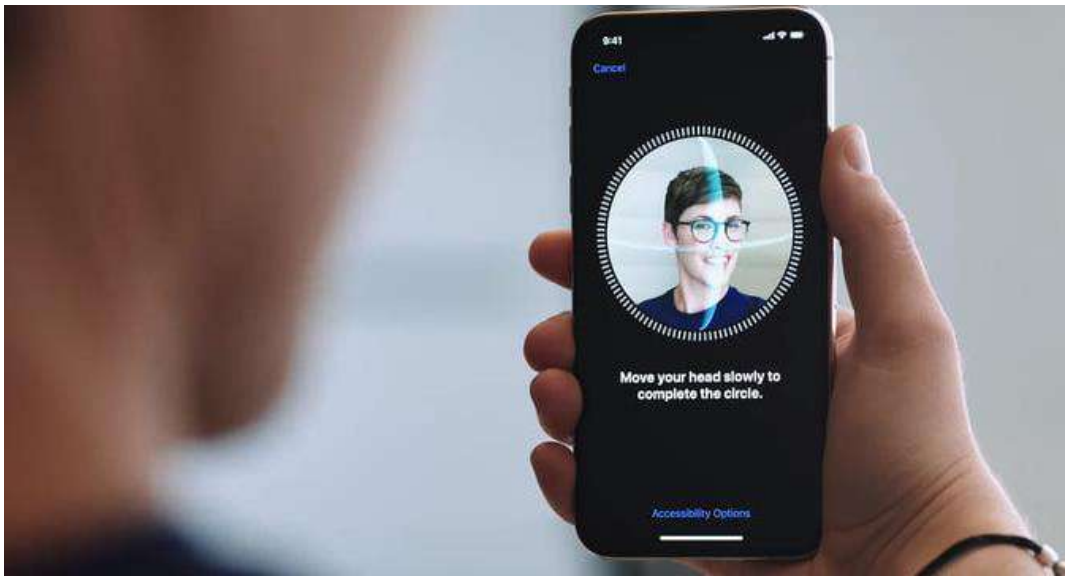
News Desk: Apple may take Face ID to the next level, scan retinas for increased security



Face ID was first officially unveiled by Apple at its September 2017 iPhone event, allowing individuals to securely unlock their devices thanks to a newly designed facial recognition sensor. A recent patent filed by the company with the European Patent Office shows that the system might become just a bit more advanced, taking into account retinal scanning. The newly discovered patent also makes references to a stand-alone keyboard containing a built-in Touch Bar with Touch ID.

CONTENTS

Hawk-Eye Technology

Joel Raphael | S6 CSE

In many sports there are many decisions which cannot be determined by human interfaces. So we need to use different types of technologies to determine the decisions perfectly .one of most prominently used technology is HAWK-EYE technology. It is used in sports like cricket, tennis, snookers and in some games. It is a technology where we can determine speed, deviation of ball from actual track etc.

Hawk-Eye as the most innovative technology provider in sports broadcasting and is a development that will reinforce the group's presence and influence. It is primarily used by the majority of television networks to track the trajectory of balls in flight.

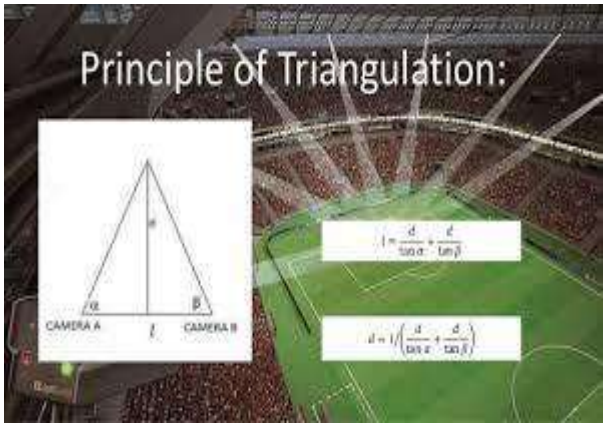
It is a computer system used in cricket, tennis, snookers and other sports to visually track the path of the ball and display a record of its most statistically likely path as a moving image. Hawk-Eye as the most innovative technology provider in sports broadcasting and is a development that will reinforce the group's presence and influence. It is primarily used by the majority of television networks to track the trajectory of balls in flight. It was developed by engineers at Roke Manor Research Limited of UK in 2001. A patent was submitted by Dr Paul Hawkins and David Sherry.

Hawk-eye can track any type of bounce, spin, swing and seam movement of the ball. Give a prediction as accurate as 99.99 percent. It was used for referring decisions to the third umpire in LBW.A Hawk-Eye system is based on the principle of Triangulation which is the process of determining the location of a point by measuring *angles* to it from known points at either end of a fixed baseline.

Hawk-Eye takes 2 inputs, a Video provided by 6 different cameras placed at 6 different places and the speed of the ball.The system rapidly processes the video feeds by a high speed video processor.Hawk Eye incorporates both image analysis and radar technology.The six fixed JAI monochrome cameras, with a 120 MHz frame rate, are placed around the playing field.They track the ball entire trajectory, right from the point where it is released from the bowler? hand to the point the ball is considered dead.

Processor follows 4 Steps,It Identifies each frame from each camera, and groups the corresponding pixels to the image of the ball , Computes for each frame the 3D position of an image thus identified using ball image data from at least two different cameras,Predicts a ball flight-path from the said 3D ball position as computed in successive frames and Maps the predicted path on the modeled area so as to identify any interaction with one or more of the said characteristic features.

The cameras are used in two sets, and a multi-channel frame grabber handles each set of cameras.The images captured are then processed by software to produce a 3-D image.This is updated 100 times every second.The system is able to locate the ball in 3-D and can predict the motion with a claimed accuracy of 5 mm.The system generates a graphic image of the ball path and playing area by using which umpires take decisions.The same can be provided to the television viewers and coaching staff.



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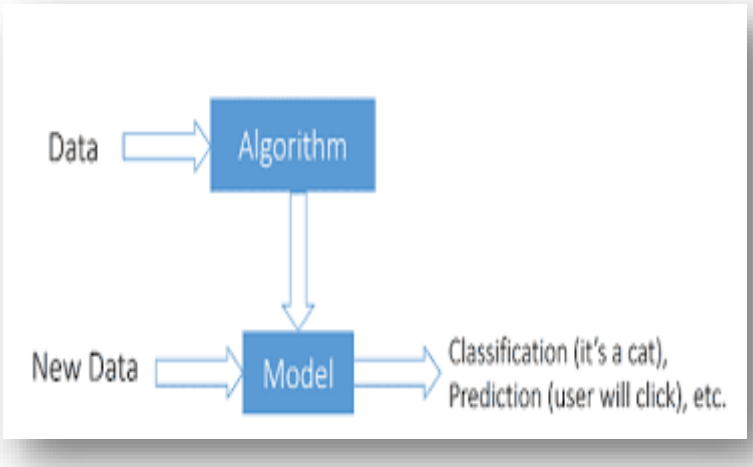
Researchers devise approach to reduce biases in computer vision data sets

Malavika Girish | S6 CSE

Addressing problems of bias in artificial intelligence, computer scientists from Princeton and Stanford University have developed methods to obtain fairer data sets containing images of people. The researchers propose improvements to ImageNet, a database of more than 14 million images that has played a key role in advancing computer vision over the past decade.ImageNet, which includes images of objects and landscapes as well as people, serves as a source of training data for researchers creating machine learning algorithms that classify images or recognize elements within them. ImageNet's unprecedented scale necessitated automated image collection and crowdsourced image annotation. While the database's person categories have rarely been used by the research community, the ImageNet team has been working to address biases and other concerns about images featuring people that are unintended consequences of ImageNet's construction.



In a new paper, the ImageNet team systematically identified non-visual concepts and offensive categories, such as racial and sexual characterizations, among ImageNet's person categories and proposed removing them from the database. The researchers also designed a tool that allows users to specify and retrieve image sets of people that are balanced by age, gender expression or skin color -- with the goal of facilitating algorithms that more fairly classify people's faces and activities in images. The researchers presented their work on Jan. 30 at the Association for Computing Machinery's Conference on Fairness, Accountability and Transparency in Barcelona, Spain.

Some of the fairness issues in ImageNet stem from the pipeline used to build the database. Its image categories came from WordNet, an older database of English words used for natural language processing research. ImageNet's creators adopted the nouns in WordNet -- some of which, although they are clearly defined verbal terms, do not translate well to a visual vocabulary. For example, terms that describe a person's religion or geographic origin might retrieve only the most distinctive image search results, potentially leading to algorithms that perpetuate stereotypes.

A recent art project called ImageNet Roulette brought increased attention to these concerns. The project released as part of an art exhibition on image recognition systems, used images of people from ImageNet to train an artificial intelligence model that classified people in words based on a submitted image. Users could upload an image of themselves and retrieve a label based on this model. Many of the classifications were offensive or simply off-base.

The central innovation that allowed ImageNet's creators to amass such a large database of labeled images was the use of crowdsourcing -- specifically, the Amazon Mechanical Turk (MTurk) platform, through which workers were paid to verify candidate images. This approach, while transformative, was imperfect, leading to some biases and inappropriate categorizations.

In the study, the team first filtered out potentially offensive or sensitive person categories from ImageNet. They defined offensive categories as those containing profanity or racial or gender slurs; sensitive categories included, for example, the classification of people based on sexual orientation or religion. To annotate the

categories, they recruited 12 graduate students from diverse backgrounds, instructing them to err on the side of labeling a category as sensitive if they were unsure. This eliminated 1,593 categories -- about 54% of the 2,932 person categories in ImageNet.

The researchers then turned to MTurk workers to rate the "imageability" of the remaining safe categories on a scale of 1 to 5. Keeping categories with an imageability rating of 4 or higher resulted in only 158 categories classified as both safe and imageable. Even this highly filtered set of categories contained more than 133,000 images -- a wealth of examples for training computer vision algorithms.

Within these 158 categories, the researchers studied the demographic representation of people in the images in order to assess the level of bias in ImageNet and devise an approach to create fairer data sets. ImageNet's content comes from image search engines such as Flickr, and search engines in general have been shown to produce results that overrepresent males, light-skinned people, and adults between the ages of 18 and 40.

" Of the attributes protected under U.S. anti-discrimination laws, the researchers considered the three attributes that are imageable: skin color, gender expression and age. MTurk workers were asked to annotate each attribute of each person in an image. They classified skin color as light, medium or dark; and age as child (under 18), adult 18-40, adult 40-65 or adult over 65. Gender classifications included male, female and unsure -- a way to include people with diverse gender expressions, as well as annotate images in which gender could not be perceived from visual clues (such as many images of babies or scuba divers).

An analysis of the annotations showed that, similar to search results, ImageNet's content reflects considerable bias. People annotated as dark-skinned, females, and adults over 40 were underrepresented across most categories.Although the annotation process included quality controls and required annotators to reach consensus, out of concern for the potential harm of mis-annotations, the researchers opted not to release demographic annotations for individual images. Instead, they designed a web-interface tool that allows users to obtain a set of images that are demographically balanced in a way the user specifies.

The ImageNet team is currently working on technical updates to its hardware and database, in addition to implementing the filtering of the person categories and the rebalancing tool developed in this research. ImageNet will soon be re-released with these updates, and with a call for feedback from the computer vision research community.

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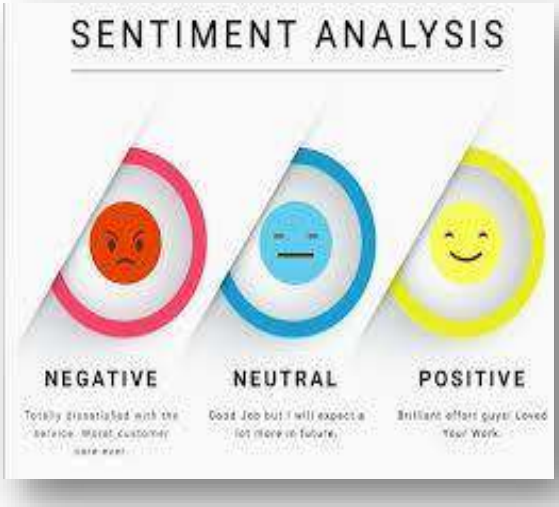
Sentiment Analysis

Mariya Paul | S6 CSE

Sentiment analysis is the interpretation and classification of emotions (positive, negative and neutral) within text data using text analysis techniques. Sentiment analysis allows businesses to identify customer sentiment toward products, brands or services in online conversations and feedback. Sentiment analysis models detect polarity within a text (e.g. a *positive* or *negative* opinion), whether it's a whole document, paragraph, sentence, or clause.Understanding people's emotions is essential for businesses since customers are able to express their thoughts and feelings more openly than ever before. By automatically analyzing customer feedback, from survey responses to social media conversations, brands are able to listen attentively to their customers, and tailor products and services to meet their needs.

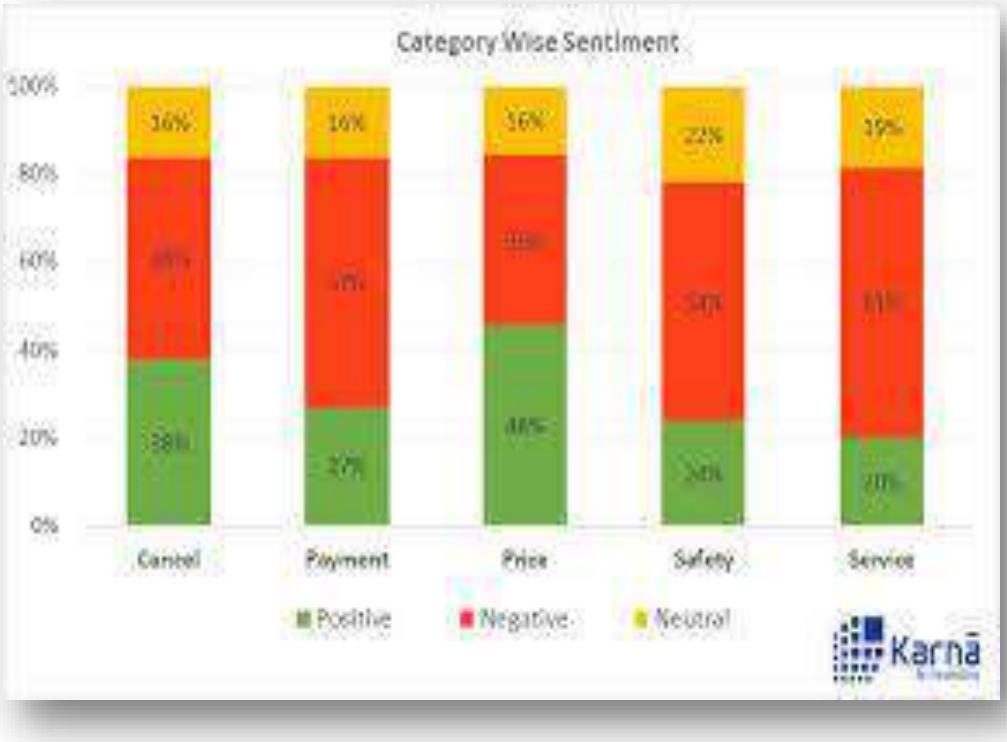


Sentiment analysis assumes various forms, from models that focus on polarity (positive, negative, neutral) to those that detect feelings and emotions (angry, happy, sad, etc), or even models that identify intentions. In Fine-grained Sentiment Analysis,If polarity precision is important to your business, you might consider expanding your polarity categories to include Very positive,Positive,Neutral,Negative and Very negative.

Emotion detection aims at detecting emotions, like happiness, frustration, anger, sadness, and so on. Many emotion detection systems use lexicons (i.e. lists of words and the emotions they convey) or complex machine learning algorithms.

One of the downsides of using lexicons is that people express emotions in different ways.
Usually, when analyzing sentiments of texts, let's say product reviews, you'll want to know which particular aspects or features people are mentioning in a positive, neutral, or negative way. That's where aspect-based sentiment analysis can help, for example in this text: *"The battery life of this camera is too short"*, an aspect-based classifier would be able to determine that the sentence expresses a negative opinion about the feature battery life.

Multilingual sentiment analysis can be difficult. It involves a lot of preprocessing and resources. Most of these resources are available online (e.g. sentiment lexicons), while others need to be created (e.g. translated corpora or noise detection algorithms), but you'll need to know how to code to use them.Alternatively, you could detect language in texts automatically, then train a custom sentiment analysis model to classify texts in the language of your choice.



Sentiment analysis works by using various Natural Language Processing (NLP) methods and algorithms.The main types of algorithms used include Rule-based systems that perform sentiment analysis based on a set of manually crafted rules,Automatic systems that rely on machine learning techniques to learn from data and Hybrid systems that combine both rule-based and automatic approaches.

Benefits of sentiment analysis include helping businesses process huge amounts of data in an efficient and cost-effective way,Real-Time Analysis Sentiment analysis can identify critical issues in real-time, for example is a PR crisis on social media escalating? Is an angry customer about to churn? Sentiment analysis models can help you immediately identify these kinds of situations, so you can take action right away.

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Virtual reality technology transforming cardiovascular medicine

Meenakshi K T | S6 CSE

Rapid advancements in the field of virtual reality are leading to new developments in cardiovascular treatment and improved outcomes for patients, according to a review paper published today in *JACC: Basic to Translational Science*. Extended reality applications in cardiac care include education and training, pre-procedural planning, visualization during a procedure and rehabilitation in post-stroke patients.

"For years, virtual reality technology promised the ability for physicians to move beyond 2D screens in order to understand organ anatomy noninvasively," said Jennifer N.A. Silva, MD, FHRS, assistant professor of pediatrics and cardiology at the Washington University School of Medicine in St. Louis and lead author of the paper.

"However, bulky equipment and low-quality virtual images hindered these developments. Led by the mobile device industry, recent hardware and software developments -- such as head mounted displays and advances in display systems -- have enabled new classes of 3D platforms that are transforming clinical cardiology."

Virtual reality provides complete control over the wearer's visual and auditory experience as they interact within a completely synthetic environment, while augmented reality allows the wearer to see their native environment while placing 2D or 3D images within it. Merged reality and mixed reality allow for interaction with digital objects while preserving a sense of presence within the true physical environment. These technologies make up the full spectrum of extended reality, which is transforming the practice of cardiovascular medicine.

Advances in this technology allow patients and family members to better understand their cardiac conditions, helping them to make more informed decisions surrounding their medical care. Medical students and trainees can better visualize cardiac abnormalities with virtual reality, which allows trainees to simulate operating environments and multiple physicians to interact while viewing the same educational

material in a natural environment. Additionally, 3D workstations may assist physicians in assessing the heart in surgical situations where it may be difficult to see.

However, the authors point out that there are still challenges and limitations."These technologies are still constrained due to cost, size, weight and power to achieve the highest visual quality, mobility, processing speed and interactivity," Silva said. "Every design decision to mitigate these challenges affects applicability for use in each procedural environment."

Still, according to the research, early data show that improved visualization due to this technology will allow physicians to learn more quickly, interpret images more accurately and accomplish interventions in less time. These improvements will most likely translate into lower cost procedures and better outcomes for patients.

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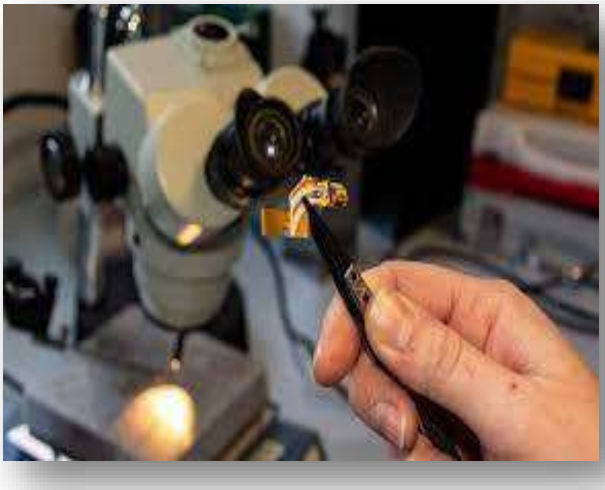
Using sound and light to generate ultra-fast data transfer

Alvin Mohan| S6 CSE

Researchers have made a breakthrough in the control of terahertz quantum cascade lasers, which could lead to the transmission of data at the rate of 100 gigabits per second -- around one thousand times quicker than a fast Ethernet operating at 100 megabits a second.What distinguishes terahertz quantum cascade lasers from other lasers is the fact that they emit light in the terahertz range of the electromagnetic spectrum. They have applications in the field of spectroscopy where they are used in chemical analysis.



The lasers could also eventually provide ultra-fast, short-hop wireless links where large datasets have to be transferred across hospital campuses or between research facilities on universities -- or in satellite communications.To be able to send data at these increased speeds, the lasers need to be modulated very rapidly: switching on and off or pulsing around 100 billion times every second.

Engineers and scientists have so far failed to develop a way of achieving this.A research team from the University of Leeds and University of Nottingham believe they have found a way of delivering ultra- fast modulation, by combining the power of acoustic and light waves. They have published their findings today (February 11th) in *Nature Communications*.

John Cunningham, Professor of Nanoelectronics at Leeds, said: "This is exciting research. At the moment, the system for modulating a quantum cascade laser is electrically driven -- but that system has limitations."Ironically, the same electronics that delivers the modulation usually puts a brake on the speed of the modulation. The mechanism we are developing relies instead on acoustic waves."

A quantum cascade laser is very efficient. As an electron passes through the optical component of the laser, it goes through a series of 'quantum wells' where the energy level of the electron drops and a photon or pulse of light energy is emitted.One electron is capable of emitting multiple photons. It is this process that is controlled during the modulation.

Instead of using external electronics, the teams of researchers at Leeds and Nottingham Universities used acoustic waves to vibrate the quantum wells inside the quantum cascade laser.The acoustic waves were generated by the impact of a pulse from another laser onto an aluminium film. This caused the film to expand and contract, sending a mechanical wave through the quantum cascade laser.

Tony Kent, Professor of Physics at Nottingham said "Essentially, what we did was use the acoustic wave to shake the intricate electronic states inside the quantum cascade laser. We could then see that its terahertz light output was being altered by the acoustic wave."

Professor Cunningham added: "We did not reach a situation where we could stop and start the flow completely, but we were able to control the light output by a few percent, which is a great start."We believe that with further refinement, we will be able to develop a new mechanism for complete control of the photon emissions from the laser, and perhaps even integrate structures generating sound with the terahertz laser, so that no external sound source is needed.

"Professor Kent said: "This result opens a new area for physics and engineering to come together in the exploration of the interaction of terahertz sound and light waves, which could have real technological applications."

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Deep learning enables real-time imaging around corners

Varsha Hari | S6 CSE

Researchers have harnessed the power of a type of artificial intelligence known as deep learning to create a new laser-based system that can image around corners in real time. With further development, the system might let self-driving cars "look" around parked cars or busy intersections to see hazards or pedestrians. It could also be installed on satellites and spacecraft for tasks such as capturing images inside a cave on an asteroid.

"Compared to other approaches, our non-line-of-sight imaging system provides uniquely high resolutions and imaging speeds," said research team leader Christopher A. Metzler from Stanford University and Rice University. "These attributes enable applications that wouldn't otherwise be possible, such as reading the license plate of a hidden car as it is driving or reading a badge worn by someone walking on the other side of a corner."

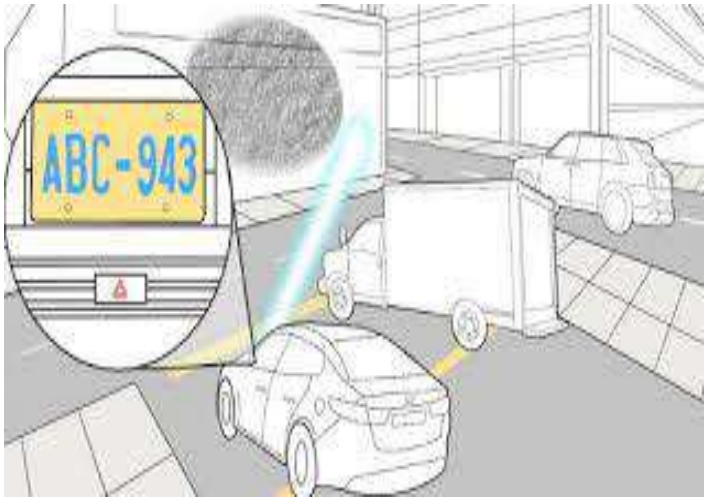
In Optica, The Optical Society's journal for high-impact research, Metzler and colleagues from Princeton University, Southern Methodist University, and Rice University report that the new system can distinguish submillimeter details of a hidden object from 1 meter away. The system is designed to image small objects at very high resolutions but can be combined with other imaging systems that produce low-resolution room-sized reconstructions.

"Non-line-of-sight imaging has important applications in medical imaging, navigation, robotics and defense," said co-author Felix Heide from Princeton University. "Our work takes a step toward enabling its use in a variety of such applications."

The new imaging system uses a commercially available camera sensor and a powerful, but otherwise standard, laser source that is similar to the one found in a laser pointer. The laser beam bounces off a visible wall onto the hidden object and then back onto the wall, creating an interference pattern known as a speckle pattern that encodes the shape of the hidden object.

Reconstructing the hidden object from the speckle pattern requires solving a challenging computational problem. Short exposure times are necessary for real-time imaging but produce too much noise for existing algorithms to work. To solve this problem, the researchers turned to deep learning.

"Compared to other approaches for non-line-of-sight imaging, our deep learning algorithm is far more robust to noise and thus can operate with much shorter exposure times," said co-author Prasanna Rangarajan from Southern Methodist University. "By accurately characterizing the noise, we were able to synthesize data to train the algorithm to solve the reconstruction problem using deep learning without having to capture costly experimental training data."



The researchers tested the new technique by reconstructing images of 1-centimeter-tall letters and numbers hidden behind a corner using an imaging setup about 1 meter from the wall. Using an exposure length of a quarter of a second, the approach produced reconstructions with a resolution of 300 microns.

The research is part of DARPA's Revolutionary Enhancement of Visibility by Exploiting Active Light-fields (REVEAL) program, which is developing a variety of different techniques to image hidden objects around corners. The researchers are now working to make the system practical for more applications by extending the field of view so that it can reconstruct larger objects.

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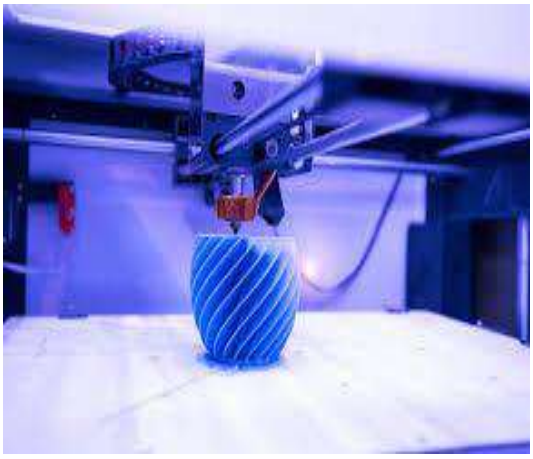
Making 3-D printing smarter with machine learning

Christa Raju | S6 CSE



3-D printing is often touted as the future of manufacturing. It allows us to directly build objects from computer-generated designs, meaning industry can manufacture customized products in-house, without outsourcing parts. But 3-D printing has a high degree of error, such as shape distortion. Each printer is different, and the printed material can shrink and expand in unexpected ways. Manufacturers often need to try many iterations of a print before they get it right.

What happens to the unusable print jobs? They must be discarded, presenting a significant environmental and financial cost to industry.A team of researchers from USC Viterbi School of Engineering is tackling this problem, with a new set of machine learning algorithms and a software tool called PrintFixer, to improve 3-D printing accuracy by 50 percent or more, making the process vastly more economical and sustainable.

The work, recently published in *IEEE Transactions on Automation Science and Engineering*, describes a process called "convolution modeling of 3-D printing." It's among a series of 15 journal articles from the research team covering machine learning for 3-D printing.

The team, led by Qiang Huang, associate professor of industrial and systems engineering, chemical engineering and materials science, along with Ph.D. students Yuanxiang Wang, Nathan Decker, Mingdong Lyu, Weizhi Lin and Christopher Henson has so far received $1.4M funding support, including a recent $350,000 NSF grant. Their objective is to develop an AI model that accurately predicts shape deviations for all types of 3-D printing and make 3-D printing smarter.

"What we have demonstrated so far is that in printed examples the accuracy can improve around 50 percent or more," Huang said. "In cases where we are producing a 3-D object similar to the training cases, overall accuracy improvement can be as high as 90 percent.""It can actually take industry eight iterative builds to get one part correct, for various reasons," Huang said, "and this is for metal, so it's very expensive."

Every 3-D printed object results in some slight deviation from the design, whether this is due to printed material expanding or contracting when printed, or due to the way the printer behaves.PrintFixer uses data gleaned from past 3-D printing jobs to train its AI to predict where the shape distortion will happen, in order to fix print errors before they occur.

Huang said that the research team had aimed to create a model that produced accurate results using the minimum amount of 3-D printing source data."From just five to eight selected objects, we can learn a lot of useful information," Huang said. "We can leverage small amounts of data to make predictions for a wide range of objects."

The team has trained the model to work with the same accuracy across a variety of applications and materials -- from metals for aerospace manufacturing, to thermal plastics for commercial use. The researchers are also working with a dental clinic in Australia on the 3-D printing of dental models."So just like a when a human learns to play baseball, you'll learn softball or some other related sport much quicker," said Decker, who leads the software development effort development in Huang's group. "In that same way, our AI can learn much faster when it has seen it a few times."

"So you can look at it," said Decker, "and see where there are going to be areas that are greater than your tolerances, and whether you want to print it."He said that users

could opt to print with a different, higher-quality printer and use the software to predict whether that would provide a better result."But if you don't want to change the printer, we also have incorporated functionality into the software package allowing the user to compensate for the errors and change the object's shape -- to take the parts that are too small and increase their size, while decreasing the parts that are too big," Decker said. "And then, when they print, they should print with the correct size the first time."

The team's objective is for the software tool to be available to everyone, from large scale commercial manufacturers to 3-D printing hobbyists. Users from around the world will also be able to contribute to improving the software AI through sharing of print output data in a database."Say I'm working with a MakerBot 3-D printer using PLA (a bioplastic used in 3-D Printing), I can put that in the database, and somebody using the same model and material could take my data and learn from it," Decker said."Once we get a lot of people around the world using this, all of a sudden, you have a really incredible opportunity to leverage a lot of data, and that could be a really powerful thing," he said.

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Escapism: A powerful predictor of internet gaming disorder among video gamers

Job V Mathew | S6 CSE

A new study in *Comprehensive Psychiatry*, published by Elsevier, is the first to compare professional electronic sport (esport) players with recreational video game players and explores the similarities and differences between what motivates each group. While the two groups are psychosocially different, they found that both esport and recreational gamers run the risk of developing internet gaming disorder when their intense immersion in the activity is tied to escapism.

"Previous research has linked escapism to psychiatric distress and gaming disorder in recreational gamers. While esport gamers have many positive motivators like skill development, our study found that excessive immersion by some individuals can indicate mental health issues," explained investigator Zsolt Demetrovics, PhD, Institute of Psychology, ELTE Eötvös Loránd University, Budapest, Hungary.

Internet gaming disorder (IGD) is described by leading classification manuals (DSM-5 and ICD-11) as severe behavior patterns that significantly impair personal, family, social, educational, and occupational functioning. Although the condition affects only a minority of gamers, it is associated with depression, anxiety, and social anxiety. Gaming motivations have also been found to predict gaming disorder, especially the incidence of escapism when gamers play video games to avoid real life problems.

The present study demonstrated a number of novel findings which can help move the field forward and suggests a number of practical and policy implications.The investigators surveyed close to 4,300 recreational and esport gamers to gather data about game time, gaming motivations, presence and severity of gaming disorder, and psychiatric symptoms. Additionally, the mediating effect of gaming motivations among esport and recreational gamers between psychiatric distress and problematic gaming was examined.

Their findings revealed that esport gamers spent significantly more time playing video games both on weekdays and weekends than recreational gamers. Esport gamers scored higher on social, competition, and skill development gaming motivations than recreational gamers. In both groups, escapism appeared to be the common predictor of gaming disorder. In the esport group, escapism was the only motivation that had mediating effect, while in the recreational group, competition, fantasy, and coping also showed weak or even negative association with gaming disorder.

The way in which both esport gamers and recreational gamers escape from reality into virtual worlds may be the result of different mechanisms and psychological backgrounds. In some pro players mental health status (stress level, psychosocial well-being, self-esteem) can modify the effect of escapism in the development of gaming disorder."Escapism can cause negative outcomes and interfere with an esport gamer's career just like any sportsman's career could end with a physical injury or trauma," noted Professor Demetrovics. "Future studies should focus on exploring

escapism's mechanism in different subgroups of gamers in relation to problematic gaming to help the development of prevention, intervention, and treatment programs. Recognizing their risks can lead to increased support methods, such as mental training, optimal self-esteem, and adaptive coping strategies for competitive situations."

Further, the results suggest that some esport players might be addicted to gaming like professional poker players being addicted to gambling or professional athletes being addicted to exercise.The results of this study have implications for esports governing bodies. The investigators contend that there is arguably a duty of care for professional esport bodies to ensure that the individuals who engage in the sport, and subsequently develop problems, get help, support, and treatment if they need it.

"While esports bodies like the Electronic Sports League have developed rigorous guidelines around the use of performance enhancing drugs, based on our findings they should also develop a code of conduct that includes guidance and diagnostic checklists concerning problematic gaming and gaming disorder," advised Professor Demetrovics.

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AI can detect low-glucose levels via ECG without fingerprick test

Rahul Krishnan | S6 CSE

A new technology for detecting low glucose levels via ECG using a non-invasive wearable sensor, which with the latest Artificial Intelligence can detect hypoglycaemic events from raw ECG signals has been made by researchers from the University of Warwick.Dr Leandro Pecchia with the new technology from the University of Warwick.Currently Continuous Glucose Monitors (CGM) are available by the NHS for hypoglycaemia detection (sugar levels into blood or derma). They measure glucose in interstitial fluid using an invasive sensor with a little needle, which sends alarms and data to a display device. In many cases, they require calibration twice a day with invasive finger-prick blood glucose level tests.

However, Dr Leandro Pecchia's team at the University of Warwick have published results in a paper titled 'Precision Medicine and Artificial Intelligence: A Pilot Study on Deep Learning for Hypoglycemic Events Detection based on ECG' in the Nature Springer journal *Scientific Reports* proving that using the latest findings of Artificial Intelligence (i.e., deep learning), they can detect hypoglycaemic events from raw ECG signals acquired with off-the-shelf non-invasive wearable sensors.

Two pilot studies with healthy volunteers found the average sensitivity and specificity approximately 82% for hypoglycaemia detection, which is comparable with the current CGM performance, although non-invasive.Dr Leandro Pecchia from the School of Engineering at the University of Warwick comments:"Fingerpicks are never pleasant and in some circumstances are particularly cumbersome. Taking fingerpick during the night certainly is unpleasant, especially for patients in paediatric age.

"Our innovation consisted in using artificial intelligence for automatic detecting hypoglycaemia via few ECG beats. This is relevant because ECG can be detected in any circumstance, including sleeping."The figure shows the output of the algorithms over the time: the green line represents normal glucose levels, while the red line represents the low glucose levels. The horizontal line represents the 4mmol/L glucose

value, which is considered the significant threshold for hypoglycaemic events. The grey area surrounding the continuous line reflects the measurement error bar.

The Warwick model highlights how the ECG changes in each subject during a hypoglycaemic event. The figure below is an exemplar. The solid lines represent the average heartbeats for two different subjects when the glucose level is normal (green line) or low (red line). The red and green shadows represent the standard deviation of the heartbeats around the mean.A comparison highlights that these two subjects have different ECG waveform changes during hypo events. In particular, Subject 1 presents a visibly longer QT interval during hypo, while the subject 2 does not.

The vertical bars represent the relative importance of each ECG wave in determining if a heartbeat is classified as hypo or normal.From these bars, a trained clinician sees that for Subject 1, the T-wave displacement influences classification, reflecting that when the subject is in hypo, the repolarisation of the ventricles is slower.

In Subject 2, the most important components of the ECG are the P-wave and the rising of the T-wave, suggesting that when this subject is in hypo, the depolarisation of the atria and the threshold for ventricular activation are particularly affected. This could influence subsequent clinical interventions.This result is possible because the Warwick AI model is trained with each subject's own data. Intersubjective differences are so significant, that training the system using cohort data would not give the same results. Likewise, personalised therapy based on our system could be more effective than current approaches.

Dr Leandro Pecchia comments:

"The differences highlighted above could explain why previous studies using ECG to detect hypoglycaemic events failed. The performance of AI algorithms trained over cohort ECG-data would be hindered by these inter-subject differences.""Our approach enable personalised tuning of detection algorithms and emphasise how hypoglycaemic events affect ECG in individuals. Basing on this information, clinicians can adapt the therapy to each individual. Clearly more clinical research is required to confirm these results in wider populations. This is why we are looking for partners."

References

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Is virtual reality the next big thing in art therapy?

Rahul Murali | S6 CSE

The ever-expanding field of virtual reality (VR) has been used in health care settings like physical rehabilitation. It's also made its way into therapy settings to reduce phobias and delusions. Could creative arts therapies be the next frontier for VR? Researchers from Drexel University's College of Nursing and Health Professions in the Creative Arts Therapies Department conducted a study to see if VR can be used as an expressive tool in art therapy.

"Art therapy is founded on the idea that creative expression with an art therapist facilitates communication and problem solving, reduces inhibition, alleviates depressive symptoms and promotes personal development," said lead author of the study Girija Kaimal, EdD, an associate professor in the College of Nursing and Health Professions.VR can facilitate the exploration of imaginal worlds, which is a central tenet of the creative processes of both art and play.

Tools like VR also have the potential to help patients with sensory, cognitive and motor-related disabilities who are unable to use traditional art media in therapeutic ways or who need alternative options for creative self-expression.

"With the availability of cost-effective VR solutions, we are seeing an increased adoption of these technologies in hospitals, clinics and healthcare facilities," said Arun Ramakrishnan, PhD, director of Research Labs in the College of Nursing and Health Professions and co-investigator on this project.

In the study, five men and 12 women engaged in free-from, immersive VR art making for about 20 to 25 minutes.The art therapy sessions were conducted with the HTC VIVE VR headset, remote control devices and Leap Motion controller running on a personal computer that could support a session in a virtual space. The software used was Tilt Brush by Google, to create 3D images in VR; Kodon, for virtual sculpting; and Nature Treks, for an immersive three-dimensional environment for relaxation.

After the session, participants were invited to save their artwork and talk about their experience with the art therapist."Most participants reported feeling energized and elated by the experience of being in an imaginal space that was unlike anything that existed in the material world," said Kaimal. "Some were, however, disappointed by the

lack of tangible, physical engagement with the medium and for a few, the experience was disorienting."

Creative expression in VR reduced inhibitions, activated full-body movements and enhanced mood and creative play exploration among participants. They enjoyed the 3D virtual environment and being able to see the art from different angles and perspectives. It also challenged the participants' perceptions of physical reality, traditional art making and art media.

The study did find some downsides to VR in art therapy. VR can be disorienting for those with cognitive, perception and/or inner ear issues. Researchers suggest further exploration of how these experiences might differ for individuals with clinical conditions, differences in physical and/or mental functioning and comfort with digital media.

The digital form meant it was easy to store and save the finished -- or, in some cases, unfinished -- art, but some participants mentioned it was dissatisfying to not have a tangible product.

"This study provides the groundwork for VR as an art therapy tool, especially as the technology becomes more sophisticated," said Kaimal.Researchers from the College of Nursing and Health Professions are continuing this work through several ongoing immersive reality projects in the College's VR labs."These applications are not only improving health and wellness but also enhancing learning," said Deborah Clegg, PhD, associate dean of research in the College of Nursing and Health Professions. "Drexel is on the cutting edge of incorporating this technology into the classroom to enhance education and ultimately health care."

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