DEPERTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Tele Electro

NEWSLETTER

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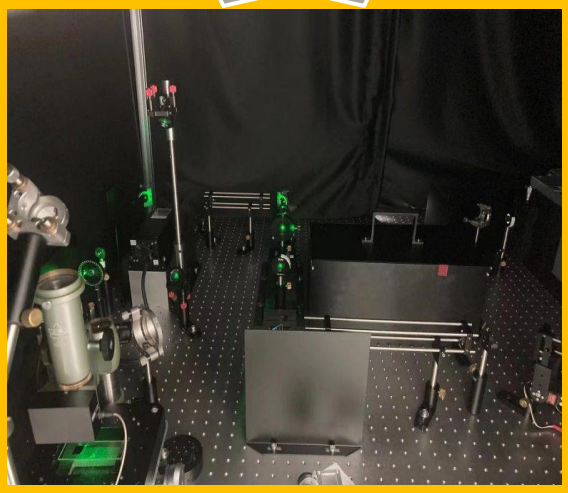

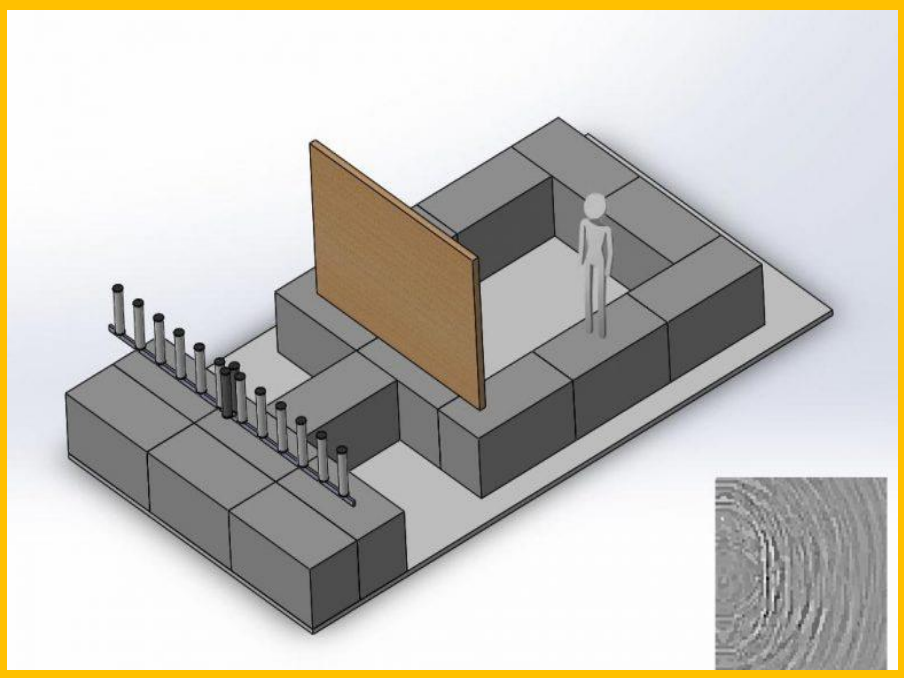

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DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY::GANGURU

Institute Vision

Pioneering Professional Education through Quality.

Institute Mission

1. Quality Education through state-of-art infrastructure, laboratories and committed staff.
2. Moulding Students as proficient, competent, and socially responsible engineering personnel with ingenious intellect.
3. Involving faculty members and students in research and development works for betterment of society.

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Vision

- Pioneering Electronics and Communication Engineering Education & Research to Elevate Rural Community

Mission

- Imparting professional education endowed with ethics and human values to transform students to be competent and committed electronics engineers.
- Adopting best pedagogical methods to maximize knowledge transfer.
- Having adequate mechanisms to enhance understanding of theoretical concepts through practice.
- Establishing an environment conducive for lifelong learning and entrepreneurship development.
- To train as effective innovators and deploy new technologies for service of society.

Principal's Message

Dear Parents and Students,

It is with great pleasure that I welcome you to our College (DIET) Newsletter.

As Principal I am hugely impressed by the commitment of the college and the staff in providing an excellent all-round education for our students with our state of the art facilities. We as a team working together, strongly promote the zeal towards academic achievement among our students. The cultural, sports and other successes of all our students and staff are also proudly celebrated together. I congratulate the staff and students who brought latest technologies and concepts onto the day to day teaching learning platform. As long as our ideas are expressed and thoughts kindled, we can be sure of learning, as everything begins with an idea.

I appreciate every student who shared the joy of participation in co-curricular and extracurricular activities along with their commitment to curriculum. That little extra we do, is the icing on the cake. 'Do more than belong – participate. Do more than care – help. Do more than believe – practice. Do more than be fair – be kind. Do more than forgive – forget. Do more than dream – work.'

With a long and rewarding history of achievement in education behind us, our DIET community continues to move forward together with confidence, pride and enthusiasm.

I hope you enjoy your visit to the website, and should you wish to contact us, please find details at the www.diet.ac.in

Yours in Education,

Dr. Ravi Kadiyala
Principal

HOD's Message

The Department of Electronics & Communication Engineering (ECE) has consistently maintained an exemplary academic record. The greatest asset of the department is its highly motivated and learned faculty. The available diversity of expertise of the faculty with the support of the other staff prepares the students to work in global multicultural environment. The graduates of the Electronics & Communication Stream have been selected by some of the world's leading corporations & as well as by most of the leading Indian counter parts. We hope that we will continue to deliver our best to serve the society and mankind. It is also expected that our students will continue to pass-on the skills which they have developed during their stay at this department to whole of the world for a better society.

Dr.G.L.Madhumati

Professor & HOD

Dept. of ECE

Dhanekula Institute of Engineering & Technology

Editor's Note

Dear Readers,

It gives us great pleasure to bring you the sixth issue of **Tele-Electro** for the academic year 2020-21, the Department newsletter of Dhanekula Institute of Engineering & Technology, Ganguru.

The name and fame of an institute depends on the caliber and achievements of the students and teachers. The role of a teacher is to be a facilitator in nurturing the skills and talents of students.

This Newsletter is a platform to exhibit the literary skills and innovative ideas of teachers and students. **Tele-Electro** presents the achievements of students and con-tributions of teachers.

We profusely thank the management for giving support and encouragement and a free hand in this endeavor. Last but not the least we are thankful to all the authors who have sent their articles. We truly hope that the pages that follow will make an interesting read.

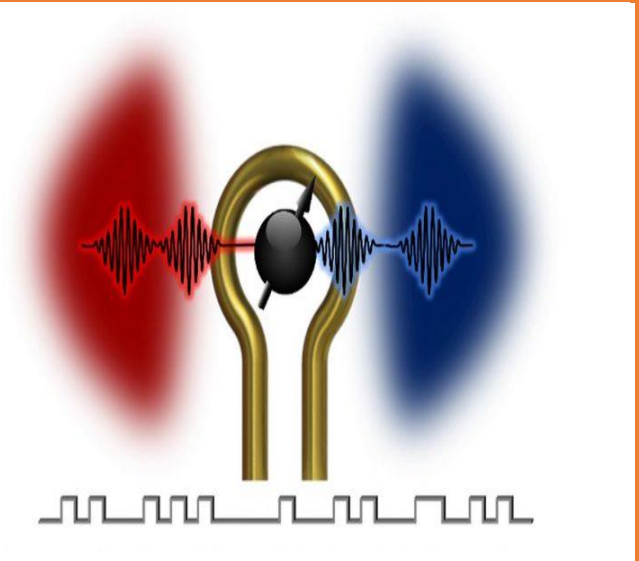
Mr. N Nagaraju
Faculty Member

P.Sai Bhavana
Student Coordinator

P.Harshita
Student Coordinator

STUDENT ARTICLES

New Technology Opens the Gate to the Next Generation of Information Processing



New method for information processing: The coherent information exchange (black undulating lines) between magnons (shaded red area) and microwave photons (shaded blue area) is controlled by turning an electric pulse on and off (square wave at bottom). Credit: Image by Xufeng Zhang, Argonne National Laboratory

New technology paves the way for improved information transfer in both classical and quantum regimes.

Many of us swing through gates every day — points of entry and exit to a space like a garden, park or subway. Electronics have gates too. These control the flow of information from one place to another by means of an electrical signal. Unlike a garden gate, these gates require control of their opening and closing many times faster than the blink of an eye.

Scientists at the U.S. Department of Energy's (DOE) Argonne National Laboratory and the University of Chicago's Pritzker School of Molecular Engineering have devised a unique means of achieving effective gate operation with a form of information processing called electromagnonics.

Their pivotal discovery allows real-time control of information transfer between microwave photons and magnons. And it could result in a new generation of classical electronic and quantum signal devices that can be used in various applications such as signal switching, low-power computing and **quantum networking**.

"Signal processing that couples spin waves and microwaves is a high-wire act. The signal must remain coherent despite dissipations and other outside effects threatening to throw the system into incoherence."

Microwave photons are elementary particles forming the electromagnetic waves employed in, for example, wireless communications. Magnons are the particle-like representatives of "spin waves." That is, wave-like disturbances in an ordered array of microscopically aligned spins that occur in certain magnetic materials.

"Many research groups are combining different types of information carriers for information processing," said Xufeng Zhang, assistant scientist in the Center for Nanoscale Materials, a DOE Office of Science User Facility at Argonne. "Such hybrid systems would enable practical applications that are not possible with information carriers of a single type."

"Signal processing that couples spin waves and microwaves is a high-wire act," added Zhang. "The signal must remain coherent despite energy dissipations and other outside effects threatening to throw the system into incoherence."

Coherent gate operation (control over on, off and duration of the magnon-photon interaction) has been a long sought-after goal in hybrid magnonic systems. In principle, this can be achieved by rapid tuning of energy levels between the photon and magnon. However, such tuning has depended on changing the geometric configuration of the device. That typically requires much longer than the magnon lifetime — on the order of 100 nanoseconds (one-hundred billionths of a second). This lack of a rapid tuning mechanism for interacting magnons and photons has made it impossible to achieve any real-time gating control.

Using a novel method involving energy-level tuning, the team was able to rapidly switch between magnonic and photonic states over a period shorter than the

magnon or photon lifetimes. This period is a mere 10 to 100 nanoseconds.

“We start by tuning the photon and magnon with an electric pulse so that they have the same energy level,” said Zhang. “Then, the information exchange starts between them and continues until the electric pulse is turned off, which shifts the energy level of the magnon away from that of the photon.”

By this mechanism, Zhang said, the team can control the flow of information so that it is all in the photon or all in the magnon or some place in between. This is made possible by a novel device design that allows nanosecond tuning of a magnetic field which controls the magnon energy level. This tunability allows the desired coherent gate operation.

This research points to a new direction for electromagnonics. Most importantly, the demonstrated mechanism not only works in the classical electronics régime, but can also be readily applied for manipulating magnonic states in the quantum régime. This opens opportunities for electromagnonics-based signal processing in **quantum computing**, communications and sensing.

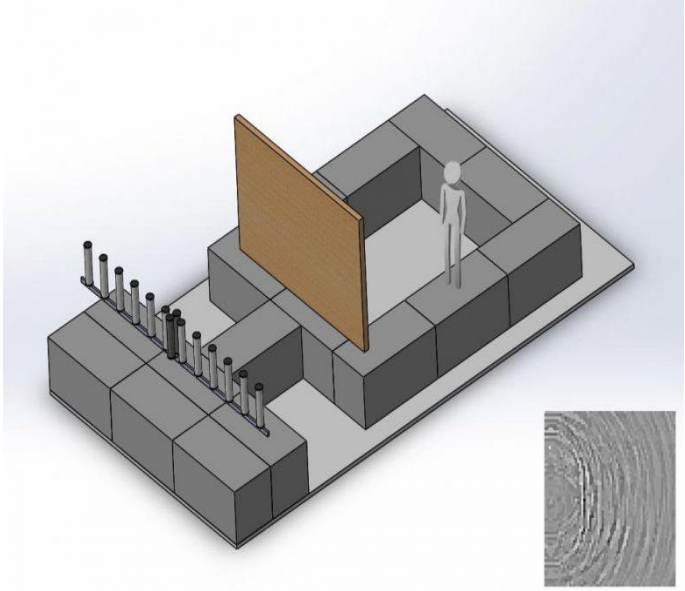
This research was partially supported by the DOE Office of Basic Energy Sciences. It was reported in *Physical Review Letters*, in a paper titled “Coherent gate operations in hybrid magnonics.” In addition to Zhang, authors include Jing Xu, Changchun Zhong, Xu Han, Dafei Jin and Liang Jiang.

Article by
PENUGONDA LAKSHMI MANJUSHA
188T1A0445
III-ECE

New Technology Uses Radio Signals to Image Hidden and Speeding Objects

Researchers at the National Institute of Standards and Technology (NIST) and Wavsens LLC have developed a method for using radio signals to create real-time images and videos of hidden and moving objects, which could help firefighters find escape routes or victims inside buildings filled with fire and smoke. The technique could also help track hypersonic objects such as missiles and space debris.

The new method, described in *Nature Communications*, could provide critical information to help reduce deaths and injuries. Locating and tracking first responders indoors is a prime goal for the public safety community. Hundreds of thousands of pieces of orbiting space junk are considered dangerous to humans and spacecraft.



“Our system allows real-time imaging around corners and through walls and tracking of fast-moving objects such as millimeter-sized space debris flying at 10 kilometers per second, more than 20,000 miles per hour, all from standoff distances,” said physicist Fabio da Silva, who led the development of the system while working at NIST.

This demonstration of the m-Widar (micro-Wave image detection, analysis and ranging) system shows, in the video on the left, a person walking and later crouching and lying down in an anechoic chamber. The transmitters and receiver are in a vertical line on the right side of the chamber. The second video on the right shows the instrument’s view of the same scene. About 21 seconds into the video, a wallboard is inserted between the person and the instrument in the anechoic chamber, to show that m-Widar can “see” through walls. Credit: NIST

“Because we use radio signals, they go through almost everything, like concrete, drywall, wood, and glass,” da Silva added. “It’s pretty cool because not only can we look behind walls, but it takes only a few microseconds of data to make an image frame. The sampling happens at the speed of light, as fast as physically possible.”

The NIST imaging method is a variation on radar, which sends an electromagnetic pulse, waits for the reflections, and measures the round-trip time to determine distance to a target. Multisite radar usually has one transmitter and several receivers that receive echoes and triangulate them to locate an object.

“We exploited the multisite radar concept but in our case use lots of transmitters and one receiver,” da Silva said. “That way, anything that reflects anywhere in space, we are able to locate and image.”

Da Silva explains the imaging process like this:

“To image a building, the actual volume of interest is much smaller than the volume of the building itself because it’s mostly empty space with sparse stuff in it. To locate a person, you would divide the building into a matrix of cubes. Ordinarily, you would transmit radio signals to each cube individually and analyze the reflections, which is very time consuming. By contrast, the NIST method probes all cubes at the same time and uses the return echo from, say, 10 out of 100 cubes to calculate where the person is. All transmissions will return an image, with the signals forming a pattern and the empty cubes dropping out.”

Da Silva has applied for a patent, and he recently left NIST to commercialize the system under the name m-Widar (microwave image detection, analysis, and ranging) through a startup company, Wavsens LLC (Westminster, Colorado).

The NIST team demonstrated the technique in an anechoic (non-echoing) chamber, making images of a 3D scene involving a person moving behind drywall. The transmitter power was equivalent to 12 cellphones sending signals simultaneously to create images of the target from a distance of about 10 meters (30 feet) through the wallboard.

Da Silva said the current system has a potential range of up to several kilometers. With some improvements the range could be much farther, limited only by transmitter power and receiver sensitivity, he said.

The basic technique is a form of computational imaging known as transient rendering, which has been around as an image reconstruction tool since 2008. The idea is to use a small sample of signal measurements to reconstruct images based on random patterns and correlations. The technique has previously been used in communications coding and network management, machine learning and some advanced forms of imaging.

Da Silva combined signal processing and modeling techniques from other fields to create a new mathematical formula to reconstruct images. Each transmitter emits different pulse patterns simultaneously, in a specific type of random sequence, which interfere in space and time with the pulses from the other transmitters and produce enough information to build an image.

The transmitting antennas operated at frequencies from 200 megahertz to 10 gigahertz, roughly the upper half of the radio spectrum, which includes microwaves. The receiver consisted of two antennas connected to a signal digitizer. The digitized data were transferred to a laptop computer and uploaded to the graphics processing unit to reconstruct the images.

The NIST team used the method to reconstruct a scene with 1.5 billion samples per second, a corresponding image frame rate of 366 kilohertz (frames per second). By comparison, this is about 100 to 1,000 times more frames per second than a cellphone video camera.

With 12 antennas, the NIST system generated 4096-pixel images, with a resolution of about 10 centimeters across a 10-meter scene. This image resolution can be useful when sensitivity or privacy is a concern. However, the resolution could be improved by upgrading the system using existing technology, including more transmitting antennas and faster random signal generators and digitizers.

In the future, the images could be improved by using quantum entanglement, in which the properties of individual radio signals would become interlinked. Entanglement can improve sensitivity. Radio-

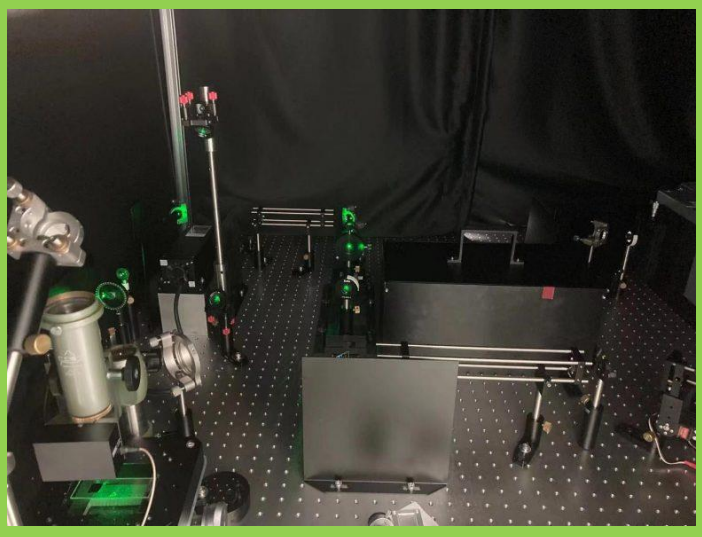
frequency quantum illumination schemes could increase reception sensitivity.

The new imaging technique could also be adapted to transmit visible light instead of radio signals — ultrafast lasers could boost image resolution but would lose the capability to penetrate walls — or sound waves used for sonar and ultrasound imaging applications.

In addition to imaging of emergency conditions and space debris, the new method might also be used to measure the velocity of shock waves, a key metric for evaluating explosives, and to monitor vital signs such as heart rate and respiration, da Silva said.

Article by
Y NAGA LAKSHMI MUKUNDA PRIYA
188T1A0456
III-ECE

Creating Precise Colors: New Algorithms Give Digital Images More Realistic Color



Method could help improve color for electronic displays and create more natural LED lighting.

If you've ever tried to capture a sunset with your smartphone, you know that the colors don't always match what you see in real life. Researchers are coming closer to solving this problem with a new set of algorithms that make it possible to record and display color in digital images in a much more realistic fashion.

"When we see a beautiful scene, we want to record it and share it with others," said Min Qiu, leader of the Laboratory of Photonics and Instrumentation for Nano Technology (PAINT) at Westlake University in China. "But we don't want to see a digital photo or video with the wrong colors. Our new algorithms can help digital camera and electronic display developers better adapt their devices to our eyes."

In *Optica*, The Optical Society's (OSA) journal for high impact research, Qiu and colleagues describe a new approach for digitizing color. It can be applied to cameras and displays — including ones used for computers, televisions, and mobile devices — and used to fine-tune the color of LED lighting.

"Our new approach can improve today's commercially available displays or enhance the sense of reality for new technologies such as near-eye-displays for virtual reality and augmented reality glasses," said Jiyong Wang, a member of the PAINT research team. "It can also be used to produce LED lighting for hospitals, tunnels, submarines, and airplanes that precisely mimics natural sunlight. This can help regulate circadian rhythm in people who are lacking sun exposure, for example."

Researchers developed algorithms that correlate digital signals with colors in a standard CIE color space. The video shows how various colors are created in the CIE 1931 chromatic diagram by mixing three colors of light. Credit: Min Qiu's PAINT research group, Westlake University

Mixing digital color

Digital colors such as the ones on a television or smartphone screen are typically created by combining red, green, and blue (RGB), with each color assigned a value. For example, an RGB value of (255, 0, 0) represents pure red. The RGB value reflects a relative mixing ratio of three primary lights produced by an electronic device. However,

not all devices produce this primary light in the same way, which means that identical RGB coordinates can look like different colors on different devices.

There are also other ways, or color spaces, used to define colors such as hue, saturation, value (HSV) or cyan, magenta, yellow and black (CMYK). To make it possible to compare colors in different color spaces, the International Commission on Illumination (CIE) issued standards for defining colors visible to humans based on the optical responses of our eyes. Applying these standards requires scientists and engineers to convert digital, computer-based color spaces such as RGB to CIE-based color spaces when designing and calibrating their electronic devices.

In the new work, the researchers developed algorithms that directly correlate digital signals with the colors in a standard CIE color space, making color space conversions unnecessary. Colors, as defined by the CIE standards, are created through additive color mixing. This process involves calculating the CIE values for the primary lights driven by digital signals and then mixing those together to create the color. To encode colors based on the CIE standards, the algorithms convert the digital pulsed signals for each primary color into unique coordinates for the CIE color space. To decode the colors, another algorithm extracts the digital signals from an expected color in the CIE color space.

“Our new method maps the digital signals directly to a CIE color space,” said Wang. “Because such color space isn’t device dependent, the same values should be perceived as the same color even if different devices are used. Our algorithms also allow other important properties of color such as brightness and chromaticity to be treated independently and precisely.”

Creating precise colors

The researchers tested their new algorithms with lighting, display, and sensing applications that involved LEDs and lasers. Their results agreed very well with their expectations and calculations. For example, they showed that chromaticity, which is a measure of colorfulness independent of brightness, could be controlled with a deviation of just ~0.0001 for LEDs and 0.001 for lasers. These values are so small that most people would not be able to perceive any differences in color.

The researchers say that the method is ready to be applied to LED lights and commercially available displays. However, achieving the ultimate goal of reproducing exactly what we see with our eyes will require solving additional scientific and technical problems. For example, to record a scene as we see it, color sensors in a digital camera would need to respond to light in the same way as the photoreceptors in our eyes.

To further build on their work, the researchers are using state-of-art nanotechnologies to enhance the sensitivity of color sensors. This could be applied for artificial vision technologies to help people who have color blindness, for example.

Article by
G BHAVANA
188T1A0474
III-ECE

Using Artificial Intelligence to Improve the Way Videos Are Organized

Netra, co-founded by Shashi Kant SM '06, uses artificial intelligence to help companies sort and manage video content.

At any given moment, many thousands of new videos are being posted to sites like YouTube, TikTok, and Instagram. An increasing number of those videos are being recorded and streamed live. But tech and media companies still struggle to understand what's going in all that content.

Now MIT alumnus-founded Netra is using artificial intelligence to improve video analysis at scale. The company's system can identify activities, objects, emotions, locations, and more to organize and provide context to videos in new ways.

Companies are using Netra's solution to group similar content into highlight reels or news segments, flag nudity and violence, and improve ad placement. In advertising, Netra is helping ensure videos are paired with relevant ads so brands can move away from tracking individual people, which has led to privacy concerns.

"The industry as a whole is pivoting toward content-based advertising, or what they call affinity advertising, and away from cookie-based, pixel-based tracking, which was always sort of creepy," Netra co-founder and CTO Shashi Kant SM '06 says.

Netra also believes it is improving the searchability of video content. Once videos are processed by Netra's system, users can start a search with a keyword. From there, they can click on results to see similar content and find increasingly specific events.

For instance, Netra's system can process a baseball season's worth of video and help users find all the singles. By clicking on certain plays to see more like it, they can also find all the singles that were almost outs and led the fans to boo angrily.

"Video is by far the biggest information resource today," Kant says. "It dwarfs text by orders of magnitude in terms of information richness and size, yet no one's even touched it with search. It's the whitest of white space."

Pursuing a vision

Internet pioneer and MIT professor Sir Tim Berners-Lee has long worked to improve machines' ability to make sense of data on the internet. Kant researched under Berners-Lee as a graduate student and was inspired by his vision for improving the way information is stored and used by machines.

"The holy grail to me is a new paradigm in information retrieval," Kant says. "I feel web search is still 1.0. Even Google is 1.0. That's been the vision of Sir Tim Berners-Lee's semantic web initiative and that's what I took from that experience."

Kant was also a member of the winning team in the MIT $100K Entrepreneurship Competition (the MIT $50K back then). He helped write the computer code for a solution called the Active Joint Brace, which was an electromechanical orthotic device for people with disabilities.

After graduating in 2006, Kant started a company that used AI in its solution called Cognika. AI still had a bad reputation from being overhyped, so Kant would use terms like cognitive computing when pitching his company to investors and customers.

Kant started Netra in 2013 to use AI for video analysis. These days he has to deal with the opposite end of the hype spectrum, with so many startups claiming they use AI in their solution.

Netra tries cutting through the hype with demonstrations of its system. Netra can quickly analyze videos and organize the content based on what's going on in different clips, including scenes where people are doing similar things, expressing similar emotions, using similar products, and more. Netra's analysis generates metadata for different scenes, but Kant says Netra's system provides much more than keyword tagging.

"What we work with are embeddings," Kant explains, referring to how his system classifies content. "If there's a scene of someone hitting a home run, there's a certain signature to that, and we generate an embedding for that. An embedding is a sequence of numbers, or a 'vector,' that captures the essence of a piece of content. Tags are just human readable representations of that. So, we'll train a model that detects all the home runs, but underneath the cover there's a neural network, and it's creating an embedding of that video, and that

differentiates the scene in other ways from an out or a walk."

By defining the relationships between different clips, Netra's system allows customers to organize and search their content in new ways. Media companies can determine the most exciting moments of sporting events based on fans' emotions. They can also group content by subject, location, or by whether or not clips include sensitive or disturbing content.

Those abilities have major implications for online advertising. An advertising company representing a brand like the outdoor apparel company Patagonia could use Netra's system to place Patagonia's ads next to hiking content. Media companies could offer brands like Nike advertising space around clips of sponsored athletes.

Those capabilities are helping advertisers adhere to new privacy regulations around the world that put restrictions on gathering data on individual people, especially children. Targeting certain groups of people with ads and tracking them across the web has also become controversial.

Kant believes Netra's AI engine is a step toward giving consumers more control over their data, an idea long championed by Berners-Lee.

"It's not the implementation of my CSAIL work, but I'd say the conceptual ideas I was pursuing at CSAIL come through in Netra's solution," Kant says.

Transforming the way information is stored

Netra currently counts some of the country's largest media and advertising companies as customers. Kant believes Netra's system could one day help anyone search through and organize the growing ocean of video content on the internet. To that end, he sees Netra's solution continuing to evolve.

"Search hasn't changed much since it was invented for web 1.0," Kant says. "Right now there's lots of link-based search. Links are obsolete in my view. You don't want to visit different documents. You want information from those documents aggregated into something contextual and customizable, including just the information you need."

"Search hasn't changed much since it was invented for web 1.0," Kant says. "Right now there's lots of link-based search. Links are obsolete in my view. You don't want to visit different documents. You want information from those documents aggregated into something contextual and customizable, including just the information you need."

Kant believes such contextualization would greatly improve the way information is organized and shared on the internet.

"It's about relying less and less on keywords and more and more on examples," Kant explains. "For instance, in this video, if Shashi makes a statement, is that because he's a crackpot or is there more to it? Imagine a system that could say, 'This other scientist said something similar to validate that statement and this scientist responded similarly to that question.' To me, those types of things are the future of information retrieval, and that's my life's passion. That's why I came to MIT. That's why I've spent one and a half decades of my life fighting this battle of AI, and that's what I'll continue to do."

Article by
N.NAGARAJU
Assistant Professor

NSS EVENTS

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

NSS CELL

EVENT REPORT

Our college NSS volunteers for their services towards online COVID-19 task force for CII Yi, Amaravathi on 04-05-2021. These are the list of volunteers allotted to the services

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2	Vengala Reddy Challa	Civil	8985052051	vengalareddy.challa@gmail.com
3	Nandam Santosh	Mech	8008136768	santoshnandam007@gmail.com
4	Sachin Jha	ECE	8639030893	sachin.jha.0516@gmail.com

DHANEKULA INSTITUTE OF ENGINEERING & TECHNOLOGY

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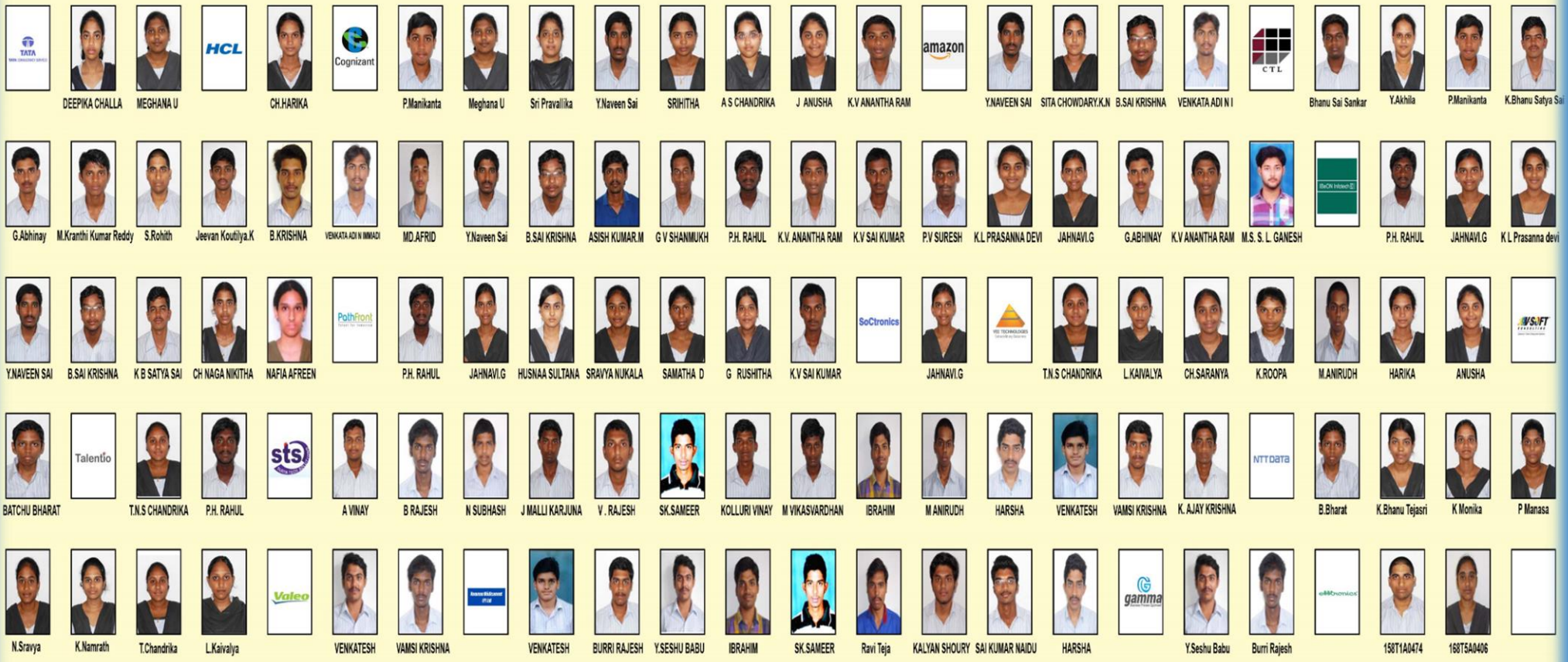
DEPARTMENT OF ECE

TRAINING, PLACEMENT & CAREER GUIDANCE CELL

WORDS REALLY FAIL TO EXPRESS OUR JOY AT THE NEWS OF YOUR SELECTION FOR THE REPUTED ORGANISATIONS RANGING FROM NATIONAL REPUTATION AND INTERNATIONAL RECOGNITION. YOUR SELECTION WAS HOWEVER, NO SURPRISE BECAUSE YOUNG AND TALENTED TECHNOCRATS OF YOUR CALIBER AND SUPERIOR INTELLIGENCE WERE BOUND TO FARE EXCELLENTLY.



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