

February-2021

Electro-Nation

"BE the BEST version of YOU"



**SPECIAL
ARTICLES
SERIES.....**

***New research in
Electronics...***

**SNJB'S KBJ, COE. DEPARTMENT OF ELECTRONICS AND
TELECOMM. ENGINEERING , CHANDWAD.**

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Electronics & Telecommunication

Vision of the Department

To prepare Electronics & Telecommunication engineers for the benefit of the society.

Mission of the Department

- M1. To provide quality education to students.
- M2. To enrich the skill in collaboration with industry for better career opportunity.
- M3. To inculcate ethics, values and environment awareness

Program specific outcomes

- PSO1. Apply their skills in designing, implementing and testing electronic systems.
- PSO2. Demonstrate proficiency in use of modern electronic design automation (EDA) tools.
- PSO3. Communicate and work effectively as individuals and as team members.

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(2020-21)**



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INDEX

1. Arduino Simulators	02
2. Lora	04
3. Aloe E-Cell	06
4. Data From The SKY-DRONES	08
5. Protenta h7:A new Controller	09
6. Waterless Solar Panels Cleaning Robots	11
7. XDC Install's World's First 300 mm MicroLED	13
8. Samsung to make chips for mobile	14
9. 6G	15
10. Remote Sensing	17
11. Graphine Super Capacitor	19
12. World's smallest computer is here	20
13. Light carrying chips, Advance machine learning, Artificial intelligence...	21
14. Siemen's Digital twin: a virtual representation of a physical Product	23
15. Memoristor	25
16. Transforming the UK Telecoms Market	26
17. The Road to Zero	28
18. Metafly	30
19. Process People Technology	31
20. Women Safety Gadgets	32
21.21. Improving Agriculture With Deep Learning	34

Arduino Simulators

- **Proteus**

Proteus is a great Arduino simulator that combines simplicity with its various features and manages to make Arduino simulation seem like the easiest thing.

- **Autodesk Eagle**

Autodesk Eagle provides powerful and easy to use tools for every engineer out there. You can now bring your electronic inventions to life with the help of a complete set of PCB layout and schematic editing tools, community-driven features and library content.

- **Autodesk Circuits**

Autodesk Circuits allows you to bring your ideas to life with online free and easy to use tools. In case you are only a beginner, you can start with more simple experiments in the Circuit Scribe or the Electronics Lab. Users who are more experienced can skip ahead and go straight to PCB Design.

- **Virtronics Simulator for Arduino**

This Victronics Arduino simulator promises to be the most full-featured one that is available now.

- **Electronify**

Electronify can be very helpful in case you are struggling with electronics and especially if you have found yourself stuck in your electronics projects. It will also come in handy if you are a newbie and you desire to learn electronics and embedded system to make yourself a career in the field. With Electronify you will be able to learn basic electronics to various hardware level language.

- **Fritzing**

Fritzing is an open source hardware initiative that makes electronics accessible as a creative material for everyone who is interested in the subject. The website provides a software tool, community, and services in the spirit of Arduino and processing and it fosters a creative ecosystem that allows users the following: Documenting their prototypes, Sharing the prototypes with others, Teaching electronics in a classroom,

With Fritzing, you can inexpensively and quickly turn your circuit into a real custom-made PCB. This tool can only act as a creative platform if lots of users are using it as a means of learning and sharing.

- **Thinker Cad**

It is good for both Breadboard training and Arduino circuit simulation.

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Dr. AGRAWAL R K
HOD (E&TC)

LORA

LoRa (short for long range) is a spread spectrum modulation technique derived from chirp spread spectrum (CSS) technology. Semtech's LoRa devices and wireless radio frequency technology is a long range, low power wireless platform that has become the de facto technology for Internet of Things (IoT) networks worldwide. LoRa devices and the open LoRaWAN® protocol enable smart IoT applications that solve some of the biggest challenges facing our planet: energy management, natural resource reduction, pollution control, infrastructure efficiency, disaster prevention, and more. With over 167 million devices connected to networks in 99 countries and growing, LoRa devices are creating a Smarter Planet.



- **What is LoRaWAN**

The LoRaWAN open specification is a low power, wide area networking (LPWAN) protocol based on LoRa Technology. Designed to wirelessly connect battery operated things to the Internet in regional, national or global networks, the LoRaWAN protocol leverages the unlicensed radio spectrum in the Industrial, Scientific and Medical (ISM) band.

• **LoRA Devices Connected Everywhere**

1. LoRa Modulation:

LoRa is physical silicon layer or wireless modulation used to create a long range communication link.

2. Transceivers and End Nodes:

Transceivers configured with LoRa devices are embedded into end nodes or sensor devices

3. Picocells and Gateways:

Sensors capture and transmit data to gateways over distances near and far, indoor and outdoor, with minimum power requirement

Network Server:

Gateways Send information via Wi-Fi , Internet or cellular to the network server, which is responsible for network management functions like over-the air activation,data , duplication,traffic management,etc

• **Key Features of LoRa Technology**

- 1.Long Range
- 2.Low Power
- 3.Secure
- 4.Standardize
- 5.Geo-location
- 6.Mobile
- 7.High Capacity
- 8.Low Cost

**-VIVEK PAWER
SE(E&TC)**

ALOE E-CELL

Yes plant based power generating sources. **This company has been declared as one of the winners in Start up India competition 2020 in the energy department.** The company is a private firm owned by Nimisha Varma and Naveen Suman. The company was established in the year 2019 and is been registered at Registrar of Companies, Kanpur.

Batteries are generally made up of harmful chemicals which when used completely are thrown away and later those harmful chemicals release in to the dump areas or landfill areas which when exposed to sun rays lead to landfill fires.

So according to the company the main idea to come up with this idea of making aloe e-cells was that it would not only save the environment but would also provide many farmers a job. Also the e-cells production cost would be 10% less and would last 50% more than the normal batteries.

Now one might think how is it possible to generate electricity from aloevera? The director's of the company have aimed to make the e-cell batteries using aloevera. They found a method of converting the chemical energy inside the aloevera plant into electrical energy. Detailed process as how this conversion takes place is yet to be known but there are some previous references which have proven that it is possible to convert the energy from plants into electrical energy.

Some of the advantages that the Company claimed while talking about their ideas were:

.The aloevera batteries would be 100% natural and eco friendly battery cells.

These batteries would be the first in the world to be completely non hazardous.

The batteries would run 50% more than the normal mercury lead made batteries.

The cost would be 10% less than those of the normal batteries.

The concept is completely made in India therefore it would be a boost for the Indian economy too.

Last but not the least this startup would give many farmers and other people jobs for survival

- **Aloe-cell :**

Aloe E-cell is not just a product its the need of today.

Its an Eco-Friendly approach to quench the thirst of your devices.

We at Aloe Ecell have created world's first 100% Eco friendly and non hazardous batteries using AL-OEVERA.

We have replaced the toxic and hazardous chemicals of the batteries with the herbal electrolyte.



**-YASH SONAR
SE (E&TC)**

DATA FROM THE SKY-DRONES



With the assistance of drones farmers have an opportunity to define crop biomass, plant height, the presence of weeds, and water saturation on certain field areas with high precision. They deliver better and more accurate data with higher resolution in comparison to satellites. When they are locally operated, they provide valuable information even faster than scouts. Drones are also considered to be unrivaled aides in the battle against insects; the invasion is prevented by applying the insecticide on the hazard areas using drones, all while reducing the likelihood of direct exposure leading to chemical poisoning.

Despite the fact that drones are easy to use and are capable of collecting large amounts of data within short time frames, there are still challenges when using them on a constant basis as they don't come cheap. Drones are almost helpless where mapping or monitoring of large areas is required, and it is better to complement the technology with satellite monitoring among already mapped areas, where specific zones need to be cross-checked.

**-AHER PRATIKSHA
TE (E&TC)**

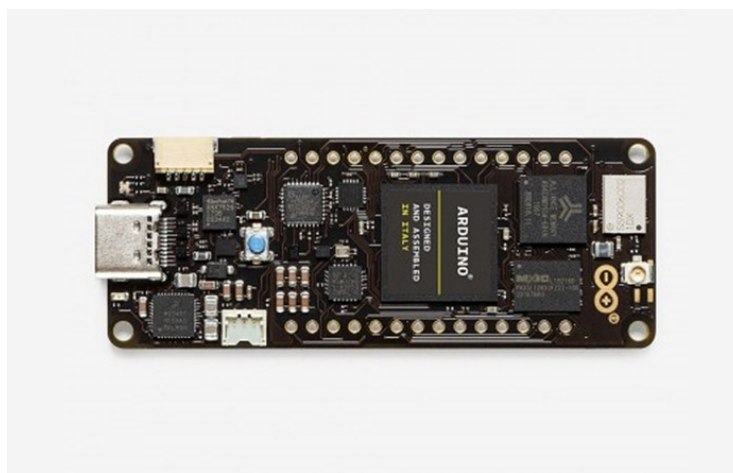
Portenta h7:A new Controller

Portenta H7 simultaneously runs high level code along with real time tasks. The design includes two processors that can run tasks in parallel. For example, is possible to execute Arduino compiled code along with MicroPython one, and have both cores to communicate with one another. The Portenta functionality is two-fold, it can either be running like any other embedded microcontroller board, or as the main processor of an embedded computer. For example, use the [Portenta Vision Shield](#) to transform your H7 into an industrial camera capable of performing real time machine learning algorithms on live video feeds.

Portenta can easily run processes created with TensorFlow™ Lite, you could have one of the cores computing a computer vision algorithm on the fly, while the other could be making low-level operations like controlling a motor, or acting as a user interface.

Use Portenta when performance is key, among other cases, we envision it to be part of:

High-end industrial machinery Labrotary equipment computer vision ,PLC's Industry Ready user interfaces Robotics Controller Mission-critical Devices,Dedicated Stationary Computer High-speed booting computation (ms)



The Portenta H7 is a highly configurable design, it is possible to order boards with different configurations of memory, crypto chip, antenna, etc. These request will be channelled through Arduino's sales team and will require a minimum amount order. We recommend you try the default H7 configuration and if you need specific features for your solution, then contact us to discuss the terms.

- Batteries, Pins and board LEDs:
- Battery capacity: Rechargeable Li-Ion, or Li-Po. Please make sur the battery connector suits your battery.
- Vin: This pin can be used to power the board with a regulated 5V source. If the power is fed through this pin, the USB power source is disconnected. This is the only way you can supply 5v (range is 5V to maximum 6V) to the board not using USB. This pin is an INPUT.
- 5V: This pin outputs 5V from the board when powered from the USB connector or from the VIN pin of the board. It is unregulated and the voltage is taken directly from the inputs.

**-NILESH ASHOK AHIRE
BE (E &TC)**

Waterless Solar Panels Cleaning Robots

Solar panels are known to sustain themselves for a long time without requiring much maintenance and effort. However, this is only applicable to areas receiving adequate rainfall throughout the year. Due to their inclined installation, rainfall washes most of the dirt, bird droppings, and dust settlement. But in dusty regions, or where the panels have stood for a long time, cleaning by rainfall is no longer enough.

In addition, manual cleaning is a risky and tedious job. Any exposed cable or a loose connection can lead to severe shock hazards. This is when professional cleaning services become a necessity to maintain the desired performance and keep accidents at bay.



To overcome these hurdles, startup Aegus Technologies has come up with intelligent waterless solar panel cleaning robots, namely Unicorn and Shreem, with an aim to protect the environment and save precious water resources. Waterless solar panel cleaning is a new technology, which uses a dry cleaning technique to enhance the capability of solar energy harnessing system.

To overcome these hurdles, startup Aegus Technologies has come up with intelligent waterless solar panel cleaning robots, namely Unicorn and Shreem, with an aim to protect the environment and save precious water resources. Waterless solar panel cleaning is a new technology, which uses a dry cleaning technique to enhance the ability of solar energy harnessing system. Unicorn is a smart robot with machine learning (ML) capabilities. It senses dust levels and cleans accordingly. It can also differentiate dust from bird droppings or panel breakage.

It features a rotary brush coupled with blower and auxiliary brushes to clean the panels. Unicorn can be set to operate at a fixed time of the day and week by using time mode, or it can be operated based on the dust level when set in auto mode. The fully automated system is ideally suited for both rooftops and ground mount farms, irrespective of the size and geography.

It sends a communication to the central monitoring station or designated mobile phone over GPRS when manual intervention is required. This intelligent robot can easily clean 400-800 panels per hour, depending upon the level of dust.

-
-RAKESH SHELKE
TE(E&TC)

XDC Install's World's First 300 mm MicroLED



Display Company (XDC), a leader in MicroLED displays, announced the installation of the world's first 300mm Elastomer Stamp based Micro Transfer Printing (MTP) equipment in 2020.

XDC's team has been pioneering Micro Transfer Printing (commonly referred to as Mass Transfer) for the past 15 years, and has created a novel way to build MicroLED displays. In addition to being the inventors of the technology and related processes, XDC has also been designing and manufacturing tools and equipment for MTP. XDC's tabletop, 200mm, 300mm and custom panel tools are reliable, cost effective and support a number of applications and different phases of development from lab to mass production.

Justin Brown, VP of Operations at X Display Company said, "15 years ago, we had to build our own equipment to support a brand new Micro Transfer Printing technology. Today, customers that license our technology prefer to buy equipment and tools from us that are guaranteed to deliver exceptional performance."

XDC, a pioneer in the MicroLED space, has been designing MTP equipment since 2005. The company has already signed licensing agreements with global players in the display industry that will mass produce MicroLED displays using XDC's elastomer stamp based micro transfer technology and its foundational IP that includes over 500 patents. Further, XDC expects to install several more MTP tools at various locations in 2021.

**KOMAL PAWAR
SE (E&TC)**

Samsung to make chips for mobile

South Korean technology multinational company Samsung is considering spending over 10 billion dollars to build an advanced chip-making plant in Austin, Texas, USA. This new plant might be capable of making processors with **3nm** advanced architecture.

This would be Samsung's third worldwide plant to use extreme ultraviolet lithography technology in its chip production.

The new US-based Samsung fabrication plant could provide the company with a strong foothold in getting new contracts from US customers amidst the ongoing trade tensions between the US and China. This move from Samsung would also bring it into closer competition with **TSMC**, which manufactures chips for **Apple**, among others, including the **5nm** processors found inside Apple's latest iPhones and Macs.

Samsung plans to invest one hundred sixteen billion dollars over the next decade into non-memory chips, which will be produced in Austin and are currently thought to be limited to lesser advanced 14 nm process nodes.

Samsung hopes to begin offering chips based on the newer 3nm processor node technology in 2022. While the South Korean giant's strength has traditionally been in memory chips, the market for logic devices like smartphones and computer processors is more profitable.

The company still faces a big challenge competing with TSMC, which plans to invest \$28 billion this year alone

AARATI ZAWAR

BE(.E&TC)

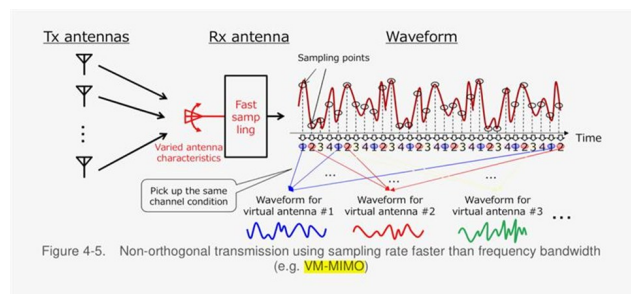
6G



5G is still in the early stages of its rollout but the attention in R&D is now on the next generation to come, even if its launch may be some way off.

At the VLSI Symposia 2020 in June, Takehiro Nakamura, senior VP and general manager of 5G Laboratories at NTT Docomo, said he expects 6G to arrive a decade from now. But geopolitics driven by the US even with a change in administration may play a role in speeding up the development of follow-ons to 5G.

In an online seminar earlier this autumn organised by Stanford University's Institute for Human-Centered Artificial Intelligence (HAI) group, Mike Brown, director of the US Defense Innovation Unit, pointed to the way in which Chinese suppliers had overtaken telecom suppliers based in the west: "On 5G, we were asleep at the switch: we've l Many of the design targets for 6G look similar to those that drove the 5G effort: even higher data rates but at lower latency and with lower energy consumption per bit. Though applications such as augmented and virtual reality remain niches, technologists such as Nakamura look to those areas as being drivers for the additional performance. The Covid-19 pandemic may have a hand in driving these technologies forward as artificial reality applications will support greater use of teleworking. "Large amount of information will need to be transferred between physical space and cyberspace," he says.



Change is already happening

Some of the changes that will be needed for 6G are already happening. Nakamura says machine learning is likely to become ubiquitous in cellular. "We think AI can be used to improve system performance: AI and machine learning should be integrated into everything."

AI can help improve performance, radio designers are looking at increasingly exotic mechanisms to try to push wireless data rates towards the 1Tbit/s target researchers such as Professor Gerhard Fettweis of the Technical University of Dresden see as feasible by the mid 2030s. Similar to 5G,

More novel circuit techniques will probably need to be found to deliver on the performance targets of 6G without compromising energy targets. But with maybe a decade to go, the likelihood of more being identified seems a safe bet.

APURVA JADHAV
BE (E& TC)

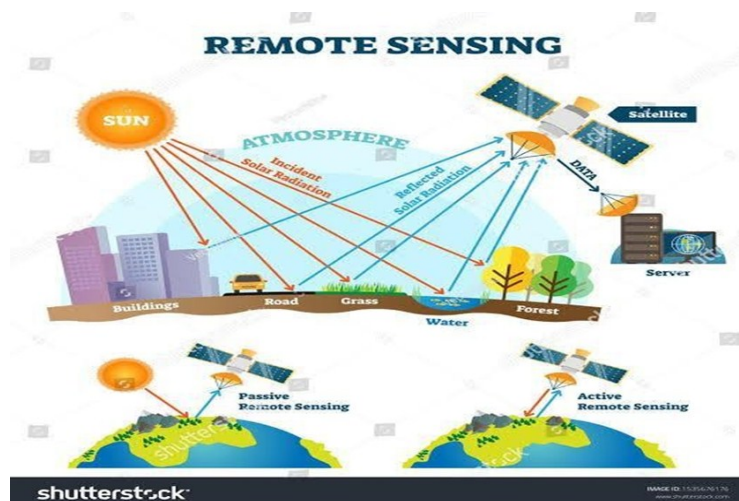
REMOTE SENSING

Remote sensing is the process of detecting and monitoring the physical characteristics of an area by measuring its reflected and emitted radiation at a distance (typically from satellite or aircraft). Special cameras collect remotely sensed images, which help researchers "sense" things about the Earth. Some examples are:

Cameras on satellites and airplanes take images of large areas on the Earth's surface, allowing us to see much more than we can see when standing on the ground. Sonar systems on ships can be used to create images of the ocean floor without needing to travel to the bottom of the ocean. Cameras on satellites can be used to make images of temperature changes in the oceans.

Some specific uses of remotely sensed images of the Earth include:

- Large forest fires can be mapped from space, allowing rangers to see a much larger area than from the ground.
- Tracking clouds to help predict the weather or watching erupting volcanoes, and help watching for dust storms.
- Tracking the growth of a city and changes in farmland or forests over several years or decades. Discovery and mapping of the rugged topography of the ocean floor (e.g., huge mountain ranges, deep-canyons, and the “magnetic striping” on the ocean floor).



Looking into the future, we should devise practical means to make space technology and remote sensing/ GIS application beneficial to sustainable development as declared in the First Ministerial Meeting on RESAP of ESCAP held in Beijing, China in 1997 and subsequent GEOSS Meeting in Tokyo, Japan in 2004. Government should set aside some budget for human resource development. Private sectors should play an increasing role in CSR especially in people participation of remote sensing application in their locality to realize the slogan of “think globally, act locally”. In some countries, big MNC’s spent a lot of money on reforestation with the slogan, such as, one million acres of reforestation in three years, but very few money and effort was put into monitoring of the project sites.

Space faring nations should help in the indigenous development of space technology in the new comer countries so that they can stand on their feet in the long run. UN bodies should spend their budget on human resources development as in the 1970’s and 1980’s and less on meetings and paperwork. Countries themselves should strive for self – dependent and work harder on their own. They should plan carefully, taking their national priorities into serious consideration. They should also avoid political influence in the operation of remote sensing undertakings or related application based organizations. Otherwise, they may be led astray and will not accomplish their goal. In this context, I would suggest those interested to read the book “India 2020: A Vision for the New Millennium”.

India has been very successful in the space program and remote sensing has turned a vast area of waste land into productive agricultural land making India self sufficient in food and in recent years become one of the top rice exporters of the world.

PRASAD KULKARNI
(SE E&TC)

GRAPHENE SUPER CAPACITOR

What are Supercapacitors ?

Supercapacitors, also known as EDLC (Electric Double Layer Capacitor) for ultracapacitor, the file from regular capacitor in that they can store tremendous amount of energy.



Supercapacitors store energy and have higher capacitance value and larger voltage limits than traditional capacitors and can function somewhat like rechargeable batteries. A supercapacitor, which can often store almost as much energy as a lithium-ion battery, offers the advantages of increased energy storage. Supercapacitors allows for the power density of capacitor – they can deliver a lot of energy in quick bursts – while also providing high energy storage capabilities and charging incredibly rapidly. Graphene help enhance supercapacitors because it is exceptionally conductive, so graphene supercapacitors are ideal for high frequency application, where as traditional supercapacitors are not. Graphene allows for structuring and scaling down, so it has application in the computer Processing Unit (CPU) and integrated circuits where standard capacitor material do not. Graphene supercapacitor may also be able to combine with carbon nanotubes to help connect the geometrically unique graphene structure into a comprehensive network.

Supercapacitors are currently used to harvest power from regenerative braking system and release power to help hybrid buses accelerate, provide cranking power and voltage stabilization in start/stop system, backup and peak power for Automotive application, assist in train acceleration, open aircraft doors in the event of power failure, help increase reliability and stability of the energy grid of blade Pitch system, capture energy and provide burst power to assist in lifting operation, provide energy to data centres between power failures and initiation of backup power system, such as diesel generators for fuel cells and provide energy Storage for firming the output of renewable installation and increasing their grid stability.

LAJIMA TIWARI
SE(E&TC)

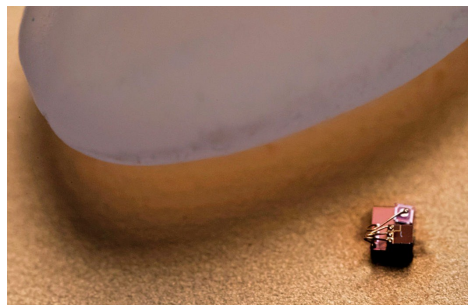
World's Smallest Computer is Here

When IBM announced in March that it had produced the world's smallest computer, it raised a few eyebrows at University of Michigan, which is home to the previous champion of tiny computing. Now, the team at Michigan University has developed an even smaller device, measuring just 0.3mm to a side—smaller than a grain of rice.

IBM has called for a re-examination of what constitutes a computer. Previous systems, including 2x2x4mm Michigan Micro Mote, retain their programming and data even when these are not externally powered. Unplug a desktop computer, and its program and data are still there when it boots itself up once the power is back. These new microdevices, from IBM and now Michigan, lose all prior programming and data as soon as they lose power.

In addition to RAM and photovoltaics, the new computing devices have processors and wireless transmitters and receivers. Because these are too small to have conventional radio antennae, these receive and transmit data with visible light. A base station provides light for power and programming, and it receives data.

One of the big challenges in making a computer about one-tenth the size of IBM's was figuring out how to run at very low power when the system packaging had to be transparent. Light from the base station—and from the device's own transmission LED—can induce currents in its tiny circuits.



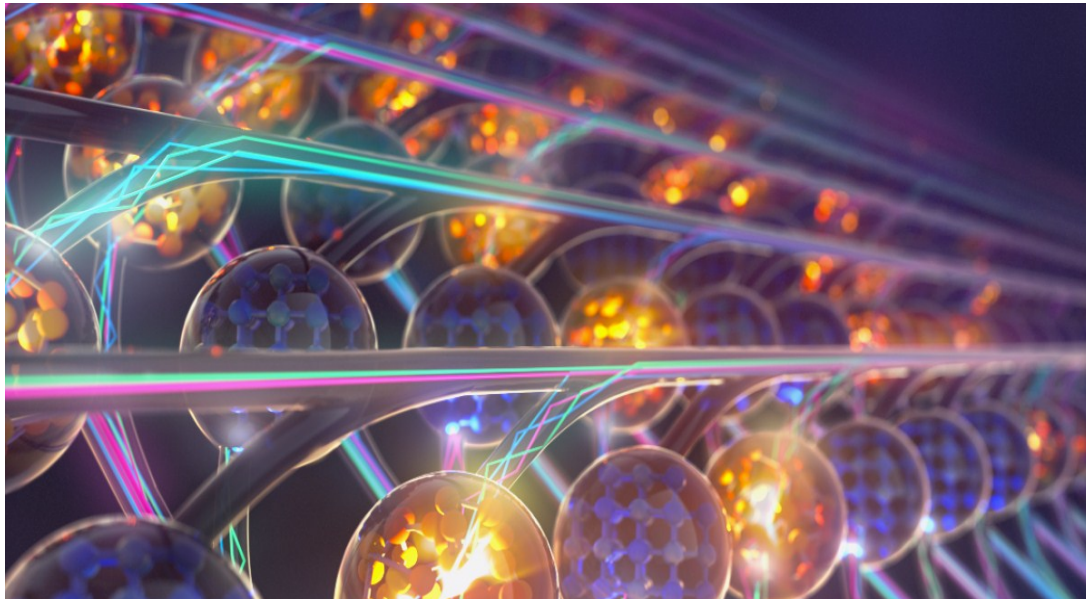
We basically had to invent new ways of approaching circuit design that would be equally low power but could also tolerate light,” said David Blaauw, professor of electrical and computer engineering, who led the development of the new system together with Dennis Sylvester, also professor of ECE, and Jamie Phillips, an Arthur F. Thurnau Professor and professor of ECE. That meant exchanging diodes, which can act like tiny solar cells, for switched capacitors.

MRUAL WAGH
BE (E&TC)

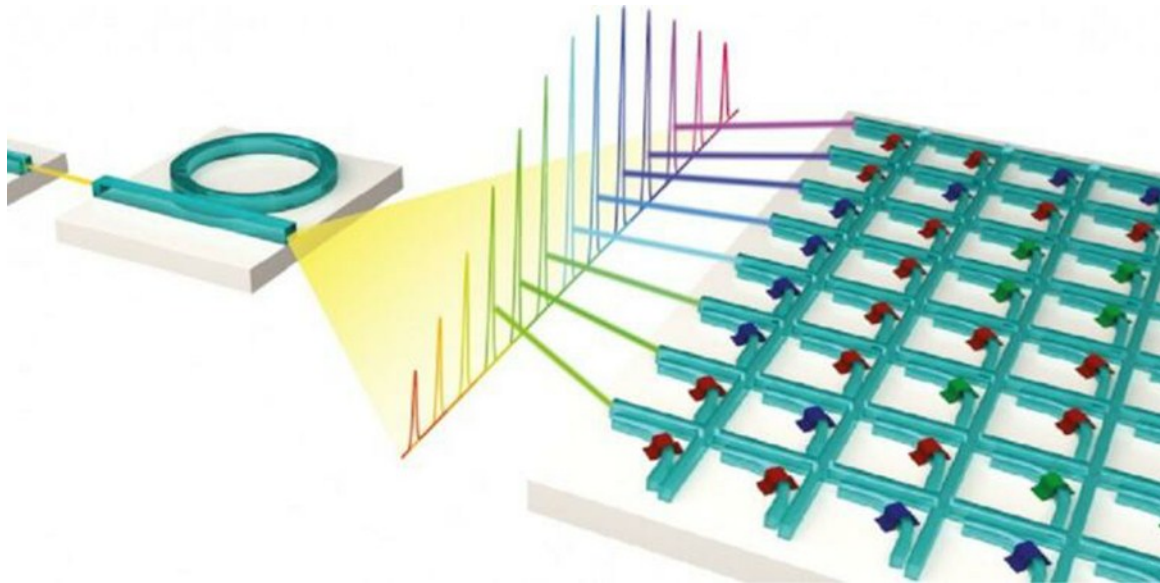
Light carrying chips, Advance machine learning, Artificial intelligence.....

Introduction: Researchers found that so-called “photonic light” can process information very much more rapidly and in parallel than electronic chips. ([Nano photonic chips](#))

Full story: In the digital age, data traffic is growing at an exponential rate. The demands on computing power for applications in artificial intelligence such as pattern and speech recognition in particular, or for self-driving vehicles, often exceeds the capacities of conventional computer processors. Working together with an international team, researchers at the University of Munster are developing new approaches and process architectures which can cope with these tasks extremely efficient. They have now shown that so-called [photonic processors](#), with which



- Deep learning of chips (background and methodology):



- Light-based processors for speeding up tasks in the field of machine learning enable complex mathematical tasks to be processed at enormously fast speeds (10^{12} - 10^{14} operations per second). Conventional chips such as graphic cards or specialized hardware like Google's TPU (Tensor Processing Unit) are based on electronic data transfer and are much slower. The team of researchers led by
- Wolfram Penrice from the Institute of Physics and the Center for Soft Nano science at the University of Münster implemented a hardware accelerator for so-called matrix multiplications, which represent the main processing load in the computation of neural networks.
- Neural networks are a series of algorithms which simulate the human brain. This is helpful, for example, for classifying objects in images and for speech recognition. The researchers combined the photonic structures with phase-change materials (PCMs) as energy-efficient storage elements. PCMs are usually used with DVDs or Blu-ray discs in optical data storage.

SATPUTE KOMAL
SE (E & TC)

Siemen's Digital Twin: a Virtual representation of a physical product

A digital twin is a virtual representation of a physical product that can help understand and predict the physical counterpart's performance characteristics. Digital twins are used to simulating, predict, and optimise the product and production system before investing in physical prototypes.

Ola has partnered with Siemens to leverage the latter's technology at its upcoming electric SCOOTER manufacturing facility in Tamil Nadu. Ola's factory will be built on Industry 4.0 principles and will be the most advanced manufacturing facility in the country. It will have almost 5,000 robots deployed across various functions.

As part of the partnership, Ola will have access to Siemens' integrated 'Digital Twin' design and manufacturing solutions to digitalise and validate product and production ahead of actual operations, it added. The factory will be artificial intelligence-powered with Ola's proprietary AI Engine and tech stack deeply integrated into every aspect of the manufacturing process, continuously self-learning and optimising every aspect of the manufacturing process.

This will provide unprecedented control, automation and quality to the entire operations, especially with Ola's implementation of cyber-physical and advanced Internet of Things systems.

Ola said the entire material handling at its factory would be fully automated for maximum efficiency - right from raw materials to materials movement inside the factory, to the storage, to the finished scooter rolling off the production lines and being loaded onto trucks. The factory is expected to generate almost 10,000 jobs and, with an initial capacity of 2 million units a year. It will serve as Ola's global manufacturing hub catering to its customers in India as well as key markets across Europe, U.K., Latin America and ANZ.

MediaTek Dimensity 1200, 1100: 5G chipsets

Taiwanese fabless chipmaker MediaTek on Wednesday launched two new 5G chipsets--MediaTek Dimensity 1200 and MediaTek Dimensity 1100 with AI, camera, and multimedia improvements.

The Dimensity 1200 has an octa-core CPU, comprising Arm Cortex-A78 clocked up to 3GHz, three Arm Cortex-A78 super cores and four Arm Cortex-A55 efficiency cores. It also features a nine-core GPU and hexa-core MediaTek APU 3.0.

The Dimensity 1100 is an octa-core CPU that includes four Arm Cortex-A78 cores operating at up to 2.6GHz and four Arm Cortex-A55 efficiency cores, along with a nine-core Arm Mali-G77 GPU.

Both chipsets are manufactured on TSMC's 6nm process technology.

The Dimensity 1200 supports 200MP photos powered by five-core HDR-ISP, staggered 4K HDR video, and MediaTek APU 3.0. While Dimensity 1100 packs 108MP camera support, and integrates MediaTek's existing APU 3.0.

Both chipsets support AI camera features including AI-Panorama Night Shot, AI Multi-Person Bokeh, AI noise reduction (AINR), and HDR capabilities. The chipsets also support new AI-enhanced video playback features.

The Dimensity 1200 supports 168Hz refresh rates and the Dimensity 1100 also supports displays with 144Hz refresh rates. Both chipsets support MediaTek's HyperEngine 3.0 gaming technologies.

Dimensity 1200 and 1100 both support Bluetooth 5.2 and ultra-low latency true wireless stereo audio and LC3 encoding.



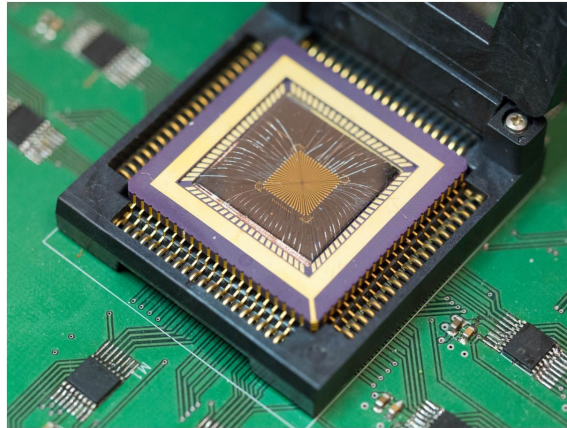
MONIKA G. SHENDGE
SE (E&TC)

Memristor

Memristor theory was formulated and named by Leon Chua in a 1971 paper. Chua strongly believed that a fourth device existed to provide conceptual symmetry with the resistor, capacitor and inductor. The known three fundamental circuit elements as resistor, capacitor and inductor relates four fundamental circuit variables as electric current, voltage, charges and magnetic flux.

A single memristor can perform the same logic functions as multiple transistors making them a promising way to increase computer power. Memristors could also prove to be a faster, smaller, more energy-efficient alternative to flash storage.

to build brain like learning machines with nano-scale memristive synapses.



In a paper published today in science, robotics a team of researchers from the University of Southern California in Los Angeles and the Air Force Research Laboratory in Rome, N.Y., demonstrate a simple self-balancing robot that uses memristors to form a highly effective analog control system inspired by the functional structure of the human brain.

This has generated unprecedented, worldwide interests because among many applications, memristors can be used as super-dense-non-volatile memory for building instant turn-on computers. There are suggestions from many researchers that memristor based analog memory can be used to build brain like learning machines with nano-scale memristive synapses.

Vaishnavi Sanap
SE (E&TC)

Transforming the UK Telecoms Market

Forthcoming telecommunication legislation is likely to have a significant impact on the UK electronics industry, as **Dr Andy G Sellars** explains.

Forthcoming legislation is likely to have a profound effect on the UK's telecoms market and, by extension, the electronics companies in the supply chain. This legislation includes the National Security and Investment Bill and the Telecom Security Bill.

As a non-profit research and technology organisation helping UK companies develop advanced electronics, the Compound Semiconductor Applications (CSA) Catapult has followed these developments closely, consulting widely with our industrial and academic partners.

National Security and Investment Bill

The National Security and Investment bill aims to bring the UK in line with other major economies by protecting intellectual property and assets of strategic national importance. The bill had its first reading in Parliament in July 2020, and its second reading in November 2020.

The bill identifies 17 'key sectors' of strategic national importance. Many of these sectors are relevant to telecoms including: advanced materials; artificial intelligence; communications; computing hardware; cryptographic authentication; data infrastructure; quantum technologies and satellite and space technologies.

Companies operating in these sectors must notify the Secretary of State for the Department of Business Energy and industrial Strategy (BEIS) when they intend to transfer a sizeable proportion of their assets, exceeding 25%, to an overseas entity. The bill gives the Secretary of State power to intervene and block the acquisition.



- **Opportunities for UK electronics**

Telecom diversification has the potential to create a level playing field for innovative new entrants, including many UK companies, enabling them to provide a larger proportion of UK infrastructure. While the UK no longer has a recognised OEM, we have many companies developing world-leading technologies for the global telecoms market. These technologies include small cell base-stations, complementing the more established macro sell base stations; backhaul; satellite communications; optical transceivers for fibre communication; quantum encryption; compound semiconductors; digital chip design and software development.

The UK also has world-leading companies providing test and validation. Many companies design and manufacture these technologies in the UK.

The market opportunity is substantial; the rollout of fibre to the premise (FTTP) and 5G deployment, including small cell and macro cell, is estimated to be around £50-100bn in the UK alone. As other countries adopt open standards, this will create export opportunities for technologies developed the UK.

Developing next generation telecoms will inevitably stimulate novel innovations, and intellectual property, with some innovations falling within the scope of the National Security and Investment Bill.

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POONAM WAGH
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THE ROAD TO ZERO

Short abstract

Imagine that, in 2050, not a single person in the United States dies in a traffic crash. This article describes how changes in policy, technology, and social norms can substantially improve road safety, leading to zero roadway deaths by 2050.

Keywords:

Autonomous Vehicles, Traffic Accidents, Transportation Planning, Transportation Safety, United States

Abstract

Imagine that, in 2050, not a single person in the United States dies in a traffic crash. This is the scenario described in this article, in which RAND researchers set forth a vision and strategy for achieving zero roadway deaths by 2050. The authors propose that a combination of three approaches can realize this scenario. The first is doubling down on programs and policies that have already been shown to be effective, including laws and enforcement, changes to roadway infrastructure designed to reduce traffic conflicts, reductions in speeds where crashes are likely, improvements to emergency response and trauma care, and more safety education and outreach. The second is accelerating advanced technology, beginning with advanced driver assistance systems (many of which are already in the market) and progressing up to fully automated vehicles. The third is prioritizing safety, which includes both (1) embracing a new safety culture that will lead Americans to think differently about our individual and collective choices and (2) widespread adoption of the “Safe System” approach, a paradigm shift in addressing the causes and prevention of roadway deaths and injuries. The authors conclude with a list of actions that key stakeholders—including professional engineering and planning organizations, public-sector organizations, safety advocates, vehicle manufacturers, technology developers, public health, emergency medical and trauma care organizations, and law enforcement and judicial system representatives—can take to bring about the changes needed to achieve zero roadway deaths by 2050.

Why Zero? Is This Really Possible?

Back in the world of 2018, the idea of a future with literally zero roadway deaths seems like a pipe dream. Roadway deaths—deaths due to traffic crashes—have

The Road to Zero Coalition Has Taken on This Challenge

The Road to Zero Coalition was established by assembling a wide-ranging group of stakeholders to provide a major push to achieve zero roadway deaths. This is the largest and broadest coalition that has ever focused on roadway safety in the United States. The RTZ Coalition was launched in 2016 in reaction to sharp increases in roadway deaths and has brought together more than 650 professional associations, businesses and industry associations, safety groups, government agencies, and nonprofit organizations. With a clear, compelling, and unifying vision, the RTZ Coalition is a powerful force for change. National Safety Council commissioned the RAND Corporation to develop a process for the RTZ Coalition to create an overall vision and strategy to reach zero deaths. The process included convening three intensive workshops in 2017 to bring together disparate stakeholders to discuss vision, goals, obstacles, approaches, strategies, tactics, and ultimately a scenario of how zero deaths could be achieved by 2050 and what that future might look like. This study is the result of that process. While this study presents one of potentially many scenarios, it incorporates the perspectives and suggestions of a wide variety of road safety stakeholders.

Double Down on What Works

The United States has both an accumulated body of evidence-based countermeasures and a well-established network of experts who can deploy them. The RTZ Coalition envisions engaging political leaders and decisionmakers to support policies and identify new or shared resources for research, roadway design and construction, vehicle engineering, law enforcement, consumer education, and trauma care. Because motor vehicle crashes represent the single largest cause of workplace fatalities, the RTZ Coalition will look to establish partnerships with businesses at the state and community levels as an important source of new energy for such change.

DAMINI BACHHAV
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MetaFly

MetaFly has a wingspan of 29 centimetres, length of 19 centimetres and weighs less than 10 grams. The 0.8-watt coreless motor drives a gearbox with a 1/36 reduction. The remote measures 10cm x 15cm. Wings are built from carbon-fibre and liquid crystal polymer, and the tail can be moved up or down to give users more control or speed during flight

MetaFly, a new flying experience

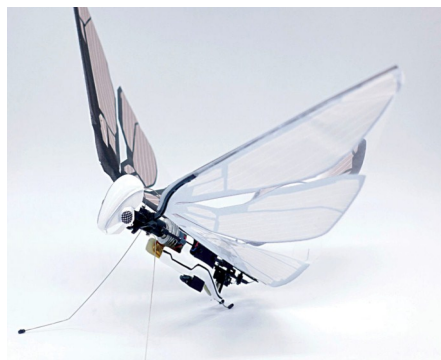
Edwin Van Ruymbeke and his team at BionicBird have developed MetaFly, a remote-controlled ornithopter, and are running a Kickstarter Campaign to fund the first production run.

The aircraft can be controlled with a two-channel remote control, and has a range of 100 metres. Speeds up to 18 kilometres per hour can be reached, and the 55mA per hour hybrid lithium-polymer battery gives eight minutes of flight from a 12-minute charge. An upgrade kit available through the campaign lets users bring a power bank along during flights for even longer flying times, as reported

The stretchable, flexible, and self-healing materials that can mimic the features of an animal or human skin are called electronic skin. There is a wide range of materials that respond to changes in pressure and heat and are capable of measuring information via physical interaction.

Those materials could open new doors to useful applications, such as prosthetics, soft robotics, health monitoring, and artificial intelligence. The future designs of new electronic skins would include materials with high mechanical strength, better sensing ability, recyclability, and self-healing properties.

An electronic tongue, on the other hand, measures and compares tastes. It contains multiple sensors; each has a different spectrum of reaction, capable of detecting organic and inorganic compounds.



UJWAL MORE
BE (E&TC)

Process, People Technology

When it comes to the adoption of technology, manufacturers need to take a strategic approach that brings processes, people and technology together.

A recent survey conducted by the Made Smarter North West pilot of small businesses operating in the region, found that too many were operating without a strategic plan when it came to digitalisation and investing in new technology.



“Manufacturers recognise that digital tools and technology are essential to remain competitive, cut costs, increase growth, and enhance the customer experience, and without capitalising on the opportunities digital technology offers, risk getting left behind,” said Donna Edwards, programme director for the Made Smarter North West pilot. “But it is also clear that too many makers have employed technology without the technical understanding of which areas to focus on first – which leads to disparate, disconnected equipment, and increases the risk of wasted time, money and effort.”

Manufacturers must take a strategic approach to capitalise on technology adoption yet, according to this survey, 55% don't include technology in their vision and growth strategy, despite there being a huge appetite and motivation to introduce new digital tools into their operations.

The research suggests that too few UK businesses are approaching the opportunities and challenges of Industrial 4.0 in a planned, strategic manner and despite an appetite for technology adoption, barriers remain with the biggest being insufficient capital and a need for guidance.

According to Edwards, “Before implementing technology, makers need to consider whether they have a culture of innovation, the right skill sets, good digital leadership, and the buy-in and support of the team. Then they need to identify the most effective technologies to overcome their operational challenges and create a digital transformation roadmap to help them achieve their goals.

KIRAN DARADE

TE E&TC

Women safety gadgets

Women safety in India is highly compromised which have actually resulted in making India - A Vulnerable Country, especially for women. So, there is a high need for women to be aware of all the self-defense techniques and all the smart apps that are made for women safety. Not only these women safety gadgets can protect you from all the risky situations but they are also easy and safe to carry in your hand-bag. So lets walk through all the essential women safety gadgets that every independent lady should carry as the mantra is to “Be Safe”.

- **Safelet**

Safelet is wearable women safety device with two buttons on the side that can be used to send a message or contact the guardian member. It also syncs with the user’s cell phone to start audio recording. In case of risky situation, the concerned member who receives the alert can immediately dial the emergency number 911 from within the app. the emergency number 911 from within the app



Pepper Spray Pistol



Safelet

- **Pepper Spray Pistol**

Pepper spray pistol is among the legally approved women self-defence appliances. It is way different than other pepper sprays as it doesn’t require to be sprayed on eyes. As this spray act as irritant affecting the eyes and skin of the person. Always remember two sprays are capable to affect the attacker. If you press continuously then the bottle will be emptied in 6 seconds.

- **Safety Rod**

The telescopic batons can be played very well for both offence and defence techniques in self-defense. Safety rods can deliver a massive pain with a shock to the attacker. The simple motto of this device is to save you from all the risky

- **Sonata Watch Named ACT**

The Sonata Watch ACT has a mobile application which will be downloaded in the user's smartphone. By making use of Bluetooth, the watch will work with the phone to send distress alerts to the network of the guardian member. The alert message in the app and SMS will include user's location.



Safety Rod



Sonata Watch Named ACT

Safety Rod

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Pooja Kasar
TE(E&TC)

Improving Agriculture With Deep Learning

Demand for food has increased with global population explosion in the past few decades, making old farming practices obsolete. Improper fertiliser distribution over an agricultural land results in excess fertilisers available for weeds. To increase yield, precision agriculture was introduced where technology is applied to optimise productivity. Starting its operations in 2017, Europe-based Augmenta, founded by Dimitri Evangelopoulos and George Varvarelis, is one such startup that leverages latest technologies like deep learning to develop fully-automated yet sustainable precision solutions for economically boosting agriculture worldwide.

The name Augmenta has been created from the term augmented farming, which is used to define a combination of augmented reality (AR) with precision farming that can provide such precise information as leaf pattern/number, fungus appearance, height of plants and so on.

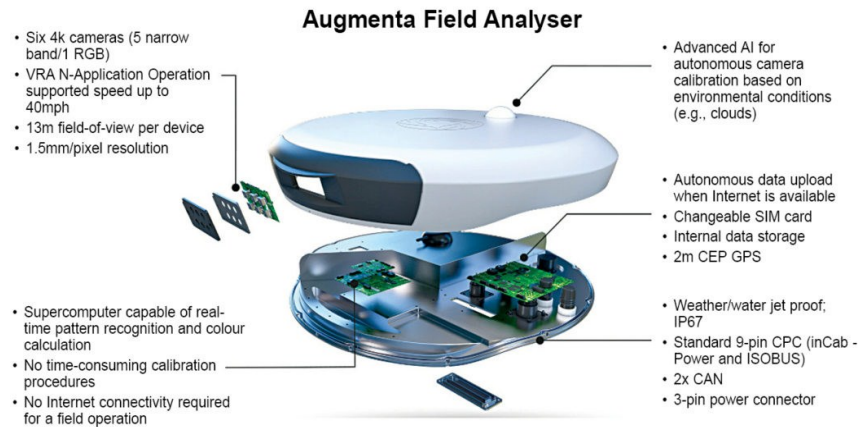
The company offers an artificial intelligence (AI)-based solution consisting of a hardware device and a Web platform for superior efficiency, thereby increasing the farmers' income. During prototyping phase, the device was tested to perform in varied environments and conditions. The final product—the field analyser—is an Isobus-compliant plug-and-play device, which, when attached to a tractor or retrofitted to a pre-existing equipment, can scan and analyse crops like wheat, rice, canary grass and potatoes to ascertain the optimal quantity of inputs (fertilisers, pesticides and the like) required per unit area, as well as the timing of field treatments. For this, the device captures 4k video data using its multispectral cameras, and applies real-time image processing along with AI to measure canopy shape, size and light reflectance before applying inputs.

The Web platform uses visual data analytics to not only track real-time operations for performance but also make customised decisions for every farm for the future. Available information includes health index maps, crop input statistics, 4k images of damaged areas, etc.

Real-time monitoring of tractor position, speed and rate of application is also available given that a cellular connection exists. There are options to interface with the machine (sprayer or spreader) and control variable rate applications from it using deep learning algorithms to apply the correct amount of these inputs at the required place in real time.

The latest software update offers a host of new features including virtual fertilisation map generation

shapefile generation and downloading, unit customisation and choices between measurement units. Benefits include increased yields, better grain protein levels and improved quality with lesser chemicals/fertilisers and input spend, unlike conventional methods. The process is less time-consuming and less labour-intensive.



Besides absence of noise, cost gets reduced when compared to drone/plane imagery and active sensor systems. Real-time processing makes it possible to avoid delays between data acquisition and usage.

Several data-based pilot projects have been completed with businesses, such as cereals grown for Italian multinational food company Barilla. The startup also partnered with NVIDIA last year for development of its cutting-edge deep learning device. The device already operates in numerous countries like Serbia, Turkey, Germany, the US, Brazil and Australia.

-Yogesh Khangal
TE(E&TC)