



IETE Bengaluru Magazine

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From the President's Desk

It gives me immense pleasure to know that IETE Bengaluru Centre has efficaciously published and released the 10th edition of its quarterly magazine to highlight the endeavours and accomplishments of the centre towards furthering the objectives of the Institution. The centre is fervent to strengthen the standing of the Institution by serving the corporate and student members of South Zone with enormous passion even during present devastating times.



IETE Bengaluru is, indeed, the most vibrant and energetic centres of IETE. Even during the current pandemic time the centre has not dwindled and is successively organizing technical conferences, symposiums, conventions and lectures for the benefit of its members.

IETE HQ has always encouraged and supported all initiatives of its centres in the quest for research and excellence.

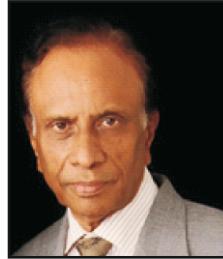
I wish Chairman, IETE Bengaluru Centre and his team success in all their future endeavours.

Prof (Dr) J W Bakal
President

From the Chairman

Dear IETEians,

This 10th edition of your Magazine is being released on the World Telecommunications and Information Society Day, which IETE observes religiously every year.



Covid and the consequent lockdown have indeed affected the Centre's work, but like everyone else, we have been resorting to the online mode to continue with the everyday work and technical activities. This is reflected in the pages of the Magazine, a result of team work. I compliment the Magazine Committee Members, in particular the Editor-in-Chief Dr. M H Kori, for bringing it out in trying circumstances.

IETE has lost many dedicated members and staff in recent days on account of the pandemic and other causes. I pay my respects to their memory.

I request you to send in your critical review of the Magazine and also about the work of the Centre. Please be in touch on mail and social media. As always, your contributions to the Magazine and involvement in the Centre's activities are valuable to us.

Best Wishes.

C Satyanandan
Chairman, IETE Bangalore

IETE Bengaluru Magazine Editorial Board: Dr. M H Kori, Editor-in- Chief
 Mr. C Satyanandan, Chairman Dr. S G Shivaprasad Yadav, Convener
 Dr. C V Ravishankar, Member Dr. E Kavitha Ramesh, Member
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From Hon. Secretary

In the unprecedented situation of the Covid the entire nation is fighting against this Pandemic to cope up and survive. Despite the alarming situation, the spirit of IETE Bangalore is strong and we are working hard to keep up its activities.

I am very happy that the Tenth issue of the IETE Bangalore magazine is being released on a special day – "World Telecommunication Day" on 17th May 2021.



As we all know that nothing stays forever – neither success nor failure, the only thing that is constant in life is change. We have to accept the changes and challenges of life and be mentally focused, strong and determined. IETE Bangalore center has been continuing to maintain the quality and organizing many technical activities. The Magazine has been instrumental in showcasing all the good work that we have been doing and publishing technical articles which can pave the way to new research activities.

I would appreciate your sincere feedback and suggestions to improve our activities and make the Bengaluru Centre more proactive and accomplish the vision of IETE.

Dr. S G Shivaprasad Yadav

Honorary Secretary
IETE Bangalore

Welcome to Tenth Issue of *iete Bengaluru Magazine!*

We are releasing this issue of IETEBM on World Telecommunications & Information Society Day. 17th May is celebrated as World Telecommunications and Information Society Day all over the world. The purpose of World Telecommunication and Information Society Day (WTISD) is to help raise awareness of the possibilities that the use of the Internet and other information and communication technologies (ICT)



can bring to societies and economies, as well as of ways to bridge the digital divide. 17 May marks the anniversary of the signing of the first International Telegraph Convention and the creation of the International Telecommunication Union (ITU). We are immensely proud and happy to release our 10th Issue of ieteBM on this very important day. Appropriately we have included an article about WTISD & ITU in this issue. ITU expert Mr Vishnu Ram has kindly provided an article on ITU's "AI for Good – Machine Learning Challenge" which explains opportunities for students and professionals to take this ITU AI challenge.

In continuation with the series of articles on best Technical Institutes in Bengaluru & Karnataka, in this issue, we have included an article on University Visvesvaraya College of Engineering (UVCE), Bangalore. UVCE is the first engineering college in Karnataka (apart from IISc) and Prof C Murali, former Vice President of IETE and UVCE alumnus has written this article. As mentioned earlier we plan to cover all other prestigious Technical Institutes in subsequent issues.

We have also started a new feature which covers new Research, Development, Test, Fabrication and allied state-of-art activities and facilities in new technology domains by our IETE Organizational Members, ISF partner Institutes and our Collaborators. In this issue we are covering a newly established state-of-art CARFS facility at MSRIT.

This issue also covers all the major activities organized by IETEB which includes National Science Day & C V Raman Memorial Lecture, Smart Manufacturing Summit, International Women's Day, Training Programs, Workshops, etc under able stewardship of Chairman Sri Satyanandan and his team, technical articles, Tech Trends etc. We have also included an exploratory article on futuristic "6G".

We would like to thank Mr Vishnu Ram, Mr Satyanandan & Prof C Murali for their articles, to IETEB Chairperson Mr Satyanandan and his team for their immense support in bringing out this issue of the magazine. Our thanks are always due to Prof (Dr) J W Bakal, President IETE for his message, constant support & blessings, IETE Bengaluru & IETE HQ staff for their support. Thanks to all members of IETEB Magazine Editorial Board for their contributions in bringing out this issue.

Congratulations to Prof C Murali on being elected as the IETE Distinguished Fellow (DF) 2020-2021. One more worthy addition to IETEB DF list!

Please send your views, suggestions and also be part of the magazine by contributing articles, news clips etc. Thanks for your continued support and encouragement.

Thank You

Dr M H Kori

On behalf of *iete Bengaluru Magazine* Editorial Board



Celebrations and other events:

1. National Science Day 2021 was celebrated on 28th February. Dr. Radhakant Padhi, Professor of Aerospace Engineering, Indian Institute of Science, Bangalore delivered the Sir CV Raman Memorial Lecture. (Report in this issue).

2. International Women's Day was celebrated on 9th March 2021. (Report in this issue)

3. IETE Bangalore was an Associate Partner in the 'Smart Manufacturing Summit' held on 15th April 2021, in which many industries participated. Experts delivered lectures on Digital Transformation and Industry 4.0 which were followed by a panel discussion on 'Creating Opportunities from Digital Transformation in Crisis'. Mr. C Satyanandan, Chairman IETE Bangalore delivered the keynote address to begin the seminar and introduced IETE to the participants and described the mission and activities of IETE.

Mr. Satyanandan listed the various types of IETE Membership including Organisational Membership and invited the Companies represented at the Summit to become Organisational Members. He welcomed them to join hands with IETE in developing its infrastructure.

Short Term Courses/ Workshops

1. 25-30 Jan 2021: MVJ College of Engineering, Bangalore organized a Faculty Development

Program (FDP) in association on "Research Opportunities in Power Electronics and Power System Engineering". Dr. C V Ravishankar, Vice-Chairman, IETE Bangalore and Dr. Veersingh Gangwar, FIETE, DRDO scientist were chief guest and Guest of Honor respectively and delivered the technical talks. Dr. Soumya Mishra, Associate Professor, Department of EEE was the FDP coordinator

2. 29-30 Jan 2021: Two days online skill Development programme on Applications in Low Power & High-power circuits was conducted by ECE department of Dr. T Thimmaiah Institute of Technology, Kolar in association with IETE Bangalore. Dr. K B Venkatesha, BMSIT was the resource person. Dr. K M Palaniswamy was the event coordinator.

3. 2nd April 2021-IETE Bangalore conducted a 4-week Internship/Training on "Artificial Intelligent & Machine Learning using Python - How to become a data scientist?" from Friday, 02nd April 2021. The hands on internship/Training was held every day in the evening 6.00 to 8.00 by Dr. Suresh Kumar, CTO PyWiz-Analytica Pvt. Ltd., Bangalore.

Activities Planned:

An 'Augmented Reality' course – in 3 hour sessions- is planned to commence on Sunday, 16th May 2021 and held over 8 Sundays. The training is being conducted by an expert from PTC.



IETE INTERNATIONAL CONFERENCE INDIA-2022 (IICI-2022) ON AI & ML DRIVING 5G-ADVANCED & 6G January, 2022, Bengaluru, India

Please contact: Dr M H Kori, iici-22 coordinator, at mhkori@gmail.com

A Report on National Science Day Celebrations at IETE Bangalore



National Science Day 2021 was celebrated on 28th February. Dr. Radhakant Padhi, Professor of Aerospace engineering, Indian Institute of Science, Bangalore was the Chief Guest. He delivered the Sir CV Raman Memorial Lecture on "Artificial Pancreas Development for Blood Glucose Control of Type-1 Diabetic Patients in India".

The program started with Invocation and a welcome address by Dr. Shivaprasad Yadav, Hon. Secretary. Mr. C Satyanandan, Chairman talked about the Science Day celebrations conducted by Bangalore Centre since 2003. He read out a brief profile of Prof. (Dr.) JW Bakal, President, IETE, who presided over the function by joining online.

Dr. Bakal complimented Bangalore Centre for holding

the Celebration and Sir CV Raman Memorial Lecture. Mr. CP Dwivedi, Vice Chairman introduced the Chief Guest. In his Lecture Dr. Radhakant Padhi gave an overview of the concept of a closed-loop feedback system of injecting insulin called Artificial Pancreas.

Chief Guest released the 9th edition of the quarterly 'IETE Bengaluru Magazine'. Prof C Murali, former Vice President IETE spoke about the Magazine.

Dr. CV Ravishankar, Vice Chairman read the list of participants and winners in the competitions held at various ISF Colleges on the Student Day 1st February 2021. Chief Guest distributed the Certificates and cash prizes.

Mr. Ranjeet Kumar Hon. Treasurer proposed the Vote of Thanks.



Abstract of Sir C V Raman Memorial Lecture delivered on 28 Feb. 2021

The food intake of humans, which happens in three major cycles in a day, mainly consist of carbohydrate, protein and fat. The carbohydrate is a very essential component which supplies energy to various organs and muscles. However, if it is not regulated within a desirable range, grave consequences can arise. If it becomes too low, it may lead to severe condition called hypo-glycemia, where a patient can quickly fall into coma and can even die if not treated quickly. On the other hand, if it remains too high for a long time, it leads to hyper-glycemia, commonly known as diabetes, where a variety of complications can arise too. The gluco-regulatory mechanism in human body largely consist of two hormones secreted by the pancreas system, namely the glucagon, secreted by α cells, and insulin, secreted by β cells. Glucagon is responsible for raising the blood sugar level, whereas insulin is responsible for lowering the blood sugar. Type-1 diabetic patients have pancreatic failure and are incapable of secreting any insulin to the blood plasma. Hence, if untreated, they cannot live for long time.

Fortunately, however, commercially available insulin can be delivered to the patients from outside to mitigate the problem. The current practice, which is largely followed in the world, is through daily multiple insulin injections. Unfortunately, however, besides being painful, it normally leads to gross inaccuracies, thereby not being able to harvest its full potential. To address this issue, the current in the world is to develop closed-loop feedback system, called artificial pancreas, where a small amount of insulin is continuously infused to the patient's body through the subcutaneous route by an insulin pump, depending on the situation of the patient as sensed by the subcutaneous CGM sensor.

This talk, delivered by Dr. Radhakanth Padhi of IISc., Bangalore on the occasion of National Science Day gives an overview of the concept, followed by the specific activities being carried out at the Indian Institute of Science, in collaboration with MS Ramaiah Medical, in Bangalore, towards development of an effective artificial pancreas system, specifically tailored for the Type-1 diabetic patients of India.

Smart Manufacturing Summit 2021

IETE was an Associate Partner in the 'Smart Manufacturing Summit' held on 15th April 2021, in which many industries participated. Experts delivered lectures on Digital Transformation and Industry 4.0 which were followed by a panel discussion on 'Creating Opportunities from Digital Transformation in Crisis'. Mr. C Satyanandan, Chairman IETE Bangalore delivered the keynote address to begin the seminar and introduced IETE to the participants and described the mission and activities of IETE.

Mr. Satyanandan listed the various types of IETE Membership including Organisational Membership

and invited the Companies represented at the Summit to become Organisational Members. He welcomed them to join hands with IETE in developing its infrastructure.



IETE Bangalore is proud to add one more DF to its illustrious DF list!

Prof C Murali,

Former Vice President IETE & Former IETE Bangalore Chairman, has been elected as IETE Distinguished Fellow for the year 2020-2021.

**IETE Bangalore congratulates
Prof C Murali
and wishes him many more laurels!**



A Report on International Women's Day

Women's Day was celebrated on 9th March 2021. Dr. YVS Lakshmi, Group Leader IPR, Marketing & Knowledge management Group, C-DoT Bangalore was the Chief Guest. Ms. Apurva Varma, Regional Manager, Arm University, Arm India was the Guest of Honour and Ms. Mridula, Senior Project Manager, Infosys, Hyderabad gave a Motivational Talk.

Dr. Shivaprasad Yadav, Hon. Secretary gave the welcome address. Dr. Kavitha, Jt. Hon. Secretary spoke on the theme of this year's Women's Day and introduced the Chief Guest.

Dr. Lakshmi, Chief Guest, spoke about Women's Day and gave a presentation on 'Current Trends in Wireless Technologies and Products'. She talked about 'Public Data Offices', something on the lines of Public Call Offices of an earlier era. She also emphasized the need for protection of IPR in 5G Technology. She exhorted young women to compete with themselves and excel in whatever they were doing.

Mr. CP Dwivedi, Vice Chairman introduced the Guest of Honour, reading out her profile.

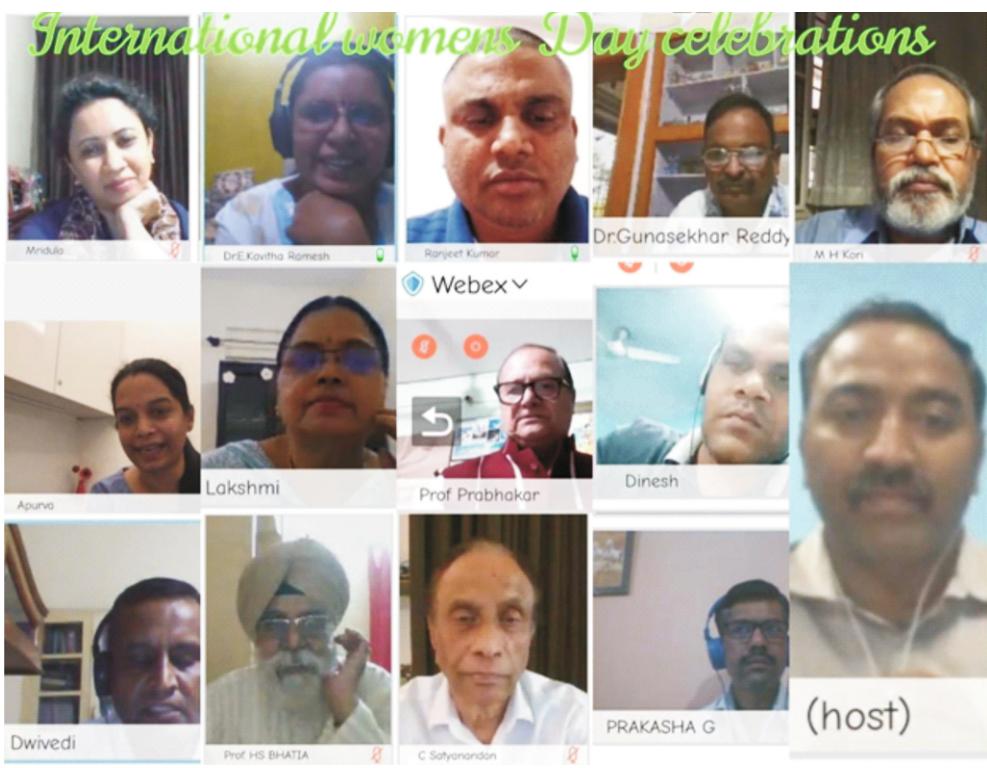
Ms. Apurva, Guest of Honour, shared her journey in the education management field- teaching children, especially the differently enabled students. She mentioned the work done by her at Arm. She advised students to embrace challenges and convert them into opportunities, based on her own experiences. Life was not always easy, she said, filled as it was with self-doubt, failures and so on, but ultimately all these contributed to success.

Ms. Mridula in her motivational talk went back to the time she passed out of college, and the ups and downs she faced in her professional and personal life. She recalled her days in the USA and back in India and how everything was seen by her as

learning experiences which helped her in her journey. A piece of advice she offered to young women was to be in the present aware of the surroundings and connected to nature.

Mr. Satyanandan, Chairman thanked the guests, all of whom were 'women in leadership' and said they were a source of inspiration to the young generation, especially women. Our duty as members of professional bodies is to quicken the pace of reducing the gender gap, he said. He spoke on the need to increase the strength of women members in IETE and offered help to all who wanted to be part of IETE's efforts. He mentioned IETE's plans to go into the midst of disadvantaged women to bring about awareness of computers and the internet. He also spoke about the Awards instituted by IETE to recognize outstanding contribution in Science and Technology and appealed to all to get deserving individuals nominated.

Recordings of cultural programs conducted at various ISF colleges in connection with Women's Day were then played out. The function ended with a Vote of Thanks by the Hon. Treasurer Mr. Ranjeet Kumar and National Anthem.



World Telecommunication and Information Society Day & ITU

Compiled by Dr M H Kori

17 May marks the anniversary of the signing of the first international Telegraph Convention and the creation of the International Telecommunication Union (ITU). The purpose of World Telecommunication and Information Society Day (WTISD) is to help raise awareness of the possibilities that the use of the Internet and other information and communication technologies (ICT) can bring to societies and economies, as well as of ways to bridge the digital divide.

World Information Society Day

World Telecommunication Day has been celebrated annually on 17 May since 1969, marking the founding of ITU and the signing of the first International Telegraph Convention in 1865. It was instituted by the Plenipotentiary Conference in Malaga-Torremolinos in 1973 as Resolution 46.

World Telecommunication Day

In November 2005, the World Summit on the Information Society called upon the UN General Assembly to declare 17 May as World Information Society Day to focus on the importance of ICT and the wide range of issues related to the Information Society raised by WSIS. The General Assembly adopted a resolution in March 2006 stipulating that World Information Society Day shall be celebrated every year on 17 May.

World Telecommunication and Information Society Day (WTISD)

In November 2006, the ITU Plenipotentiary Conference in Antalya, Turkey, decided to celebrate both events on 17 May as World Telecommunication and Information Society Day. The updated Resolution 68 invites Member States and Sector Members to celebrate the day annually by organizing appropriate national programmes with a view to:

- stimulating reflection and exchanges of ideas on the theme adopted by the Council
- debating the various aspects of the theme with all partners in society
- formulating a report reflecting national discussions on the issues underlying the theme, to be fed back to ITU and the rest of its membership.

ITU - INTERNATIONAL TELECOMMUNICATION UNION

The International Telecommunication Union (ITU) is an

agency of the United Nations (UN) whose purpose is to coordinate telecommunication operations and services throughout the world. Originally founded in 1865, as the International Telegraph Union, the ITU is the oldest existing international organization. ITU headquarters are in Geneva, Switzerland.

Founded in 1865 to facilitate international connectivity in communications networks, ITU allocates global radio spectrum and satellite orbits, develop the technical standards that ensure networks and technologies seamlessly interconnect, and strive to improve access to ICTs to underserved communities worldwide. Every time you make a phone call via the mobile, access the Internet or send an email, you are benefitting from the work of ITU. ITU is committed to connecting all the world's people – wherever they live and whatever their means. ITU is committed to connecting the world.

ITU is at the very heart of the ICT sector, brokering agreement on technologies, services, and allocation of global resources like radio-frequency spectrum and satellite orbital positions, to create a seamless global communications system that's robust, reliable, and constantly evolving.

- ITU makes phone calls possible: whether to the office next door or to a friend in another country. ITU standards, protocols and international agreements are the essential elements underpinning the global telecommunication system.
- ITU coordinates the world's satellites through the management of spectrum and orbits, bringing you television, vehicle GPS navigation, maritime and aeronautical communications, weather information and online maps, and enabling communications in even the remotest parts of the planet.
- ITU makes Internet access possible. The majority of Internet connections are facilitated by ITU standards.
- ITU helps support communications in the wake of disasters and emergencies – through on-the-ground assistance, dedicated emergency communications channels, technical standards for early warning systems, and practical help in rebuilding after a catastrophe.
- ITU works with the industry to define the new technologies that will support tomorrow's networks and services.
- ITU powers the mobile revolution, forging the technical standards and policy frameworks that make mobile and broadband possible.
- ITU works with public and private sector partners

to ensure that ICT access and services are affordable, equitable and universal.

- ITU empowers people around the world through technology education and training.

The ITU consists of three sectors:

- Radiocommunication (ITU-R) -- ensures optimal, fair and rational use of the radio frequency (RF) spectrum
- Telecommunication Standardization (ITU-T) -- formulates recommendations for standardizing telecommunication operations worldwide
- Telecommunication Development (ITU-D) -- assists countries in developing and maintaining internal communication operations

The ITU sets and publishes regulations and standards relevant to electronic communication and broadcasting technologies of all kinds including radio, television, satellite, telephone and the internet. The organization conducts working parties, study groups and meetings to address current and future issues and to resolve disputes. The ITU organizes and holds an exhibition and forum known as the Global TELECOM every four years. Another important aspect of the ITU's mandate is helping emerging countries to establish and develop telecommunication systems of their own. Although the recommendations of the ITU are non-binding, most countries adhere to them in the interest of maintaining an effective international electronic communication environment.

ITU "AI for Good" Machine learning 5G Challenge – a golden opportunity for students and professionals in India

by Vishnu Ram OV (Vishnu.n@ieee.org)

Independent expert (Vice Chair, ITU-T focus group on autonomous networks)

The ITU AI/ML in 5G Challenge brings together like-minded students and professionals from around the globe to study the practical application of artificial intelligence (AI) and machine learning (ML) in emerging and future networks. The first edition of the Challenge in 2020 welcomed over 1300 participants from 62 countries, forming 911 teams. During the Grand Challenge Finale, held online, from 15th to 17th December 2020, teams selected from each problem statement competed for prizes totaling 33 000 CHF. Global recognition and ITU certificates were presented to the winners in the Grand Challenge Finale. The challenge was open to individuals from any member country of ITU.

ITU AI/ML in 5G Challenge enabled participants to connect with new partners in industry and academia — and new tools and data resources — to solve real-world problems based on the ITU specifications. This was supported by close to 30 webinars which accompanied the Challenge received over 10'000 views (live & replay; <https://aiforgood.itu.int/ai-ml-in-5g-challenge/>) with leading researchers around the world, round-table discussions with participants and experts, and open source and open data.

A mix of participants (not only data scientists) from various backgrounds came together to solve problems, and students were provided mentoring by experts. But the real value was the diverse points-of-view offered from across the world. The best peer-reviewed papers

resulting from the Challenge will feature in a special issue of the ITU Journal "Future and evolving technologies" (<https://www.itu.int/en/journal/j-fet/2021/005>).

"Enablers/PoC" track included problem statements which worked on creating reference implementations, using open source, demonstrating concepts from ITU specifications. Thus, the challenge was more than just predictions and inferences, but also about coding and proving the concepts in ITU Recommendations. In December 2020, ITU NEWS Magazine (available in Arabic, Chinese, English, French, Russian, Spanish) featured in a 91-page dedicated edition to the Challenge https://www.itu.int/en/itunews/Documents/2020/2020-05/2020_ITUNews05-en.pdf).

The 2021 edition of the challenge is getting ready and it provides an excellent opportunity for students and professionals in India. Going beyond hackathons and AI competitions, ITU AI/ML in 5G Challenge presents Indian students and professionals an opportunity to be part of the global ecosystem. Breaking open the myth that Data from real networks is all private and cannot be opened for the Challenge, ITU provided access to data from real networks in 2020. Datasets from cutting edge research, aligned with the work of ITU, are available from our academic and industry partners. Furthermore, this year our endeavor is to enable data sharing via ITU Geneva Sandbox [Refer ITU-T Recommendation Y.3172].

Going beyond the narrow aim of winning cash prizes, students from 60+ countries participated in the learning exercise. In 2021, ITU has kicked off the webinar series as preparation for potential participants with "Towards Autonomous 6G Networks and the Role of Advanced Machine Learning Techniques" by Prof. Melike Erol-Kantarci, Canada Research Chair and Associate Professor, University of Ottawa. As ITU goes through the problem statement finalization phase in April and May 2021, the problem statements for 2021 would be announced soon. The slack channel invite to keep track of the registration and deadlines are here: https://join.slack.com/t/itu-challenge/shared_invite/zt-eq100z05-CXelo7_aL0nHGM7xDDvTmA



(from 2020 edition: prizes are subject to change).

One of the important problem statements came from IIT/D, "Intelligent Vehicles for unstructured environments": To develop an autonomous or semi-

autonomous vehicle with ADAS capabilities. It is built on the on-board vehicular sensors capable of performing i) Road scene understanding in unstructured environments, ii) Semantic labelling, object detection and recognition in complex road scenes and iii) Driver Activity Monitoring in chaotic environments. The details of this can be found here: <https://sites.google.com/view/iitd5g/>

Another interesting problem statement was ML5G-PHY [channel estimation] for which one of the most innovative solutions came from the collaborative team from Indian Institute of Science(IISc) and EURECOM. The solution was titled "A Multilevel-Greedy and Bayesian Compressive Channel Estimator for Frequency-Selective Hybrid mmWave MIMO Systems". The details can be found here: https://github.com/ITU-AI-ML-in-5G-Challenge/ITU-ML5G-PS-025-Learned_Chester

Call for participation

For 2021 edition, ITU AI/ML in 5G Challenge presents an excellent opportunity for students and professionals in India. Mentoring will be provided to students. Prizes and global recognition will be available. Problem statements and data will be announced in early June 2021. Join the Slack channel to track the announcements and technical webinars from global experts.

Prestigious Technical Institutes of Bengaluru & Karnataka

Prof C Murali



Bengaluru & Karnataka is home to many reputed and prestigious Technical Institutes. IETE Bengaluru Magazine (IETEBM) is starting a new series of articles covering these Technical Institutes. In the previous issue we had covered the Indian Institute of Science, the best Technical Institute in India. In this issue we will be covering UVCE, the first engineering college in Karnataka (apart from IISc).

UVCE

University Visvesvaraya College of Engineering, Bangalore



India had a feather in its cap when the greatest Engineer and Statesman of modern times, Sir M. Visvesvaraya, Dewan of the then Mysore regime came up with the idea of establishing an engineering college in our own state for all the capable aspirants.

History: In 1917, India had only four engineering colleges and the need of hour for engineers in India was evident and it took a visionary called, Sir M. Visvesvaraya to put the stepping stone for this wonderful institution which became the 5th established engineering college in India and churned out greatest of engineers across the world. Initially it had the capabilities to guide and

strengthen the Civil and Mechanical engineers. However, as the technology in various fields grew, new additions to the departments were made and UVCE got stronger day by day. In 1965, the name of the college was changed to University Visvesvaraya College of Engineering after its founder.

Current status: UVCE is a constituent college of Bangalore University, which gives it a special university status, a privilege, granted to only a few institutions in the country. It is now the only engineering college under Bangalore University, which happens to be the largest university spanned in the whole of Asia. UVCE is approved by the AICTE, All India Council for Technical Education and has a NAAC rating of 5 Star for the past 4 consecutive years issued by the National Board of Accreditation.

UVCE has conducted over 50 workshops, 6 International Conferences in the last four years and has published more than 500 Research/technical papers in various International journals. Repute publishers have brought out 35 books authored by the staff of UVCE.

Location: UVCE has a sprawling serene campus in the heart of Bangalore situated in the busy roads of K R Circle near Vidhana Soudha. The campus is mixture of big buildings that houses all the well spaced and comfortable classrooms, state of the art labs and all the recreational facilities to the likes of every other college in this country. At the Jnana Bharathi campus located near the suburb of Kengeri and is the hub of Bangalore University, there are the post graduate academic buildings and the departments of Civil Engineering and Architecture of the UVCE.

Activities: The best part in UVCE has been the teacher-student partnership in achieving the

missions and goals set. The students engross themselves enthusiastically and actively in the research work and gain knowledge before they venture either into the professional world or the teaching spectra. This facilitates the all round growth of any student here in the UVCE campus.

Alumni: With more than hundred years of history, UVCE has a strong Alumni spread all over the country and abroad who have made their Alma mater and their country proud. A brainchild of Bharat Ratna Sir M.Visvesvaraya, UVCE has produced many Padma awardees, celebrities, academicians, researchers, professionals, engineers, administrators, entrepreneurs, sport persons,. The count of achievers and eminent personalities run into 100s. Some of alumni's are Dr. M R Srinivasan, Dr. Vasudev K Aatre , Prof Roddam Narasimha, Dr. Prahlada, Dr. S S Iyengar, Dr. R Natarajan, Prof S Rame Gowda, Prof B T Lakshman, Prof Chidananda Gowda, Dr. K Sheshagiri, Air Vice Marshall (Rtd) Abhaya Kumar, Manjunath Prasad, Wg Cdr Dattatreya, Ramesh Arvind, Shatavadhani Ganesh, and the list grows.

Vision: The vision is to make UVCE autonomous and an institute of repute with IIT stature. A committee is formed by Govt of Karnataka with Prof Sadagopan as the chairman to explore the procedure of granting autonomy to the institute. The report with its recommendations and suggestions has been submitted to the Government of Karnataka. UVCE should be developed independently along the lines of Indian Institutes of Technology (IITs) as an autonomous institution. Vision 2030 - To be among the best in class for Higher Technical Education.

(Prof C Murali is an alumnus of UVCE. Interestingly three generations in his family, Prof Murali, his father & his son, all are alumni of UVCE!)

Obituary



We are very sorry to inform,
Prof (Dr) P V Rao (F227805),
one of the very active members of IETE Bangalore Centre passed away on 24th February 2012. Dr Rao has served IETE Bangalore in many capacities including Executive Member, Returning Officer for Center Elections etc.
Our deep condolences to his family.

News from Our IETE Organizational Members, ISFs and Our Collaborators

We have started a new feature which covers new Research, Development, Patents, Test, Fabrication and allied state-of-art activities and facilities in new technology domains by our IETE Organizational Members, ISF partner Institutes and our Collaborators. We encourage all our extended family of Organizational Members, ISFs and other Collaborators to please share any exciting new developments, achievements and activities through this new section.

In this issue we are covering a newly established state-of-art CARFS facility at MSRIT.

Centre for Antennas and Radio Frequency Systems (CARFS)

The Centre for Antennas and Radio Frequency systems (CARFS) at M S Ramaiah Institute of Technology Bangalore was inaugurated on 24th March 2021. The Centre includes design, simulation, fabrication and testing of Antennas and RF devices for the frequency range upto 40GHz.

MSRIT has established CARFS, a complete design, fabrication and testing facility for indigenous design and development of antenna, RF systems and complete wireless systems (including 5G systems). The design and simulation service includes providing consultancy in complete design and simulation of antennas and RF devices using ANSYS HFSS 19.1 software. This is followed by fabrication of Antennas and RF components on substrates like FR-4, Rogers etc through photo etching chemical process. The Antenna and RF devices can be experimentally verified and validated with major equipment's available at the centre. The state-of-the-art Vector Network Analyzer from Rohde & Schwarz operating from 100KHz to 40GHz and Anechoic Chamber operating from 700MHz to 40GHz. The size of the Anechoic chamber is 5.5 Meter x 3 Meter x 3 Meter with specifications of shielding Effectiveness -80 dBm, Quiet Zone of 1 m Diameter Sphere, Tx-Rx Range of 4.5 m, Automatic 3-axis antenna positioning system, Positioning system accuracy: 0.1 degree and Load bearing capacity upto 15 kg. The Centre is open for all academicians and Industry for Utilization & Consultancy. Thus, a complete platform from design, fabricate and testing of Antennas and RF devices can be developed and tested upto 40GHz at CARFS.

Facilities at CARFS:

1. Design of any practical antenna for given

application as part of consultancy.

2. Assistance in Simulation of Antennas, RF Filters and design validation.
3. Single layer fabrication on any given substrate.
4. Antenna parameter testing from a wide range of 700MHz to 40GHz.
5. Test Parameters are two port S Parameters, VSWR, Gain, Axial Ratio, H plane, E-Plane, 2D and 3D Radiation Patterns.
6. Active and Passive RF devices can be tested in Vector Network Analyzer from 100KHz to 40GHz.

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Kindly feel free to contact to use the facility at CARFS.



Anechoic chamber



Vector Network Analyzer



Inauguration by
Sri. M. R. Seetharam



Antenna Wall clock



Designed Antenna at CARFS

'Analyze the Argument'

C Satyanandan

Most of us like to argue, and score a point. However, winning an argument does not guarantee that it is sound. When arguments between two parties stretch to the verge of quarrel, it is obvious that either party is unable to convince the other of their reasoning. What one thinks is valid the other finds invalid. Theoretically, this should not happen, as there are accepted principles that govern the validity of an Argument.

We do not have single clear right/wrong answers on every issue: usually only less or more convincing arguments. We tend to assume that by virtue of our experience in life and education we will be inclined always to think and express our thoughts clearly and convincingly. Unfortunately, even well-educated persons are guilty of muddled thinking and incoherent expression.

The ability to convincingly put forward an argument is something that has to be diligently acquired. Language proficiency and critical reasoning ability, both, are essential ingredients of the skill of argument.

Analysis of an Argument is part of many Admission Tests. GMAT test takers, for example, have to write an essay wherein they are asked to critically analyze the reasoning given behind a given argument.

Critical reasoning is the opposite of dogma. Dogma is unquestioned information that is embraced without the intervention of active thought or criticism. To reason critically is to question the ideas and beliefs of others and oneself and to challenge dogma and authority. If you think for yourself, you question the world and offer alternative viewpoints about the way the world is perceived by other people.

Informed reasoning is based on claims that can be substantiated. Presenting an informed educated opinion, rather than sharing one based on emotion or personal experience alone, makes for a valid argument.

The ability to reflect critically on your own assumptions and to critically evaluate your own prejudicial attitudes and biases allows you to think for yourselves instead of being indoctrinated and manipulated by stereotypical beliefs.

An argument basically comprises premises, assumptions and one or more conclusions. An assumption- or, an unstated premise- bridges the gap between the argument's stated premises and conclusion.

Questions designed to test Critical Reasoning ability usually ask you to recognize such things as the basic structure of an argument, properly drawn conclusions, underlying assumptions, well-supported hypotheses, and parallels between structurally similar arguments. They may also ask you to recognize such things as factors that would strengthen or weaken the given argument and the relative appropriateness, effectiveness or efficiency of different plans of action.

Usefulness of critical thinking or reasoning is all too obvious. Increasingly more and more employers are looking, not for employees with highly specialized academic skills, but those with good thinking and communication skills. Employees, who learn quickly and can solve problems invariably think creatively and gather and analyze information meaningfully. Many of the highest paying jobs require critical thinking skills, such as generating effective ideas, and presenting arguments logically about important decisions to be taken.

While Critical Reasoning and Analysis of Arguments are basically subjects of tests for the student aspiring for higher education and lucrative careers, they are skills that benefit the wider society too. Critical thinking enhances Curiosity, Creativity and Problem Solving Ability. It is a Multi-Faceted Practice that encompasses a wide array of disciplines, and cultivates a broad range of cognitive talents. Above all, it's a Skill for Life, not just Learning.

It Encourages Curiosity

Effective critical thinkers remain curious about a wide range of topics and generally have broad interests.

A desire to think critically about even the simplest of issues and tasks indicates a desire for constructive outcomes.

Those who think critically tend to be instinctual problem-solvers.

It's a Multi-Faceted Practice Critical thinking is known for encompassing a wide array of disciplines, and cultivating a broad range of cognitive talents.

Developing solid critical thinking skill prepares our students to face the complex problems that matter to the world head-on.

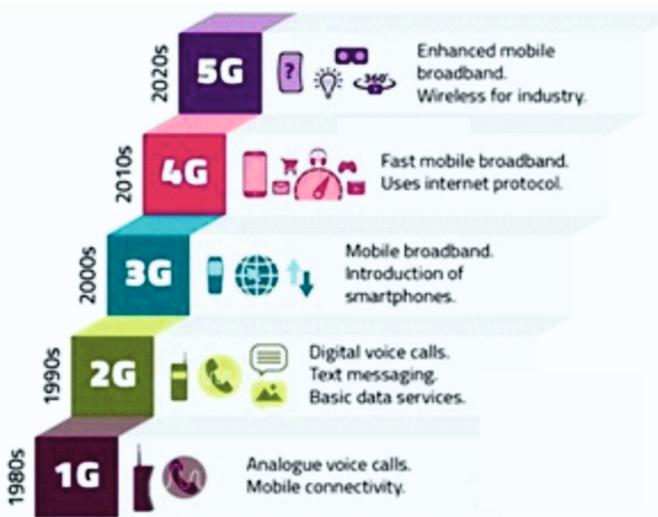
It's a Skill for Life, Not Just Learning

6G or Beyond 5G?

Dr M H Kori

We brought a series of articles on 5G in the first 3 issues of IETEB Magazine - Demystifying 5G (vol 1, 2 & 3) explaining basic concepts, technologies driving and applications. The adoption of 5G will propel the whole range of disruptive technologies, including AI, IoT, and robotics. With 5G bringing so much possibility in almost every domain, one must think – what's next? 6G?

All familiar with evolution of Mobile Communication Generations are aware that it takes approximately 10 years for development and introduction of a new generation.



Is it too early to start 6G?

Simple extrapolation of this leads to the assumption that 6G is expected around 2030. So it may appear a bit strange to discuss about 6G when we still do not have 5G! But it may not look so strange if you consider the following facts:

1. China, European Union, USA, Korea, Japan and many countries have started large funded projects for 6G Research from 2019...
2. Samsung, Ericson, Nokia. Samsung kicked off 6G research in June 2019. South Korea's SK Telecom has signed agreements...
3. NTT Docomo. As mentioned above, NTT has also published a white paper on 6G which clearly indicates the company's intentions...
4. Huawei. Chinese company is researching 6G at its R&D center in Ottawa, Canada. China has claimed 6G technology is incorporated in recent satellite...
5. LG. In January 2019, Samsung's native rival LG also opened a 6G research center, in collaboration with the Korea
6. Oulu University has started 6G Flagship Project and regular "6G Summit" Conferences

7. 6G Symposium Europe Shaping Industry & Society Beyond 5G 4-6 May 2021 • Virtual Event
8. Hexa-X European Flagship Project on 6G
9. ITU-T Future Group 2030 / IMT 2030
10. ITU has called for suggestions on Potential 6G Technologies & Applications

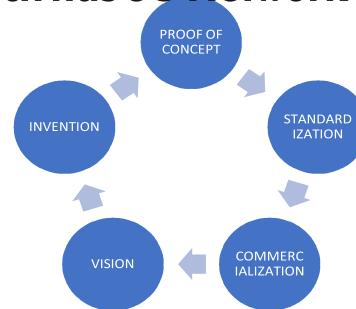
So, there is lot of excitement and buzz around 6G and India cannot afford to miss the bus again and just adopt standards and technologies developed by others. We need to take a leading role in setting standards and technologies in 6G, otherwise we will be left out!

What is 6G?

But what is 6G? What is the difference between "Beyond 5G" and 6G? Honestly, no one knows the precise answer! Of course, there are several educated, knowledgeable predictions. Let us briefly look at them.

The nomenclature of IMT 2020 (5G) or IMT 2030 (6G) is decided by the standardization bodies like 3GPP & ITU. 3GPP has declared all Releases from Rel 18 are officially called as "5G Advanced". Most likely all mature technologies that can make it up to 3GPP Releases 19, 20, 21 (22?) may be considered as "5G Advanced or Beyond 5G" and any technologies coming later than that, probably after 2025 to 2027, Releases beyond 23 may qualify as 6G.

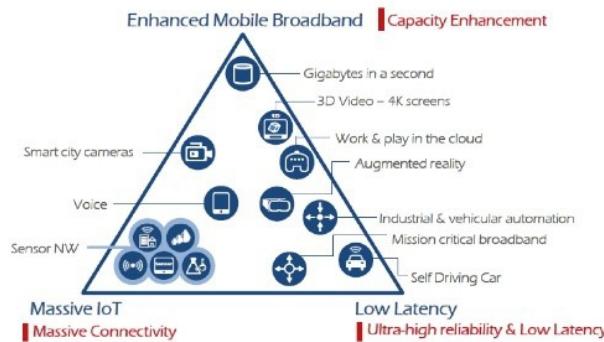
How Much has 6G Network Evolved?



The wheel of evolution for any generation of telecom technology looks something like this:

In the wheel of evolution, 6G is in a pretty early stage and no technology has been invented yet to cater to the requirements set for the 6G standards. So, this corresponds to the 'Vision Stage' where a problem or need is identified and all the requirements are established. The next stage would be the 'Invention Stage'. It appears 6G right now is at the vision stage and moving towards the invention stage.

Some potential 6G technologies and applications



(Source: ETR graphic, from ITU-R IMT 2020 requirements)

1. One school of thought is that every odd numbered G (1G, 3G, 5G) initiates a process (thought, service, technology) but doesn't complete or perfect it, even numbered G (2G, 4G, 6G) perfects it and widely deploys it. By the extension of that logic 6G is expected to complete, perfect and deploy all the promises made in, hype created by 5G, but appears to have not met all of them - specific examples being in the domain of two vertices (mMTC & uRLLC) in the famous 5G triangle (eMBB, mMTC, URLLC). Of course it will be too simplistic and underplaying 6G capabilities and potentials to just say it will deliver only 5G unfinished promises, 6G will vastly enhance the scope these envisioned in 5G - so we have been adding more prefix letters like 'u-ultra, e-enhance, m-massive, h-high etc' to signify them and also try to meet a combination of requirements - eMBB jointly with uRLLC and mMTC simultaneously and not in isolation.

2. 6G would be also adding many new sets of objectives not explicitly set out in 5G - there are many candidates - some examples being - from High Precision Positioning, Sensing and Imaging, Multisensory XR (AR/VR...) Applications, Connected Robotics to exotic areas of Cyber-Physical system, Brain-Computer Interface etc.

3. Holographic Radio (this is distinct and separate from Holographic Communication): "Holographic radio is a new method to create a spatially continuous electromagnetic aperture to enable holographic imaging-level, ultra-high density spatial multiplexing with pixelated ultra-high resolution,"

4. Orbital Angular Momentum

5. AI driven RF Interfaces / AI & ML driven 6G

6. Sub THz & THz Communication / VLC / OWC

7. Spectral Management & Coordinated Spectral Utilization for higher spectral efficiency

Other areas include:

- Path based Network Architecture / AI aware Intent based Networks
- Application Aware Data Forwarding – Burst
- Very Large Volumetric Communication: Holographic Type Communication, Huge Scientific Data – Genomic, Astronomy, Accelerator
- Haptic / Tactile Communication
- Many Nets – Space Terrestrial Integrated
- Computing and Networking Convergence
- Impact of Quantum Computing
- Ultra-Massive MIMO
- Beamforming beyond the Beam Space Paradigm
- Intelligent Reflecting Surfaces or Reconfigurable Intelligent Surfaces (RIS)

KPI	5G	6G
Peak data rate	20 Gb/s	1 Tb/s
Experienced data rate	0.1 Gb/s	1 Gb/s
Peak spectral efficiency	30 b/s/Hz	60 b/s/Hz
Experienced spectral efficiency	0.3 b/s/Hz	3 b/s/Hz
Maximum bandwidth	1 GHz	100 GHz
Area traffic capacity	10 Mb/s/m ²	1 Gb/s/m ²
Connection density	10 ⁶ devices/km ²	10 ⁷ devices/km ²
Energy efficiency	not specified	1 Tb/J
Latency	1 ms	100 μs
Reliability	1-10 ⁻⁵	1-10 ⁻⁹
Jitter	not specified	1 μs
Mobility	500 km/h	1000 km/h

Comparison of 5G & likely 6G KPIs

Reference: Various sources, credit to them

We will be exploring all facets of "6G" and "Beyond 5G" in subsequent issues, look forward to the next issues of ieteBM!

(Dr Kori leads the "6G Research Group" at "IETE Research Forum")

TECH TRENDS

Advanced virtual assistants (AVAs)

Advanced virtual assistants, sometimes referred to as AI conversational agents, process human inputs to deliver predictions and decisions. They are powered by a combination of conversational user interface, natural language processing (NLP), and semantic and deep learning techniques such as deep neural networks (DNNs), prediction models, decision support and personalization.

The estimated time to market is driven by the expansion of current, limited function virtual assistants (which have been around for years now) to advanced virtual assistants that target a multitude of jobs and functions—propelling the expansion of AI conversational agents into every sphere of consumer lives, business interactions and operations.

The impact potential of advanced virtual assistants is high because the technology can be utilized in virtually every vertical segment and almost all disciplines. It has the potential to transform the nature of how an application is used for the workforce and how consumers interact with devices and the IoT (Internet of Things) while enhancing customer experience and engagement.

Transformer-based language models

Transformer-based language models are DNNs that process words as sequences in a sentence. This approach preserves the context or meaning of surrounding terms. It also substantially improves translation, transcription, and natural language generation. These models are trained on enormous datasets of billions of phrases.

The time to market is driven by the effectiveness of the training tools, runtime efficiency and ease of deployment. Transformer-based language models, such as GPT-3, have the capability to generate paragraphs of text that are indistinguishable from those written by a well-educated human.

The impact potential of transformer-based language models is extremely high because they are displacing recurrent neural networks (RNNs) systems at a surprising rate. And new tools deliver substantial improvements in advanced text analytics and all related applications, such as conversational user interfaces, intelligent virtual assistants and automated text generation.

Compiled by Dr M H Kori & Prof C Murali

Beyond silicon: DNA computing and storage

DNA computing plays into the beyond silicon trend because it introduces a brand-new computing substrate instead of using silicon. It uses molecules and the reactions between those molecules to not just store data but give you a new way to process it as well.

Storing data in DNA sounds hopelessly complex, but the technologies are well-established and understood. First, the digital content is compressed and mapped to the four nucleotides in DNA (adenine, thymine, guanine and cytosine, or "ATGC"). Because there are four nucleotides, each nucleotide can represent two digital bits. These nucleotide codes are used to create matching synthetic DNA, which is then replicated and stored in DNA strands. Those strands are then "amplified," or copied millions of times, to make reading the data easier when material is extracted from its storage container.

When the data needs to be read, the opposite process occurs. The DNA strands are prepared and sequenced back into nucleotide codes, which are then converted back into digital content.

With digital data represented as DNA, the next step is introducing a processing mechanism to create a full DNA computing environment. While it is still a highly experimental domain in DNA computing, enzymatic processing is gaining prominence.

Enzymatic processing uses enzymes, which are proteins that act as catalysts, to perform a logical operation on a collection of DNA. This mechanism is inspired by how DNA is replicated and error-checked in organisms. Custom-designed enzymes can take the form of "logic gates" that process data and create new DNA strands as output, which can then be read by a DNA sequencer. Recent experiments have used enzymatic processing to perform machine learning over data represented as DNA.

From a resiliency and storage density perspective, nothing beats DNA. Properly stored, DNA can last for at least 500 years. And a gram of DNA can store over 200PB of data. Another advantage of DNA is it's never going to go out of style. We are made from it. Unlike other technologies that might be fads or become incredibly difficult to maintain, DNA is pretty straightforward. And the technologies that synthesize it and the technologies that sequence it are well-understood and falling in price every day, making it much more approachable.

You might see DNA computing in any industry that has a massive amount of data. A good example is CERN with the Large Hadron Collider. They collect petabytes of data every year. Storing that in magnetic tape is incredibly expensive. It takes a lot of room and they can only store it for about 10 years before they have to move it to fresh tape. Other use cases include storing national archives, scientific endeavors producing large amounts of data like astronomy, or industries like oil and gas.

But that's only half the story — you also have to be able to process that data. And this is one of the real advantages of DNA computing. You can have millions of copies of a given dataset, and you can replicate it very cheaply. Once you have that data represented millions of times, you can introduce enzymes into that pool of DNA strands, and using enzymatic reactions, it will do whatever kind of computing you might want to do. Viable DNA processing is several years away, but the possibilities are fascinating.

DNA computing is at a very early stage. We've seen some early investments from large and small technology vendors. A lot of research is happening at universities, but it is very early. I think we'll see DNA storage as a viable option within three to five years, likely in a cloud infrastructure scenario. And then DNA computing will take longer to develop. I predict that's going to happen within eight to 10 years.

Stretchable Electronics

Stretchable electronics is a technology for building electronic devices by depositing stretchable electronic circuits onto stretchable substrates or embedding them completely in a stretchable material such as silicone or polyurethane. Stretchable electronics called elastronics, is a new and emerging class of electronics that is expected to enable a range of new applications like cyber skin for robotic devices, imparting a network of sensors on a fully conformable, stretchable cyber skin, implantable sponge like electronics and flesh like devices with embedded electronic nervous systems.

Use of wearable electronics has to

accommodate all types of bending, curved, soft and elastic surfaces of biological objects. Flexible, soft, compressible, twistable and stretchable forms of electronic devices enable various avenues for healthcare, energy and military purposes.



Transparent properties to stretchable electronic lead to stretchable transparent electrodes, transparent and stretchable electronic devices where optical transparency and stretchability are required for conformal placement of devices on the human body or any arbitrary surface.

Mechanical compliance is critical in the manufacture of stretchable electronic devices as devices should not incur physical damage or change their performance



under bending or stretching states. Stretchable conductors and electrodes are the fundamental building blocks for final stretchable electronic devices. There are several challenges involved in finding suitable materials and manufacturing methods.

By integrating multiple stretchable components such as temperature, pressure and electrochemical sensors, it is possible to create a material resembling human skin that could use signals from sweat, tears or saliva for real time, non invasive healthcare monitoring, as well as for smart prosthetics or robots with enhanced sensing capabilities.

Future vision is to make 3D stretchable electronics that are as multifunctional and high performing as today's rigid electronics. In the future, stretchable electronics may be enhanced with new capabilities such as wireless communication, self charging or even self healing. The next step is taking the technology of stretchable electronics from the laboratory to the market. This requires cheaper materials and faster, scalable manufacturing methods.



A pick from our garden