From the President's Desk

I join you in celebrating the publication of the 11th edition of the IETE Bengaluru Magazine.

We're proud of the Centre's professionals work, and I'd want to extend a particular congratulations to all of the team members who, despite the hurdles, continue to deliver technical information and educate the members. The IETE Bangalore Newsletter is steadily gaining momentum and maintaining reader interest by adhering to deadlines. The thinking community benefits much from the articles and write-ups that appear in the Newsletter.

We are lucky to have a large number of committed volunteers who are enthusiastic about our profession, its reputation, and its contributions in an ever-changing world. They are also concerned with delivering service to our members, as well as opportunities for professional development and growth in both business and academia. The efficient functioning for IRSI (83) Awardee's selection Meeting and the number of webinars that IETE Bangalore has organized are examples of its determination to "return to normal."

Our communities will undoubtedly see better days ahead, thank you for your continued efforts to keep our commitment to keeping our fraternity alive.

I wish the Centre every success in the days ahead.

Prof (Dr) J W Bakal
President

Message from President Elect

I congratulate IETE Bengaluru Centre on the successful publication and release of the 11th edition of its Quarterly Magazine. I am glad that the magazine is being released on 15th September 2021, on the occasion of Engineers Day- birthday of Sir M Visveswaraya. Sir MV was an outstanding engineer, excellent statesman and an eminent scholar. He was a visionary who spearheaded development. In 1955, he was honoured with Bharat Ratna for his numerous industrial, economic and social projects. IETE being one of the leading societies of Engineers and Scientists, there could not have been a better day for release of this magazine.

IETE Bengaluru is one of the most vibrant centres which organize many technical programmes and training courses for the benefit of students, faculty and professionals. This magazine is another initiative by the centre for the technological advancement of its members. The magazine not only gives an overview of the technical programmes organized by the centre but also provides an opportunity to our Corporate, Organizational, ISF members to share their new developments, achievements and activities. I believe that with the launch of each of its successive editions, the magazine will become richer in content and variety.

I applaud the endeavours of IETE Bengaluru Chapter and wish the centre all the very best in all its future endeavours.

Prof (Wg Cdr) P Prabhakar (Veteran)
President Elect 2021-22

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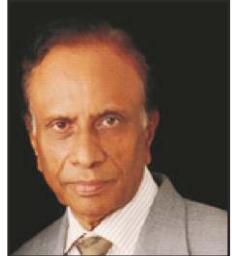
IETE BENGALURU

From the Chairman

Dear IETEians,

We at IETE Bangalore celebrate the Engineers' Day with a little more exuberance than shown on other occasions. On this day in 2018 we launched the first edition of our Magazine and we have never looked back since. It is my fervent hope that you will find each issue better than the previous.

We spare no effort to make the Centre a better and bigger one as days pass. Our membership has steadily risen. While most activities are online, the Members met together on Independence Day and also held the EC meeting. Many short-term courses and Internship programs have been undertaken, and efforts are on to improve the infrastructure for training activities. We held the AGM on 27th June, which was actually an introspection on our own performance during the one year the present Executive Committee was in office.

We are committed to do better and rise to your expectations. In this endeavour we need your involvement and support. Please send us your comments about the Magazine and critical evaluation of the Centre's work. Together let us do great things, 'Saha Veeryam Karava Vahe'.

C Satyanandan
Chairman, IETE Bangalore

From Hon. Secretary

As quoted by Scott Adams, *"Engineers like to solve problems. If there are no problems handily available, they will create their own problems"*, we all know that Engineers play a very important role in building our nation. As a token of appreciation to all Engineers and remembering the efforts of Shri Sir M Visvesvaraya, the ninth issue of the IETE Bangalore magazine is released on this special Day – *"The Engineers Day"* on 15th September 2021.

New approaches are being explored to focus the activities of IETE Bengaluru Centre. Several collaborative opportunities with many of the Industries have been explored to provide quality training to all the stake holders of the Centre. I am happy toshare, the Bangalore Centre has been recognized as the "Authorized Training Centre of PTC India in the area of Thing works IOT which is one of the State of the Art technologies in IOT and is all set to take up the training task.

The Magazine has been very instrumental in showcasing all the good work that has been done by the Centre and I appeal all the members to be more proactive and participate in all the technical activities organized by the Centre and make it more vibrant.

Dr. S G Shivaprasad Yadav
Honarary Secretary

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iici-2022

IETE INTERNATIONAL CONFERENCE INDIA-2022 (IICI-2022)
ON
AI & ML DRIVING 5G-ADVANCED & 6G
24-26 February, 2022, Bengaluru, India
Please contact: Dr M H Kori, iici-22 coordinator, at mhkori@gmail.com

From the Editor's Desk

Welcome to Eleventh Issue of *iete Bengaluru Magazine!* We are releasing this issue of IETEBM on Engineers Day. 15th Sept is celebrated as Engineers Day in India to commemorate the birthday of Sir M Visveswaraya, engineering genius and one of the architects of modern India. We are immensely proud and happy to release our 11th Issue of *ieteBM* on this very important day. Incidentally the first issue of *iete Bengaluru Magazine* was released 3 years back on 15th September 2018. We are extremely proud of bringing out this magazine continuously for 3 years.

iete Bengaluru Magazine would like to thank to Prof (Dr) J W Bakal immensely for his continued support to IETEB and for his excellent leadership and significant contributions to IETE as President for the year 2019-2021.

We would also like to congratulate Prof P Prabhakar for being elected as the IETE President for the year 2021-22. Prof Prabhakar has kindly sent his message. We are looking forward to work closely with the new IETE President.

In continuation with the series of articles on best Technical Institutes in Bengaluru & Karnataka, in this issue, we have included the articles on BMS College of Engineering Bengaluru and National Institute of Engineering Mysuru. BMSCE & NIE were started in 1946. As mentioned earlier we plan to cover all other prestigious Technical Institutes in subsequent issues.

This issue also covers all the major activities organized by IETEB which includes WT&IS Day, Prof N S Nagaraja Memorial Talk, Prof K Sreenivasan Memorial Talk, Teachers Day Program, 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 would like to thank 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 and Prof P Prabhakar, President Elect IETE, for their messages, 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.

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

Dr M H Kori
On behalf of *iete Bengaluru Magazine* Editorial Board

Thanks, Congratulations & Best Wishes

IETE Bengaluru Magazine
would like to express its immense gratitude
and heartfelt thanks to
Prof (Dr) J W Bakal
President IETE
for his unstinted and continued support to
iete Bengaluru Magazine during last two years
as President of IETE. Many Thanks Sir. Best wishes!

IETE Bengaluru Magazine would like to congratulate
Prof (Wg Cdr) P Prabhakar
on being elected as the President of IETE for the year 2021-2022
Looking forward to support and work with you Sir. Best Wishes!

Know Your President- Elect

Prof (Wg Cdr) P Prabhakar will officially assume the Presidency of IETE from 1st Oct 2021. Prof Prabhakar has a long association with IETE and has a great passion and vision for the Institution.

Prof. Prabhakar earned his B.Tech (Hons.) in Electrical Engineering with Distinction, AMIETE, and M Tech in Electronics & Communication Engineering, as well as a 'Post Graduate Diploma in Management' Program. In 1974, he started his career as an Assistant Professor in an Engineering College. He was selected as a Commissioned Officer in the Indian Air Force in 1975.

While in the IAF, he attended a semester Program on emerging technologies at Indian Institute of Technology, Kanpur, and then a one-year Comprehensive Training at M/S Mecanique Aviation Traction Electronique (MATRA), a leading provider of Mission-Critical Aerospace and Aviation Electronics Technologies in France. He was deputed to DRDO's Electronics & Radar Development Establishment (LRDE) to study the impact of Electro-Magnetic Pulse (EMP) on Electronics, Telecommunication, and Radar Systems, as well as how to initiate remedial measures to protect the Airforce's most sensitive and venerable assets. He was also involved in field trials of the INDRA Mark-1 Radar, which was made indigenously. He was also instrumental in performing multiple tests at DRDO sites, including the "Defence Laboratory" in Jodhpur, on several Defence Electronics Sensors.

Following his premature voluntary retirement from IAF, he was instrumental in the establishment of various technical institutes of higher learning. He has worked as an academician, researcher, and Director-Principal in numerous institutions in the states of Punjab, Haryana, and Himachal Pradesh over the past 25 years. He was a member of the Punjab Technical University's Academic Committee in Kapurthala, Punjab. He was also a member of the Himachal Pradesh University's Academic Committee and Board of Engineering Studies in Shimla. He has been a visiting Professor at C-DAC, Mohali.

Prof. Prabhakar, presently Senior Vice President at IETE and Chairman of Board of Research, Innovation & Standards, is engaged in implementing Revenue Generation, Digital Transformation, Digital Repository, and e-Governance reforms at all levels in IETE. He was the driving force behind the highly successful 5th IETE Innovators-Industry Meet 2021, held on 26th – 27th August '21.

AN EVENTFUL QUARTER

Activities of the IETE Bengaluru Centre & the distinguished members of the IETE Bengaluru Centre, during the quarter, are given below date wise:

1.   **01-04-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "3GPP Standards and Research in 5G & Beyond" at Ganpat University, Gujrat

2.   **05-04-2021 to 29-04-2021**: An Internship on 'AI & ML Using Big Data' was conducted by Dr. S Suresh Kumar, CTO PyWiz Analytica Pvt Ltd Bangalore

3.   **05-04-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Research in Wireless Communications leading to Beyond 5G" at Bangalore Institute of Technology, Bangalore.

4.   **10-04-2021:** Dr. T Thimmaiah Institute of Technology, KGF, conducted an Online IETE sponsored Webinar on "FPGA based Array Controller for Active Phased Array Radar" on April 10th 2021 from 10.00AM to 12.30PM. The Resource person was Mr. Amit Goel, Scientist E, LRDE.

Prof. V Vijaya Bharathi, HOD/ECE welcomed the gathering. Chief Guest was introduced by Prof. Inbalatha, Associate Prof. ECE Dept. Amit Goel in his lecture on the topic gave a clear picture about the design of Phased Array Radar using FPGA. Dr. Lakshmipathy, HOD/EEE proposed the Vote of Thanks.

5.   **15-04-2021:** 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.

Mr. Satyanandan described the mission and activities of IETE. He 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

6. *16-05-2021:* A hands-on online training on Augmented Reality' inaugurated. Sri. Hardhyan Singh Sohal, PTC Inc was the trainer. Augmented Reality: An Introductory Class for 1hr. was conducted on 16th May '21. Full-fledged classes started on 6th June. It was held for 3 hrs. on every week-end for 8 weeks.

7. *16-05-2021:* Prof C Murali, IETE Distinguished Fellow, delivered an invited talk on '5G Wireless Networks and a Glimpse of 6G' for knowledge sharing Webinar organised by the IETE Hyderabad Centre on 16th May 2021

8. *17-05-2021:* IETE Bangalore celebrated the WT & IS Day on 17th May at 6 pm. (Report in this Issue)

9. *18-04-2021:* Prof H S Bhatia, past Chairman IETE Bangalore delivered a talk on "Introduction to Radar Systems" at IETE Hyderabad Knowledge Sharing Seminar.

10. *19-05-2021:* Prof H S Bhatia, past Chairman IETE Bangalore delivered a talk on "Introduction to Radar Systems" at New Horizon College of Engineering.

11. *20-22 May 2021:* Sambhram Institute of Technology, IETE-SaIT student chapter conducted a webinar on Orientation Program on K-Tech Centre of Excellence in Aerospace & Defence.

12. *28-05-2021:* Department of Electronics & Communication Engineering, Brindavan college of Engineering, Bengaluru opened a student chapter (ISF) on 28th May,2021 with 55 student members and Faculty members of the department.

Sri. Satyanandan, Chairman IETE Bangalore was the Chief Guest, who inaugurated the ISF and gave a motivational talk. Prof. C Murali, former Vice President IETE gave a technical presentation on 5G and beyond. Dr. M Anitha presided over the function and coordinated with IETE.

13. *29-05-2021:* Sambhram Institute of Technology, IETE-SaIT student chapter conducted a online Workshop on Project Base Learning Using Proteus.

14. *29-05-2021:* Prof H S Bhatia, past Chairman IETE Bangalore delivered a talk on "Embedded Technologies for Modern Radar Systems" at Pravara IETE PAC, Pravarva Rural Engg College, Loni.

15. *29-05-2021:* Department of CS&E of SVCE, Bangalore organized a one-day webinar on "Introduction to DS & Algorithm and Roadmap for Programming" on Saturday, 29th May 2021. The program was organized in collaboration with CODINGNINJAS, Bengaluru and IETE-ISF Chapter.

Prof. Anjali Grover, Mentor, Coding Ninjas, Bengaluru and Ms. Shriya Prasanna, Alumnus, SVCE, Bengaluru were the speakers. Dr. Linga Reddy, head of the department (HoD) presided the event. Prof. G Prakasha was the coordinator and delivered vote of thanks.

16. *29-05-2021:* Department of E&CE, NMIT IETE Student Forum conducted a Webinar on Communication on Saturday May 29, at 11:30 AM. The topic was "5G &Beyond - New Technologies Driving Mobile Communications" delivered by Dr. M.H.Kori DFIETE, Vice President IETE, Technology Consultant, Consultant Telecom Standards Development Society India (TSDSI) Retd. Technical Director, Alcatel-Lucent Technologies & Former Chairman IMAPS India. Dr. Prasanna G Paga, Associate Prof., Dept of E&CE, , NMIT, Bengaluru, Dr. Sagarika Das, Associate Prof. and Ms. Ayesha Siddiqua, Assistant Prof. were Faculty Coordinators. Dr. Ramachandra. A.C. was Convener. Mr. Gagan Karthik was Student Coordinator.

17. *30-05-2021:* Department of CS&E of SVCE, Bangalore organized a one-day webinar on "Roadmap for Cracking Internships & Placements" on Sunday, 30th May 2021 for 3rd and 4th year students. The program was organased in collaboration with CODINGNINJAS, Bengaluru and IETE-ISF Chapter. Dr. Linga Reddy, head of the department (HoD) presided the event. Prof. G Prakasha was the coordinator and and delivered vote of thanks.

18. *30-05-2021:* Prof H S Bhatia, past Chairman IETE Bangalore delivered a talk on "Introduction to Low Probability Interception Radars" at IETE Hyderabad Centre Knowledge Sharing Seminar.

19. Five Day open course on "Advanced Networking and IOT Applications"- expert talk "Introduction to IOT Automation Applications", delivered by Mr Abhijith Telang, Business Development Manager at Softcell Technologies Private Limited. This session was organized in collaboration with IETE Student Forum, BMSIT&M. Introduction to IOT, its features and its automation in various applications were highlighted. IOT applications including inter disciplinary domain as well as current status and future prospect of IoT were discussed in detail. Mr. Telang also gave some demonstrations on IOT projects which he had carried out till now. Session was very informative; various concepts on IOT projects were cleared. The program was coordinated by Prof. Thejaswini S (IETE Coordinator), Assistant Professor, Dept. of ETE and Prof. Saritha I G, Assistant Professor, Dept. of ETE.

20. *31-05-2021:* Sambhram Institute of Technology, IETE-SaIT student chapter conducted a webinar on 'No Tobacco Day'.

21. **04-05-2021:** Prof C Murali, IETE Distinguished Fellow, delivered an invited talk on '5G Wireless Networks and a Glimpse of 6G' for a Webinar organised by Pravara Rural Engineering College, Loni, Maharastra,

22. **02-0602021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on " %G Applications in IOT & IIOT" at National Institute of Technology, Hamidpur, Himachal Pradesh.

23. **13-06-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Is it too early to start Research in 6G? – Research Trends in Beyond 5G and 6G" at Knowledge Sharing Series in Hyderabad IETE Centre.

24. **20-06-2021:** World Wi Fi Day was celebrated by IETE Bangalore online on 20th June at 6 pm. Mr. G R Ravi, Principal General Manager BSNL, Karnataka Circle was the Chief Guest who gave the keynote address on 'Wi Fi, a necessity for the development of Karnataka'. Dr. Kavitha, Jt. Hon. Secretary spoke about the World Wi Fi Day. Mr. Satyanandan Chairman IETE Bangalore presided.

Dr. Shivaprasad Yadav, Hon. Secretary welcomed the gathering and Dr. C V Ravishankar, Vice Chairman introduced the Chief Guest. Mr. Ranjeet Kumar, Hon. Treasurer proposed Vote of Thanks.

25. **22-06- 2021:** Sambhram Institute of Technology Dept. of ECE in Association with IETE conducted an Introductory webinar on Virtual Labs – NITK Surathkal.

26. **23-06-2021:** A meeting of the Standing Advisory Committee (SAC) of IETE Bangalore was held on 23rd June - 2021 online. Prof. Surendra Pal eminent scientist and Past President of IETE was installed as the Chairman of the SAC.

Mr. Satyanandan, Chairman IETE Bangalore welcomed the Hon'ble Members. Prof. HS Bhatia, Immediate Past Chairman and Convener, SAC conducted the meeting.

Dr. S Pal the new Chairman of SAC laid out a road map of action by SAC to assist the Centre in its future activities. It was decided that SAC would meet periodically.

Mr. GR Ravi   Dr. Surendra Pal

27. **25-06-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "5G & Logistics" at RVCE FDP

28. **27-06-2021:** IETE Bangalore held its AGM for 2020 – '21 on Sunday, 27th June-2021. The Business Session was followed by the Annual Prof. NS Nagaraja Memorial Lecture. The lecture was delivered by Mr. L Ramakrishnan, General Manager, Military Radars SBU, Bharat Electronics Ltd. Bangalore on 'Air Defense Radars- Evolution, Current Trends and Opportunities'.

29. **28-06-2021:** A webinar on Women Empowerment in Engineering was conducted. Dr. Sanju Tiwari, Senior Researcher at University Autonoma de Temaulipas, Mexico was the Chief Guest.

Ms. Tiwari, who hails from a rural background and rose to her present position as an author of numerous research publications and is a post-doctoral researcher was an inspiration to women students. She explained with data over the past decades how, in India, women's presence in Science and Technology has been increasing exponentially. However, women- to-men ratio in prestigious institutions like IIT's and at Ph. D level has been very low.
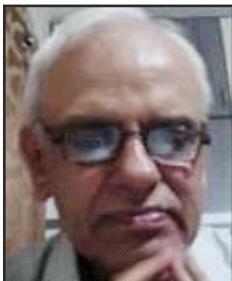
Dr. E Kavitha Jt. Secretary, IETE Bangalore introduced the Chief Guest. The lecture was followed by a lively discussion in which Chairman Mr. Satyanandan, Immediate Past Chairman Prof. Bhatia, EC member Dr. DG Rao and Dr. Kavitha participated.

30. **30-06-2021** A Webinar "Women - Peak your Potential" was conducted. Invocation was sung by Dr. Parimala P, Asst professor, MSRIT. Dr. S G Shivaprasad Yadav, Honorary Secretary gave the Welcome Address and introduced the keynote speaker Mr. K Gururaja, HRD Trainer & Mental Health Professional.

Mr. Gururaja spoke on women empowerment, challenges faced and how they can be overcome, quoting case studies. Participants engaged in the lively interactive session.

Mr. Satyanandan, who presided, appealed for increased participation of women in the activities of IETE and more representation in its rolls. He said only women can empower themselves and IETE Bangalore will conduct activities to motivate them to be on par with men. The Immediate Past Chairman, Prof. Harjinder Bhatia complimented the speaker for his talk and gave his views on Women Empowerment.

Vote of Thanks was proposed by the Honorary Treasurer Mr. Ranjeet Kuamr.

Mr. Gururaja

Mr. Abhijit Telang

31. **30-06-2021:** A Webinar cum Demo on "Wireless Module" was organized on 30th June 2021 by IETE Student's Forum (ISF), School of ECE, REVA University in association with IEEE Student Branch REVA University, IEEE Bangalore Section & IEEE VTS Bangalore Chapter. Nikhil S Arora, Scientist SF, ISTRAC-ISRO was the Resource Person.

32. **03-07-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on"Wonder World of Wireless – WiFi6 to Beyond 5G to Starlink" at Pravara Rural Engineering College, Loni, Maharastra,

33. **03-07-2021:** A Workshop on "Campus to Entrepreneurship- An Indigenous Journey" was conducted on 3rd July at 11 am. The Resource Person was Ms. Umaa Vemala, Entrepreneur, Corporate Trainer, Educationist and Management Consultant. The 2-hr. interactive session was well attended.

Dr. E Kavitha Jt. Hon. Secretary welcomed the attendees and anchored the program. Dr. Shivaprasad Yadav Hon. Secretary introduced the speaker.

Ms. Umaa gave her presentation in her lucid style, explaining the different facets of Entrepreneurship and motivating young men and women who aspire to become entrepreneurs. The session was of interest to members of IETE and invitees also who engaged in a lively discussion of the topic.

Mr. Satyanandan, Chairman presided and gave his views on the importance of such workshops in IETE Bangalore's effort to serve the student community and professionals. He complimented the speaker and invited her to future programs of IETE targeted at specified audiences.

34. **04-07-2021:** Dr Balaji Rajendran, Joint Director CDAC & IETEB EC Member, delivered a talk on "Digital Signatures and Public key Infrastructures" at IETE Hyderabad Knowledge Sharing Seminar.

35. **05-07-2021 to 20-07-2021:** IETE Bangalore was venue for the Chartered Accountant Main Examinations that began on July 5th and ended on 20th July 2021.

36. **05-07-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Advances in 5G & Beyond Technologies" at KK Wagh Institute of Engineering Engineering and Research Nagpur.

37. **07-07-2021:** Prof C Murali, IETE Distinguished Fellow, delivered an invited talk on '5G Wireless Networks – A Detailed Survey' for FDP Program at SVIT, Nashik, Maharastra.

38. **7th & 9th -07-2021:** Dr. C V Ravishankar Vice Chairmen IETE Bengaluru & HOD-ECE, Sambhram Institute of Technology gave a webinar talks on "How to be a Successful Entrepreneur" in Innovation and Entrepreneurship week conducted by YUVA incubated & KITES Research Pvt.Ltd.,New Delhi.

39. **08-07-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "New Research directions in 5G & Beyond" at SVIT, Nashik

40. **10-07-2021:** A Special Program was organized to commemorate Prof. K Sreenivasan who was President IETE during 1956-'57. (Report in this Issue)

41. **16-07-2021:** Dr C V Ravishankar Vice Chairmen IETE and HOD Dept. of ECE Sambhram IT participated as Session chair for Electronics & communication section in Online International Conference "Global convergence in technology, entrepreneurship, computing and value engineering: principle & practices (ICGCP-2021)" organized by Sapthagiri College of Engineering.

42. **20-07-2021:** The Department of Electronics and Communication Engineering Sambhram Institute of Technology in association with IETE Bangalore organized a one day National level inter college project competition named "PRATIRA-2021"in the campus premises. The event was inaugurated by Sri. C Satyanandan, Chairman IETE Bangalore and was presided by Dr. C V Ravishankar, Head of the Department, electronics and communication, Sambhram institute of technology, Bengaluru. The Program was coordinated by Dr. C Rangaswamy,

43. **22-07-2921:** Prof C Murali, IETE Distinguished Fellow, delivered an Expert talk on '5G and Beyond' for a Webinar on 'Technological Advances and Applications in 5G' by Telangana State Centre of The Institution of Engineers (India) 22nd July 2021

44. **24-07-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "5G in Logistics Applications" at Indian Institute of Material Management.

45. **29-07-2021:** ISF at Dr. Ambedkar Institute of Technology, Dept. of ECE, Bengaluru, the latest to join IETE Bangalore was inaugurated on 29th July 2021. Chairman Mr. Satyanandan and former Vice President IETE Prof. Murali gave Inaugural talk on 'Wireless Generations leading 5G and Beyond'.

46. **02-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "RF & Wireless Communication Concepts & Overview" at MSRIT FDP

47. **03-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, was the Guest of Honor at IETE Zonal Seminar at Mysuru and delivered an Invited talk on "IOT Applications and 5G"

48. **06-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Advanced concepts in Wireless Communications – 5G & Beyond" at MSRIT FDP.

49. **09-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, was the Chief Guest at VNVJ Institute of Technology Conference & delivered an Invited talk on "Challenges in adapting AI & ML in 5g & 6G Communications"

50. **09-08-2021:** Dr C V Ravishankar Vice Chairmen IETE and HOD Dept. of ECE Sambhram IT gave a key note address on" Recent technological developments and future of Electronics &communication engineering " in Online National Conference on Advancements in Electronics & communication engineering (NCAREC-21) organized by Sri Krishna College of Engineering,Bangalore,Karnataka.

51. **10-08-2021:** Dr C V Ravishankar Vice Chairmen IETE and HOD Dept. of ECE Sambhram IT gave a key note address on" Cyber Security – Future Issues & Consequences" in AICTE sponsored Online National Conference on Cryptography & Network Security (NCCNS-2021) organized by IIMT College of Engineering, Greater Noida, New Delhi.

52. **11-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Research Trends in Beyond 5G – 6G?" at IEEE MTT-S Bombay Region.

53. **12-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Advanced Antenna Systems in 5G & Beyond" at IETEB-BEL Workshop.

54. **13-08-2021:** Dr.C.V.Ravishankar, Vice Chairman, IETE Bangalore & Professor & HOD-ECE Sambhram inst of tech., gave a Key Note address on" Need of the Hour – Creating Employees or Employers" in National Webinar on Future of skill based education – Employment skills vs Entrepreneurial Skills training - hosted by Yuvaincubat ED & KITES Technologies Pvt. Ltd., New Delhi.

55. **15-08-2021:** Independence Day was celebrated. Flag Hoisting was done by the Chief Guest Dr. C Sheshgiri, Ex-President Indian Medical Association Bangalore Branch. Chairman and Members of the Executive Committee exchanged greetings and interacted with the Chief Guest over Tea. Dr. Sheshgiri was formally introduced by the Hon. Secretary. He planted a rose sapling in the IETE garden.

56. **15-8-2021:** Dr.C.V.Ravishankar, Vice Chairman, IETE Bangalore & Professor &HOD-ECE Sambhram inst of tech., gave a talk as guest speaker on " Why it is still Taboo for women to become Entrepreneur, How to overcome this stigma" in National Webinar on Role of Women in Aatmanirbhar Bharath hosted by YuvaincubatED & KITES Technologies Pvt. Ltd., New Delhi.

57. **16-8-2021:** Dr. S Suresh Kumar started a one-month internship on 'Artificial Intelligence and Machine Learning' for BE students.

58. **19-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on "Wireless Communications – 5G & Beyond" at IETE East Zonal Conference at Kolkata

59. **21-08-2021:** Dr. S G Shivaprasad Yadav, Hon Secretary, IETE Bangalore started a short-term course on 'MATLAB/SIMULINK' for 10 weeks.

60. **22-08-2021:** Dr C V Ravishankar Vice Chairmen IETE and HOD Dept. of ECE Sambhram IT gave a talk on " The Silent Language of Leaders" in Social leadership summit 2021 conducted by EWB India-Gurugaon,New Delhi, Country Edu Pvt. Ltd.,& NC University, New Delhi.

61. **24-08-2021:** Dr M H Kori, IETE Vice President & IETE Distinguished Fellow, delivered an Invited talk on " Massive MIMO and Reconfigurable Antennas for 5G & Beyond" at MSRIT FDP.

62. **29-08-2021:** Dr. S Suresh Kumar started an 8 weeks course on 'Industry perspective in Artificial Intelligence and Machine Learning – Using Python'.

63. **30-08-2021:** A four-day Course on 'Engineering of Radar Systems and its Challenges' for Executives of Bharat Electronics Ltd. started. Dr. DC Pande, GC Member was the Course Director.

64. **30-08-2021:** Dr C V Ravishankar Vice Chairmen IETE and HOD Dept. of ECE Sambhram IT gave a talk on " Engineers – Their social leadership responsibilities during COVID-19 situation" conducted by EWB India - Gurugaon,New Delhi, Country Edu Pvt. Ltd.,& NC University, New Delhi.

65. **05-09-2021:** Teachers' Day was celebrated. Dr. Debabrata Das, Director IIIT Bangalore was the Chief Guest. Prof. NC Sivaprakash Professor (Retd.), IISc. Bangalore was Guest of Honour and keynote speaker. He spoke on 'The Teacher's Role in Effective Teaching and Learning'.

Prof. Shivaprakash

Dr. Debabrata Das

Prestigious Technical Institutes of Bengaluru & Karnataka
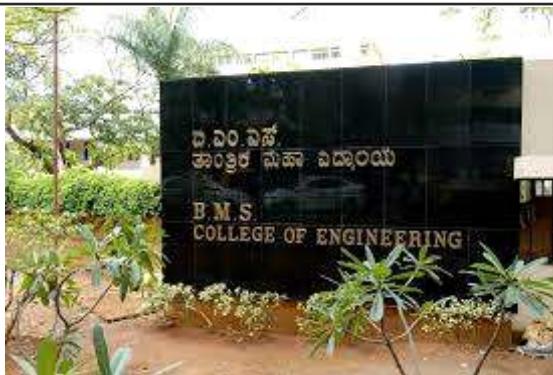
Bengaluru & Karnataka are home to many reputed and prestigious Technical Institutes. IETE Bengaluru Magazine (IETEBM) is continuing its series of articles covering these Technical Institutes. In the previous issues we had covered the Indian Institute of Science, the best Technical Institute in India & UVCE. In this issue we are covering BMS College of Engineering, Bangalore & National Institute of Engineering,

Mysore. Both were started in the year 1946.

BMS College of Engineering, Bangalore
(Compiled by Dr M H Kori)

B.M.S. College of Engineering (BMSCE) was Founded in the year 1946 by Late Sri. B. M. Sreenivasaiah a great visionary

and philanthropist and nurtured by his illustrious son Late Sri. B. S. Narayan.

BMSCE is the first private sector initiative in engineering education in India. Over the past 74 years of its illustrious existence, the institution has produced more than 40,000 engineers/leaders who have enriched the world through their immense contributions for mankind. Started with only 03 undergraduate courses, BMSCE today offers 13 Undergraduate & 16 Postgraduate courses both in conventional and emerging areas. 14 of its Departments are recognized as Research Centers offering PhD/M.Sc (Engineering by Research) degrees in Science, Engineering and Management.

The College has been effectively practicing outcome based education. The College has one of the largest student populations amongst engineering colleges in Karnataka. Currently about 5000 students are pursuing their higher studies in BMSCE. More than 350 research scholars are pursuing their PhD Degree in BMSCE Research Centres. BMSCE is one of the most preferred destinations for the students from across the country which could be attributed to the quality education, infrastructure, healthy teaching-learning practices as well as producing industry ready students. The College strives to develop technical, professional skills and individual values in its students that help to create foundation for their success. Speaking about faculty, the college has always attracted the cream of the crop. Its current team of faculty is no different. They are well qualified, meritorious, experienced and highly dedicated. The classrooms and labs of the college are best-in-class, well equipped and sophisticated. The labs are regularly upgraded in order to stay advanced. The campus is Wi-Fi enabled with 24x7 internet facilities in the departments and hostels. The college results and placement record bear testimony to the high standard of education provided by the institution.

The institution has strong linkages and collaborations with reputed national and international institutes/organizations to nourish academic, research and innovation. The academic performance of the students has been exceptional, more than 90% of the students secure first class/distinction. The institution has an excellent Placement and Training Centre. More than 200 reputed Core/IT/MNC companies visit the campus every year recruiting students from various branches. More than the

90% of the eligible students get placed every year. The institution is consistently ranked amongst the best engineering institutes in the country.

Affiliation & Accreditation

• Accredited by National Assessment and Accreditation Council (NAAC) with highest grade of A++ in the second Cycle with a CGPA of 3.83 on a scale of four. Valid from 28.03.2019 to 28.03.2024.

• First institution in the State of Karnataka accredited by National Board of Accreditation (NBA) in Tire I Format

• Permanently affiliated by Visvesvaraya Technological University (VTU), Belagavi

HIGHLIGHTS

• First Private engineering college established in the Country

• Approved by All India Council for Technical Education (AICTE), New Delhi

• Autonomous Institution (UGC approved) since 2008. The College has been effectively practicing Outcome Based Education (OBE)

• Permanently affiliated to Visvesvaraya Technological University (VTU)

• Approved as QIP Centre in Engineering & Technology by AICTE, New Delhi

• Included under 2f and 12B of the UGC Act, 1956

• The institution is proud recipient of TEQIP III (World Bank Funded Project); Successfully participated in TEQIP I & II Projects.

• Only partner institution from India of the Melton Foundation, USA, Which advocates global citizenship.

• Recipient of MHRD Scheme on Global Initiative of Academic Network (GIAN) and National Doctoral fellowship – AICTE NDF since 2018-19.

Distinguished Alumni include Academicians like Padmashree H C Viveswaraya (Former VC IIT Rourkee), Prof H P Khincha (Former VC VTU), Prof S S Murthy (Former Vice Chancellor,Central University; Dean IITD), Dr Purna Prasad (Director, Clinical Technology & Biomedical Engineering at Stanford University Medical Center), Industrialists like Col.

HS Shankar (Former Director R&D BEL and current CMD at ADTL), Mr. TAN Moorthy (Senior VP Infosys), Padmashree Dr. V R Gowrishankar (CEO and Administrator Sringeri Peetam), Politicians like Shri Dinesh Gundurao.

Location & Area : Located in the heart of Bangalore, the Garden City of India, BMSCE is about 5 KMs from the Central Railway Station. The campus area is 11 Acres 30 Guntas with a built up area of 99,500 Sq.M..

National Institute of Engineering, Mysuru

(Compiled by Mr C Satyanandan)

The National Institute of Engineering (NIE) is a private engineering college located in Mysore. It was established in 1946 and granted autonomy in 2007 from Visvesvaraya Technological University.

NIE was started in 1946 with diploma programs in Civil Engineering in a room under a thatched roof in Lakshmipuram. The first batch consisted of 86 students. Later, the classes were held in a shed in the nearby Sharada Vilas High School campus, in Mysore. S. Ramaswamy, D. V. Narasimha Rao and T. Ramarao ("Tunnel" Ramarao), the founders, established NIE by 1950 with its own class rooms and workshops on a 6-acre campus. NIE started AMIE courses in Civil Engineering for intermediate-passed students in 1948. The students were permitted to change over to the regular degree course leading to B.E. degree in Civil Engineering of the University of Mysore. Thus, NIE became the second engineering college in the state of Karnataka and the first in Mysore. The first batch of students in Civil Engineering graduated in 1953.

The National Institute of Engineering (NIE) is a grant-in-aid institution and approved by the All India Council for Technical Education (AICTE), New Delhi. NIE got autonomous status from Visvesvaraya Technological University, Belagavi in 2007. It has been accredited by NAAC. Five Undergraduate Programmes – Civil Engineering, Mechanical Engineering, Electronics & Communication Engineering, Electrical & Electronics Engineering and Industrial & Production Engineering and

three PG Programmes – Hydraulics, Production Engineering & System Technology and Structural Engineering have been accredited by the National Board of Accreditation, New Delhi, under Tier-I.

It is one of the 14 colleges in Karnataka that has been recognized under MHRD-World Bank sponsored Technical Education Quality Improvement Programme (TEQIP) in all the three phases. All the Departments of NIE are recognized as Research Centre under VTU and AICTE for QIP. Currently, NIE offers 7 UG and 12 PG Programmes. Faculty has been the main strength of NIE. They impart their vast knowledge to the students by using conventional methods of teaching-learning process as well as contemporary ones.

To enrich research and consultancy activities, 14 Centres of Excellence have been set up in collaboration with Industries and Alumni. These Centres provide opportunities for students to fine tune their skills to the expectation of industries and offer consultancy services. Many funded research projects of Central and State Governments, VTU and overseas universities are presently being carried out at NIE.

In March 2019, the government of Karnataka approved a private university status for NIE society through notification of The NIE University Act 2019, and it is set to start NIE University. D.A. Prasanna was designated the founder chancellor.

The institute is presently located on Mananthavady Road, Mysore Spread across 18 acres. A new campus is planned to be built on a 50-acre land granted by Karnataka Industrial Area Development Board (KIADB) beyond Mysore Airport at Mandakalli. New Campus is expected to be ready by 2022.

The National Institutional Ranking Framework (NIRF) ranked NIE 175 among engineering colleges in India in 2020. NIE was ranked 28 in Outlook India's "India's Top 150 Engineering Colleges in 2019" and 49 in The Week-Hansa Research's "Best Colleges Survey 2019: Top Engineering Colleges - All India"

The illustrious alumni of NIE include - Mr. N.R.Narayana Murthy of Infosys, Mr. Kumar Malavalli of Brocade Communications, Mysooru Nagaraja of New York City Transit Authority, Mrs. Kalavathi, Head of Philips Innovation Campus, Bangalore, Mr. S.B.Ravishankar, Businessman in London, Mr. EAS, Prasanna, Legendary cricketer, Mr. Shriram Revankar, Vice President of Adobe Reserach Lab, Mr. Ramesh Kannan, Founder of Kayens Technology, Mr. Athul V Kulkarni, IPS, and Swamy Nirmalanandantha of Adichunchanagiri Matha.

Dr. M.S.Ranganath is the President of the Institution and Dr. N V Raghavendra the Principal.

Remembering Prof. K Sreenivasan- A Report

A special Program was organized on 10th July 2021 at 6. 30 pm to commemorate Prof. K Sreenivasan who was President IETE during 1956-'57. This was in pursuance of the decision taken at the Standing Advisory Committee Meeting held on 23rd June '21 to revive and institute Memorial Lectures in honour of IETE's legends.

Prof. JW Bakal, President IETE was the Chief Guest at the online program.

After Invocation Mr. Satyanandan, Chairman IETE Bangalore welcomed the Chief Guest, Members and invitees. He gave a brief account of the early life of Prof. Sreenivasan. He then requested Mr. G Ramesh, Governing Council Member to conduct the proceedings. Mr. Ramesh said that we had been thinking of reviving the tradition of conducting Prof. Sreenivasan Memorial Lecture which was not held for many years. He remembered that it was Prof. BS Sonde who delivered the first lecture and many other luminaries also had given these talks. He also talked about how he found in his files an old invitation which happened to be one to the celebration of the 90th birthday of Prof. K Sreenivasan on 10th July 1989. He narrated his early memories of Prof. Sreenivasan and then requested the senior members to talk about their acquaintance with or information about the legendary figure.

Mr. H Ramakrishna who had been a student at Indian Institute of Science, Bangalore narrated anecdotes about Prof. Sreenivasan, his interest in classical music and his unique qualities as a teacher. He mentioned an interesting incident about how he introduced Radar in IISc. curriculum and motivated some students to join the efforts in World War II.

Prof. HS Bhatia Immdt. Past Chairman read out the complete list of Prof. Sreenivasan Memorial Lectures held till it was interrupted some years ago. Dr. MH Kori, Vice President IETE remembered the memorial lecture given by Prof. Sonde and said he had family ties with Prof. Sreenivasan. Dr. DC Pande, GC Member and South Zone Mentor also said he was acquainted with the Professor through the Memorial Lectures. He was known to be a strict teacher and taskmaster who at times assigned work from outside the books.

Members were happy about the attempt to revive the Lectures. Invitees to the day's function Mr. MK Krishna, Mr. HV Manjunath and Mr. Raju Sagi were also appreciative of the effort.

Executive Committee Members spoke briefly too. Mr. CP Dwivedi said he got to know about Prof. Sreenivasan from late Mr. AB Sreenivasan. Prof. Ravishankar said the common link with the Professor was that their ancestral village was Hebbur in Tumkur. Mr. Ranjeet Kumar had attended a few Memorial Lectures. Dr. Shivaprasad Yadav

and Mr. Vinay Avanchi appreciated the fact that we were able to organize the program at short notice.

Dr. JW Bakal, President IETE, in his Presidential Remarks said that he was honoured to be in the long line of Presidents including visionaries like Prof. Sreenivasan. He brought to everyone's attention that IETE is now leading the other professional bodies in India. IETE Journal of Research has just received the top ranking among similar publications. He wanted the series of Memorial Lectures in honour of the legends to continue and complimented the Bangalore Centre.

Prof. HS Bhatia proposed the Vote of Thanks.

Prof. K Sreenivasan was born on 10th July, 1899 in Hebbur Village, near Tumkur in Karnataka to K.V Krishan Sastry and Sowbhagyavathi Lakshmi.

He passed SSLC in June 1916 and joined Central College Bangalore and obtained B .Sc. degree from the University of Mysore in 1920. From 1920 to 1922 he worked as an Apprentice in the Electrical Department of the Govt. of Mysore.

He was a Student of Electrical Technology at the Indian Institute of Science Bangalore from July 1922 to Oct. 1927. He was awarded the Certificate of Proficiency of the Indian Institute of Science in July 1926 and the Associateship of the IISc. next year. From Oct. 1927 to Dec. 1930 he was on a scholarship to study Radio & Electronics in England and France, working at BBC London and Les Laboratories Standard Paris.

Prof. Sreenivasan was Asst. Professor of Electrical Communication Engineering at IISc. from April 1932 to Feb. 1945. He was an Honorary Worker at Laboratoire Centraile Des Telecommunications, Paris from May 1930 to Feb. 1940.

He was Prof. of Telecommunications Engg. at College of Engineering, Guindy, Madras (1945-1948), Prof. and Head of Dept. Communication Engg. at Indian Institute of Science Bangalore (1948-1959) and Director, MIT Chrompet, Madras (1960-1971).

Prof. Sreenivasan has numerous publications to his credit on Radio Engineering subjects in Indian and foreign journals. He was Fellow of the Indian Academy of Sciences, Bangalore, Fellow of the Institute of Electrical Engineers, London, Senior Member of IEEE and Distinguished Fellow of IETE. He was President of IETE, 1956-'57.

A widely travelled person, Prof. Sreenivasan visited England, France, Germany, Czechoslovakia, Denmark, Switzerland, Japan and the USA.

One Week Faculty Development Program on
"RECENT ADVANCES IN RF & WIRELESS COMMUNICATIONS"
AUG 2nd to 07th 2021
Organised By Departments of Electronics & Telecommunication Engineering, Electronics & Communication Engineering Jointly With IETE Bangalore & SAGE USA

FDP Co-ordinators:
Dr. S. G. Shivaprasad Yadav, & Mrs. Nisha S L, Dept. of ETE
Mr. V Nuthan Kumar, and Mrs. Chitra M, Dept. of ECE

The FDP was inaugurated on 2nd August 2021 at 9.30am. The welcome address was given by FDP Coordinator Dr. S G Shivaprasad Yadav, Associate professor, department of ETE. Prof. H R Ramya, Faculty, ETE department rendered the invocation. Dr. B K Sujatha, Hod of ETE department, then gave an overview of the FDP.

The Chief Guest Dr. Surendra Pal, Former President IETE and Former Vice Chancellor DIAT inaugurated the program and delivered the key note address on the theme of the program. Followed by this the two Guests of Honour Dr. M H Kori, Vice President IETE, Former Tech Director, Alcatel-Lucent Technologies and Dr Prasad Shastry, Professor, Bradley University USA the Guests of Honour addressed the gathering and explained the importance of RF and Wireless Communication and appreciated the organisers for the theme identified. They also briefed the objectives of SAGE group and gave their vision to contribute to the RF and Wireless domain.

Mr. C Satyanandan, Chairman, IETE Bangalore Centre addressing the participants gave details of technical activities conducted by the Centre and appealed to all to participate in all its activities.

In the absence of the Dr. N V R Naidu, Principal of RIT who was out of the country, the In-charge Principal and Registrar Academics Dr. Archana delivered the presidential address and spoke about the importance of technology updates in the RF, Microwave and Wireless domains with lots of examples and her personal experiences. She complimented both the departments of ETE and ECE for organizing the FDP program on a very good theme and wished all the participants all the best in learning the technology.

Mr. Mahadev Kokkari Registrar (Administration), RIT also appreciated the faculty participants for and appreciated the interest shown towards upgrading the knowledge as more than 200 participants had enrolled for this FDP. Dr. Sujatha B, Associate Professor from ECE department then proposed the Vote of Thanks.

There were several legendary speakers for the program. The speakers from SAGE (Shastry Associates Group Enterprise) delivered excellent talks during the FDP. To name a few of them, Dr. Prasad Shastry, Prof Scarlet Daoud, Eagle-i RF Consulting, USA, Mr Bala Sundaram. Endotronix Inc, USA & Mr Roger Watkins, Accuray Inc, USA, Mr Krishna Katragadda, Google LLC, USA and Dr. M H Kori.

Along with SAGE experts, there were many other eminent personalities from India also shared their expertise in their talks like Ms Aparna Sankara Subramaniam, Verdant Telemetry & Antenna Systems Pvt Ltd, Kochi, Dr Subha P Eswaran, Central Research Labs, BEL, Bangalore, Dr Hanumantha Rao, Alpha Design Technologies Ltd, Bangalore, Prof V Mahadevan, PES Univ, Bangalore and Mr H Ramakrishna Former Exec Director & Head CRL, BEL.
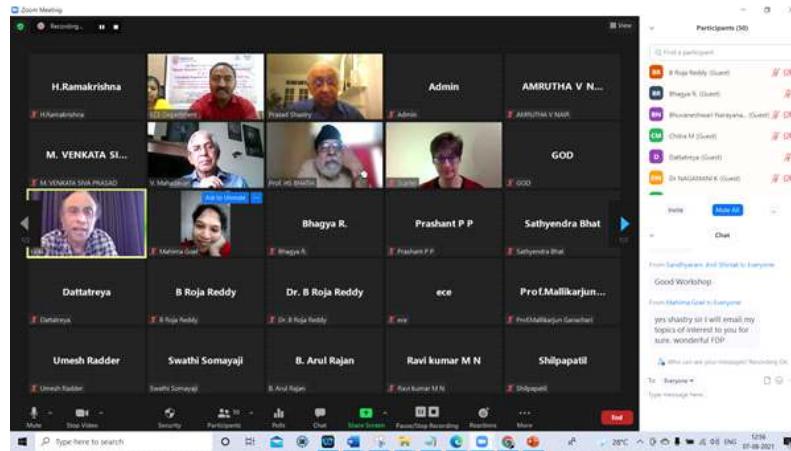
All the talks were outstanding lectures covering the recent trends and challenges in the respective domain. The talks covered most of the topics in the RF and Wireless domain and highlighting the research opportunities for the faculty participants in the global level. Speakers shared their experiences, challenges faced and achievements made in their domains.

The talks were also supported by excellent hands-on sessions and demonstrations by MathWorks and AvGarde Systems. In the first three days afternoon sessions were covered by Mathworks on the topics

Wireless Communication, Antenna design technology and Advances like AI for Communications with Matlab and Simulink. The hands-on sessions on several interesting topics in RF and Microwave domain using the Matlab and Simulink tool boxes were very planned and demonstrated. Step by step guidance was given to all the participants for executing the experiments. Mrs. Nisha SL and Dr. Swetha Amit, faculty from ETE departments assisted the Mathworks team during the hands on sessions.

The experts from AvGarde systems also explained the usage of SDR kits and demonstrated several experiments which can be implemented in the RF and Wireless domain using Software defined and cognitive radio concepts using Labview. The participants could interact lively with the experts and did many of the programs during the hands-on sessions.

Shri Ramkrishna H, Former Exec Director & head CRL, BEL, Bangalore was the Chief Guest of the valedictory session. He appreciated the participants for the enthusiasm and interest they were showing in learning the technology and congratulated the organizers for conducting a nice FDP. He also shared his experiences during his tenure the challenges and achievements in defence projects. His words were very encouraging and motivating to the participants.
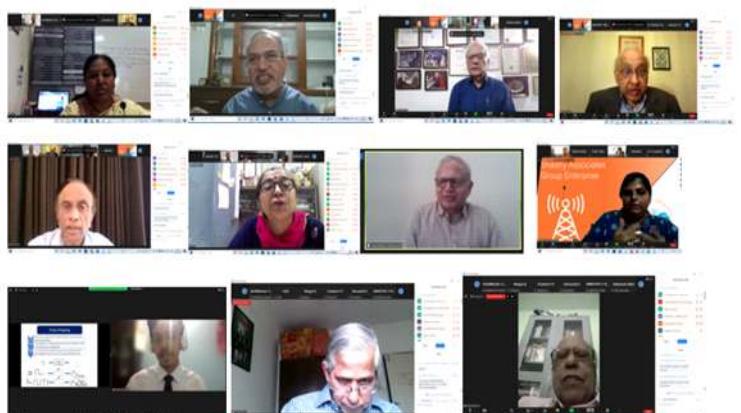
Dr. Prasad Shastry was the Guest of Honour during the valedictory and addressed the participants. He appealed to all to involve in more quality research in the domain of RF and Wireless and said he would support with his SAGE Team. He also mentioned that they would be conducting several similar training programs in the RF and Wireless domains for the benefit of faculty and students.

Prof. Mahadevan the other Guest of Honour appreciated the well planned flow of the lectures during the FDP. He also explained the various research opportunities which can be taken by the faculty and guide the students effectively.

Mr. Satyanandan, Chairman, IETE Bangalore was appreciative of the efforts of the coordinators and Heads of ETE & ECE departments in jointly organising this FDP in association with IETE Bangalore.

Some of the Participants also expressed their views and happiness about learning many new topics and concepts during the FDP. They also appreciated the hands-on/demo sessions and overall were very delighted with the program.

The Heads of the ETE & ECE departments and the coordinators thanked the dignitaries and participants for their support and cooperation during the program.

The Written Word

C Satyanandan

The first written records date back more than 5,000 years in Egypt and ancient Sumer. Since then the power of the written word has remained unquestioned. From circulating powerful ideas to preserving traditions and memories to creating constitutions and the laws of nations, the written word has been one of the most potent tools developed by the human mind.

Certainly, the pen is mightier than the sword. But people have started wondering if it is mightier than the keyboard. With instruments of information technology we can write so fast that handwritten copy is fast disappearing in the workplace and even in personal communication. IT has entered even school classrooms where children take notes on their laptops, leading to some countries even dropping "cursive writing" practice altogether from primary standards and requiring children to learn to use computers.

Understandably, many bemoan the gradual death of handwriting. For many of us it's a tradition, an art form or a basic skill whose disappearance would be a cultural tragedy. Handwritten file notings and signatures, nevertheless, still command respect in government work, and for most elderly people it has been the way they communicated over decades. For a good part of my life I was exchanging handwritten letters with my near and dear ones. Taking down notes in hand, apparently, is quicker and easier even for the most technologically savvy, and surely a birthday greeting written in one's own hand is far more precious than a whatsapp message. Thankfully, schools in our country and elsewhere have decided to continue with teaching cursive writing.

Whatever way words are written, (or typed if you prefer), written language has enormous influence, and words are its building blocks. One of the key indicators of students' success in standardized tests, and indeed, in life, is their vocabulary. The reason for this is simply that the knowledge anyone has about a topic is based on the vocabulary of that information. GRE, a computerized test whose score determines in large part the likelihood of getting admission to a post graduate course in top universities, including the Ivy League ones, tests the aspirant's verbal ability of a high order.

For the student aspiring for admission to an institution of higher learning and subsequent pursuit of careers, a high level of vocabulary is important:
1.   To improve Reading Comprehension, a skill required in understanding fiction and non-fiction text books.
2.   To develop oral communication skills required, say, in making presentations.
3.   To develop written communication skill required in writing essays and other academic material.
4.   To achieve occupational success, for example, success in the business place which requires competitive communication skills.

A word has form, meaning and use. The form of a word involves its pronunciation (spoken form), spelling (written form), and any parts that make up the word (such as a prefix, root, and suffix). Meaning refers to the concept and the associations that come to mind when people think about a specific word or expression. Use involves the grammatical functions of the word or phrase, collocations that normally go with it, and any constraints on its use, in terms of frequency, level, and so forth.

The GRE is a typical (and globally, the most respected) test of a student's verbal skill. It measures your ability to analyze and evaluate written material and synthesize information obtained from it, to analyze relationships among component parts of sentences, and to recognize relationships among words and concepts.

Ability to write well and comprehend what is written by others is an asset not only for students but for anyone who wants to share his/her thoughts, ideas, feelings, experiences and much else effectively. Written words have a much stronger and broader impact on the human conscience than the spoken words we use in our regular speech. Written words have a clearer, enduring and direct message, when compared to spoken words. Your writing can influence, inspire and educate numerous others on a massive scale.

There are four main types of writing in terms of the purpose: expository, descriptive, persuasive, and narrative. Expository writing sets forth facts, and is probably the most common writing genre you will come across during your day. Descriptive writing is to help the reader visualize, in detail, a character, event, place, or all of these things together. The aim of persuasive writing is to influence the reader to assume the author's point of view. Narrative writing can be found in all types of Fiction, Poetry, Biographies, Human interest stories and Anecdotes.

Learning words that you can use in writing isn't difficult if you have the will. Developing the reading habit is the first step. Understanding meanings of words that appear in a novel or a newspaper article can be far more helpful than finding meanings out in isolation. Standard tests assess the student's knowledge of words in context. Use the dictionary to find synonyms, antonyms, root words, and related words. Be on the look-out for words that would actually be better words in the context of what you're writing. A mnemonic device or word association helps you to remember words' definitions and proper uses. Word games and Crossword puzzles can function as a fun way to expand your English vocabulary, as well.

Learn words. As you broaden your range of vocabulary, you become better able to describe specific settings, emotions, ideas and a lot more. You become a better communicator.

A Report on World Telecommunications & Information Society Day 2021

IETE Bangalore celebrated the World Telecommunications & Information Society Day on 17th May at 6 pm. The online event was well attended.

Mr. Devesh Kumar ITS, Chief General Manager Telecom. BSNL Karnataka Circle was the Chief Guest. Dr. Saptarshi Chaudhuri, Chief Architect, Radisys and Mr. K S Madanpuri ITS, CGM, NE-I Telecom Circle, Shillong were Guests of Honor. The speakers made presentations on the theme 'Accelerating Digital Transformation in Challenging Times'.

The function began with an Invocation by Ms. Rashmi, student of MSRIT. Dr. Shivaprasad Yadav, Hon. Secretary gave the Welcome Address. Dr. Kavitha, Jt. Hon. Secretary read out the Message of the Secretary General ITU, followed by Dr. Shivaprasad who read the Message of the President IETE.

Dr. CV Ravishankar, Vice Chairman introduced the Chief Guest Mr. Devesh Kumar by reading out his profile.

Mr. Devesh Kumar explained what we mean by Digital Transformation and described the various areas in which it is happening. He emphasized the need to take this to the lowest strata of the society and dwelt on the measures taken by BSNL to reach remote areas. He said BSNL adopted Digital to increase efficiency of operations and to enhance Customer Experience. High Speed Data Connection to households has been accomplished. He elaborated on how digital technology has come to the rescue in the present Covid crisis and natural disasters. Quality of life is the ultimate purpose of Digital Transformation, he said.

Dr. Shivaprasad Yadav then read out the profile of Dr. Saptarshi Chaudhuri, Guest of Honour and requested him to make his presentation.

Dr. Choudhuri gave an illuminating presentation on '5G and Beyond- Technology and Challenges'. He talked about the imminent launch of 5G, its benefits and how it is different from 4G. He also said the time has come when we can talk about the vision of 6G. He then proceeded to give the agenda of his talk and the detailed presentation.

Dr. Kavitha, Jt. Hon. Secretary introduced the next Guest of Honour Mr. Madanpuri with his profile.

Mr. Madanpuri presented the challenges for ICT's during the Covid crisis. He listed the various domains for digital transformation and said that Broadband has become the new essential and Fibre to homes is a basic need.

Dr. MH Kori, Vice President IETE gave an introduction of IETE's mission and activities. He talked about the large number of IETE centres spread across the country and IETE's wide reach. IETE is also recognized by Govt. as a Scientific & Industrial Research Organisation, he said. He gave a short history of the quarterly IETE Bengaluru Magazine and the features of the latest edition which he requested the Chief Guest to release. Mr. Devesh Kumar released the 10th edition of the IETE Bengaluru Magazine amidst applause from the audience.

Mr. Satyanandan, Chairman IETE Bangalore who presided, appreciated the presence of the distinguished guests and their illuminating lectures. He also thanked Dr. Kori for his introduction of IETE's mission and the Magazine. He thanked the efforts of the Office Bearers and the staff to make the function a success.

Quoting from the message of ITU Secretary General, the Chairman said that there are digital inequalities between different countries and within the countries themselves. This, he said, is unfortunately too true of our own country and IETE has a role in trying to remedy the situation by bringing all stake holders on a common platform.

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

MADANPURI   DEVESH KUMAR   SAPTARSHI CHAUDHURI

Dialogues

(Aug. 12, 2021)
Dear Chairman,

As a former student of IETE Bangalore Division, I am glad to inform you that the AMIETE course has really helped in our career and academic growth. Presently, I am working with DRDO and I've received my promotions after completing AMIETE course.

I really thank IETE to provide us an opportunity to continue learning process for working professionals like

Today, I am really glad to inform you that I've been selected for higher studies. During this joyful moment, I thought I would like to thank IETE for proving a path to continue studies.

Thanking You,

Jayamohan.C.B
AM-190540

Data Analysts and Developer with SageMaker

Vidya. R Pai1, Shruthi J2, Sumathi M S3, Bharathi R4
Vidya R Pai, Shruthi J, Bharathi R, Faculty, Department of Computer Science and Engineering,
BMS Institute of Technology and Management.
Sumathi M S, Faculty, Department of Electronics & Telecommunication Engineering,
BMS Institute of Technology and Management.

Abstract:
SageMaker, a cloud platform that enables the developer to design, impart, and deploy machine-learning prototypes in the cloud launched in November 2017. SageMaker works at different levels of abstractions while training and deploying machine learning prototypes. It provides a customised ML algorithms to train on their own data and as well as the developers can create their own ML algorithms from scratch using the instance of TensorFlow and Apache MXNet. Irrespective of the level of abstraction, the developer shall join their ML protypes to other AWS services like Amazon DynamoDB database, AWS Batch or Amazon Kinesis for structured data storage, offline batch processing and real-time processing.

Keywords: Machine Learning, Cloud Computing, Jupyter Notebook, SageMaker, TensorFlow, Apache MXNet.

1. Introduction

The matter of the fact is, taking ML model from conceptualization to product is indeed a time consuming and amazing complex. The complexity involved in managing the large amount of data, in choosing the best algorithm for training it, and in utilizing the prototype in production environment. Amazon SageMaker would reduce the complexity. It is much easier to build and deploy ML model. Once the right algorithms and frameworks are made available. SageMaker manages all of the central infrastructure to train the model at petabyte scale, and organize it for production. Machine learning models with SageMaker shall be effortlessly constitute and train and then straight away position them into 'ready for production' environment,
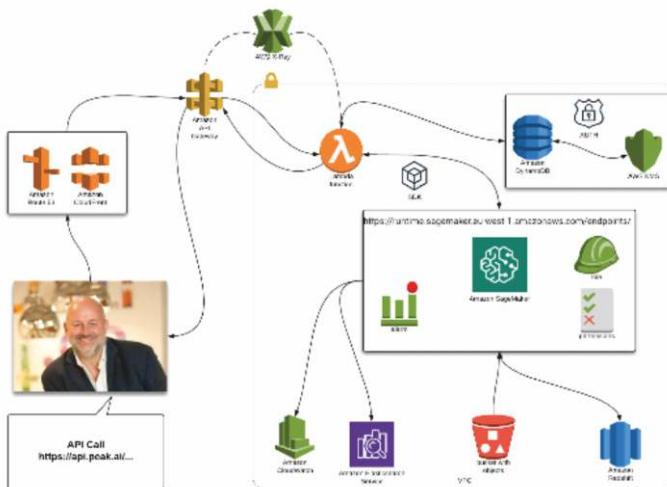

Fig. 1: Deploying ML models with Amazon SageMaker

SageMaker furnishes a unified Jupyter authoring notebook for easy accession of data sources for analysis thereby one

need not to control the services. A customary learning algorithm that are standardised to run proficiently against a sizable amount of data in a distributed dispensed condition. SageMaker with indigenous support for being-your-own-algorithms and frameworks, offers flexible distributed training option that shall adjust to our specific workflows.

Position a model into a reliable and scalable condition and launch it with SageMaker studio or the console. with no minimum fees and no advance commitments, training and hosting shall be billed by minutes of usage.

2. WORKING PRINCIPLE

Working principle of ML is to instruct system to make forecast or inferences. One can use an algorithm and data to impart training for a model and then unified the model into the application to bring about conclusion in real time and at scale. A prototype in a production condition, normally learn from millions of examples and produces hundreds of inferences less than 20 milliseconds. The following diagram illustrates the classic workflow for building a machine learning model.
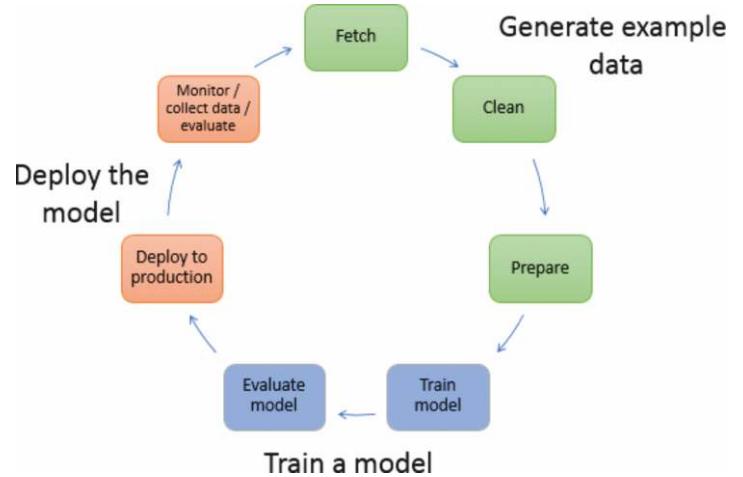

Fig 2: Workflow of Machine Learning Model

The following activities shall be performed according to the following diagram: -
❖ Generate Example data: In SageMaker, the example data is being processed in a Jupyter notebook. The notebook is being used to fetch dataset, to analyse and prepare for model training.
❖ Train a Model: SageMaker contribute a suite of built-in- algorithms to assist data analysists and machine learning professional to get training and deploying machine learning prototypes quickly.
❖ Deploying the model: ordinarily, a client application

sends a request to the SageMaker HTTPS endpoint in order to secure inferences from deployed model. During testing one can send request to the endpoint from Jupyter notebook. Model trained with SageMaker shall be deployed in deployment target.

3.   **Data preparation using SageMaker:**
A machine learning model relay entirely on the dataset. Higher the data quantity, more is the model efficiency. At Amazon SageMaker marking of the data is not too hard. It's user choice. one can choose either private/public or vendor workspace. In the private and vendor work space, the labelling job shall be done on its own or uses third party APIS and requires some agreement of confidentiality statements. On the other hand, public workspace, a system called Amazon Mechanical turn workforce generate a labelling job and gives the status of successful or failed jobs.

a.   Steps are mentioned below:
•   Store data in the S3 bucket and define a manifest file for which the labelling job will run.
•   A labelling workforce shall be created by selecting workforce type.
•   Define a labelling job by selecting job types such as image classification, text classification, bounding box etc.
•   For instance, the selected job is of bounding box, then draw a bounding box around desired object and tag it.
•   Through confidence store and other metrics results shall be picturized.

b.   **Train a model with Amazon SageMaker:**
The below diagram illustrate how one shall train and setup a model with Amazon SageMaker
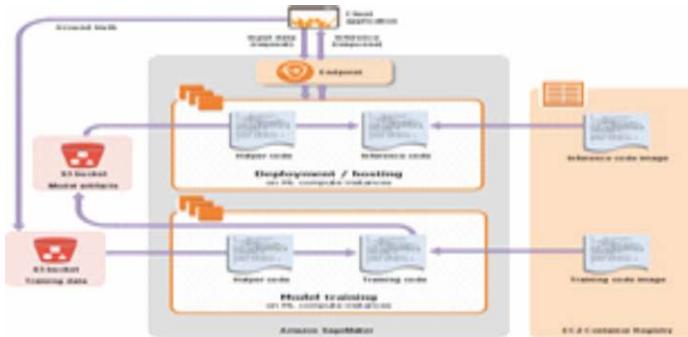
Fig 3: Train a Model in SageMaker

The space labelled SageMaker features two components: Model Training and Model deployment. A training job needs to create to train a model in SageMaker. The imparted training consists of the following information.
•   The URL of the Amazon Simple Storage Service (AmazonS3) bucket where the training data is stored.
•   The compute resources i,e machine learning compute instances .this machine learning instances are to be used for model training and being managed by SageMaker.
•   The URL of S3 bucket, where output of the job is stored.

C. **Deploy a model in Amazon SageMaker:**
Once the model is trained, the same shall be deployed in SageMaker to get the following forecast: -
•   To establish a persistent end point to get prediction one at a time using SageMaker hosting services.

•   By using SageMaker batch transform, total dataset prediction shall be obtained.
Positioning a model by employing a SageMaker hosting services is a Three steps procedure: -
•   Design a model in SageMaker: Design a model component for SageMaker and asking it to find the model. This includes S3 path where the model brands are reserved and the docker registry path for the image accommodates the inference code in consecutive arrangement steps, indicate the model by name.
•   Constitute an endpoint configuration for an HTTP endpoint: Mention the name of one or more models in production variants and the machine learning compute instances that SageMaker supposed to lunch or host.
One can configure the endpoint flexibly to the deployed machine learning compute instances during hosting models in production. It's essential to specify the number of machine learning compute the instances for each production variant that ought to deploy when more instances are specified (generally two or more). SageMaker launches them in multiple-availability zones. This guarantees the conditional accessibility. SageMaker governs the deployed machine learning compute instances.
•   Constitute an HTTP endpoint: - Serve the endpoint configuration to SageMaker. The model(s) as described in the configuration are deployed by machine learning compute instances. To get interpretation from the model, the client application sends request to the SageMaker runtime HTTPs endpoints. For more information about API, see the Invoke Endpoint API.

d.   **Hyper-parameter tuning @ SageMaker :-**
 Parameters that define the model architecture is known as hyperparameters and the action of searching for the ideal model architecture is called hyperparameter turning methods: -
1.   Random search: As the name implies the selection of hyperparameter is random. SageMaker furnishes the concurrent running jobs to find the best hyperparameter without interrupting the current job.
2.   Bayesian Search: The algorithm works on the principle of checking the performance of previously used combination of hyperparameters in a job and explores the new combination using the supplied list.

Fig. 4: The Complete workflow of Aws SageMaker

4.   Features of SageMaker:-

SageMaker clarify with Amazon SageMaker Data wrangler, identifies bias during data preparation a set of algorithms that detects the presence of bias in the attributes of interest.

The following are the features of SageMaker: -

1. Transparency: Model quality is improved with bias detection during data preparation and after training. During this process, a model explainabilty reports are also generated so that the stake holders can visualise how and why models make predictions.

2. Security and Privacy: A sageMaker has an encyclopaedic set of security features that allows the stakeholders to operate their ML models in an secured environment from day one with wide broadband range as per the company regulations.

3. Reinforcement Learning: SageMaker provides extended built-in, fully-managed reinforcement learning algorithms that includes the newest - best performing algorithms in the research and academic literature.

4. AutoML : Being a distributed trainer ,Amazon SageMaker divides the data across multiple GPUs that accomplish near-linear scaling efficiency bu automatically profiling and partitioning the model with less than 10 lines of code.

5. One-click Jupyter Notebooks: Amazon SageMaker Studio Notebooks are one-click Jupyter notebooks that can be shared with the colleagues on a single click. Your associates will get the notebook saved at the same place. since the underlying computing resource are fully elastic, so that the stakeholders can easily dial up or down the available resources.

6. Managed Spot Training: with this technique, training cost is reduced by up to 90%. SageMaker allows Training jobs to execute, when compute capacity becomes available and are made volatile to the interruptions, caused by the changes in computing capacity.

7. Automatic Model Tuning: Sagemaker provides Automatic tuning model that modulates your model by tuning or calibrating thousands of combinations of algorithm parameters resulting in accurate predictions that the model is capable of producing in short durations thus saving in weeks of effort.

8. Monitoring: The model performance is monitored and the ground values of data are saved into s3 bucket. The performance deviation is analysed. its instances are then trained on new samples in a real time environment.

9. Model Evaluation: Trained models are evaluated in two ways: offline testing or online testing. In offline testing, historical data are fetched or accessed by making a request through Jupyter notebook's endpoint using cross-validation or validation set .in online testing, the model is deployed, and a traffic threshold is set to handle requests. The threshold is 100%, if the model is working fine.

5.   USE CASES

Though still relatively new, SageMaker has illustrate a wide range of practical situations using its predictive analytics capabilities in several industries, thereby supporting real-world tasks with different machine learning platforms, can support real-world tasks on the public cloud.

1. Medical image analysis: Today, most of the medical sectors are using machine learning models to have an exhaustive comparisons of patient images using extensive libraries to identify anomalies or suggest diagnoses based on a model's analysis. this in turn provides faster screenings, earlier and more accurate diagnoses. This avoids Physicians spending more time in identifying the symptoms or sign of disease by reading the X-rays and other medical images.

2. Sports performance predictions: Major League Baseball and Formula 1 uses AWS machine learning models to drive stats for their live broadcasts. For example, SageMaker can process applications like pitcher and hitter stats against other current conditions to suggest future pitch selection and its success or failure rate against the current batter.

3. Product forecasting: Several companies and organisations uses SageMaker built-in machine learning models for detailed analysis of saled data, thereby predicting the demand based on seasonal, economical and other factors such as recommendations across the product supply chain.

6.   BENEFITS:

1.   Faster Model Development & Deployment: With SageMaker. the user can select an commonly used built-in Machine learning algorithms to train a model and make forecast or inferences quickly and effortlessly on a real time applications/data. Thus creating a 'ready for production' environment. The time taken from model creation until it is trained and tuned to produce predictions on live data was reduced by 33 to 50 percent.

2.   Cost Savings: Some companies have reduced their expenditure on machine learning - associated hardware and related resources up to 80% by moving their workloads to AWS SageMaker.

3.   Increased Machine Learning Agility: Using SageMaker, developers were able to implement more machine learning models faster, increasing the speed of their research by enabling teams to test new ideas, tune parameters, and troubleshoot models, then rapidly deploy them on real data to assess the results. Customers said using SageMaker makes training and deployment 2-3 times faster than on self-managed infrastructure.

4.   Data analysis: Machine learning in SageMaker assist data analysts to determine the correlations across the attributes of different data sets. For example, SageMaker could support models for population analysis and use census data to identify population trends that help a government.

7.   Companies using SageMaker:

Research and development R&D, generates all over the world, tons of tons of data every day. These data need to be analysed and understand precisely and quickly. This method of data analysis is being done using modern

technology like Machine Learning (ML). Amazon SageMaker is a wonderful platform for Machine Learning. It helps data scientist and developers to formulate, build, train and place high quality ML models quickly and precisely.

Many companies have already been using Amazon SageMaker platform at all stages of research and development.

1. Intuit: is a business and financial software company that develops and sells financial, accounting and tax preparation software and related services for small businesses, accountants and individuals. With Amazon SageMaker , the company is able to create a novel machine learning and AI algorithms and deploy them in SageMaker cloud to solve complex problems that are power constrained.

2. ADP Inc: with AWS machine learning and Amazon SageMaker , the company is able to quickly identify workforce patterns and predict the outcomes well in advance ,before they happen, for example the impact of increase in compensation or employee turnover.in order to maintain employers strong team, the company has continued to enhance ADP DataCloud with AI capabilities.

3. Formula 1: Company used various AWS technologies to learn the performs of the cars, for example understanding the incredible aerodynamic complexities. F1 used AWS technologies to study how cars perform in the wake of another, as opposed to running in clean air and understand the incredible aerodynamic complexities associated with multi-car simulations."

4. AstraZeneca: A biopharmaceutical company involved in innovative medicines. Most recently against Coronavirus. The company has developed Covishield vaccine in association with Serum Institute of India. AstraZeneca has used Amazon SageMaker at all the stages of its R&D. Machine Learning models first understand from a representative data set. Labelling the data is another laborious process specially while labelling thousands of tissue samples images to train and accurate model. Amazon SageMaker would at least reduce by 50 percent of the time spent on cataloguing the samples.

5. Bayer Crop Science: An esteemed company committed for crop protection, pest control and other areas of applied biological sciences. The company is also working on the SageMaker platform to reduce the waste in agricultural fields, globally. Albeit, households contribute, to certain extent, for food loss in the form of kitchen waste, leftover foods etc., the majority of the loss being happened at the field level due to pests, weeds, diseases, poor nutrition of the soil and so on. Amazon SageMaker offers digital solution (digital farming) to these challenges. By providing these digital services to the farming community,

Amazon SageMaker keeps our farmer's field as well as crops healthy.

Conclusion:

Amazon SageMaker is being widely used by data scientist to furnish end to end solution through Machine Learning. This platform is malleable, cost effective and minimizes the usage of Software which necessitate to achieve the desired goals.

Every SageMaker customer is being charged for the computation, Storage, and data processing kits used to build, train, and perform with prediction along with S3 costs by Amazon Web Services. The SageMaker Framework's design in such a way that it supports ML application and end to end lifecycle, from data creation to execution and scalable construction, makes it more accomplished. SageMaker platform shall be used independently for model construction, training &7 deployment.

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Tech Trends Compiled by Dr M H Kori

Computed Tomography Scan Analysis

Since the COVID-19 pandemic has stricken the planet's population, the strain put upon computed diagnostic specialists (radiologists) has dramatically increased.

A system driven by AI could be a solution. AI algorithms can swiftly process computed tomography scans of thousands of patients, detecting pneumonia patterns caused by COVID-19 and reporting these to clinicians. That would compensate for a shortage of skilled human resources in this field.

Innovative projects are unfolding before our eyes. Imaging COVID-19, for instance, was established as a deep learning model for automated detection of COVID-19 patterns on CT scans. Another promising project for computed tomography scan processing is the Microsoft-backed InnerEye research project.

Even though accuracy has dramatically improved, radiologists are still concerned about trusting important decisions to the digital mind. It is impossible to hold AI accountable in the case of a wrong diagnosis or counterproductive treatment. Instead, the specialist who decided to use AI pays for their mistake and must do everything possible to mitigate the negative consequences while making the most of this digital health trend.

For this reason, most advanced clinics use AI as a supplementary tool rather than a solo diagnostic or treatment practice. It is great for confirming existing diagnoses or enriching research data that is collected in traditional ways.

Machine Learning in Biopharma and Medtech

The pharmaceutical industry will use AI to discover new drugs and successfully takes advantage of certain technology trends in healthcare. The first drug molecule invented by AI was patented by a team of British and Japanese scientists in January 2020. The medication was accepted for human testing and will be used for the treatment of obsessive-compulsive disorder.

As of early 2021, other promising formulas have also been discovered as the result of AI-enhanced lab experimenting, including some potential cures for rare and highly dangerous diseases.

Many innovative projects use AI and machine learning methodologies to augment chemical experiments and medical drug research, including molecule modeling and simulation of chemical reactions under multi-factor environments.

This approach allows scientists to minimize costly onsite experiments with reagents and hi-tech lab equipment because many experiments can be conducted virtually. It also speeds up the discovery of fundamental scientific breakthroughs.

Smart autonomous devices in healthcare

Autonomous nursing robots or self-moving smart devices can greatly support medical staff by reducing their sanitation-related or supply management chores.

Different kinds of robots can work in various hospital-based locations and positions, which protects human employees from being exposed to infection risks or burnout due to immense strain placed on many US hospitals flooded by COVID-19 patients.

For example, robot nurses have been used by an Italian hospital, during a severe COVID-19 outbreak. Those smart helpers were used for remote monitoring of blood pressure and oxygen saturation levels for patients, as those are crucially important parameters about their current health condition. Those levels might drop in a matter of minutes, with the patient requiring immediate assistance. In this way, the need for nurses to personally visit patients was significantly reduced.

Big Data and Analytics to Support Disease Prevention

The technological revolution keeps going, and the amount of healthcare data accumulated in recent years is astonishing. The massive arrays of data (anonymized) can be used for figuring out medical patterns and trends, allowing scientists to discover new correlations between demographics, ecology, economy, and many other factors on the one hand and health conditions of the population on the other.

ADVANCED TELEMEDICINE

Telemedicine took a great leap forward during the Covid-19 pandemic. In January 2020, an estimated 24 percent of healthcare organizations had an existing telehealth program. According to Forrester, an analytics firm, the country was set to complete over a billion virtual care visits by the end of the year. Forced into functionality, many of telehealth's regulatory barriers have been removed, and healthcare organizations now have nearly a year's worth of data on how to evaluate and improve telehealth services.

For 2021, many healthcare organizations will be focusing on how best to integrate telehealth services with existing physical ones. Virtual visits will continue to be used as a way to increase access to primary care and urgent care, as well as to improve collaboration with clinics, long-term care facilities, dialysis centers, and mental health services. All of this, however, hinges upon a more permanent lifting of regulatory barriers: the American Medical Association, and others, are urging Congress to act fast.

NEW METHODS OF DRUG DEVELOPMENT

The development of multiple safe and effective Covid-19 vaccines in less than a year may be remembered as one of the greater scientific accomplishments in human history. The process was sped along not only by regulatory fast-tracking but also by innovations in the ways medical trials are conducted: virtual clinical trials, held mostly online, eased the burden of participation. Combined with a spirit of collaboration rather than competition between pharmaceutical companies, they could pave the way for a bright future in drug development.

Some of the relaxed regulatory procedures around drug development will fade with the Covid-19 pandemic, but innovative approaches to testing and collaboration could linger. An alliance between several pharmaceutical heavyweights—including Gilead, Novartis, and WuXi AppTec—has already begun collaboratively exploring new antiviral treatments and sharing preliminary data. The FDA has released guidelines for virtual trials, opening up a new frontier for the development and testing of new drugs.

Once Covid-19 is relegated to the history books, what's next?

DATA-DRIVEN HEALTHCARE

Healthcare's big data market is expected to reach nearly $70 billion by 2025, according to Bain, a consultancy firm. As the collection of health data continues to accelerate, its applications become more widespread, and its potential for improving treatment options and patient outcomes skyrockets. The biggest barrier, however, has been a lack of interoperability: one healthcare organization's data is not easily transferred to (and easily processed by) another organization. Covid-19 underscored that problem further. Interoperability took a large step forward in November 2020, when Google Cloud launched its healthcare interoperability readiness program. Aimed at helping payers, providers, and other organizations prepare for the federal government's interoperability regulations, it gives program participants access to data templates, app blueprints, security tools, and implementation guidelines. If healthcare organizations can get on the same page, the potential of the industry's big data could quickly turn kinetic.

NANOMEDICINE

Nanomedicine is the medical application of nanotechnology, the technology that operates on the atomic, molecular, or supramolecular scale. For something of such a small size, the potential is huge: nanomedicine has applications in imaging, sensing, diagnosis, and delivery through medical devices.

Researchers are finding new ways to use nanomedicine to target individual cells, and in 2021, that research will be put into action. CytImmune Sciences, a leader in cancer nanomedicine, has recently completed a Phase I trial of using gold nanoparticles to target drug delivery to tumors; BlueWillow Biologics, a biopharmaceutical company, has developed nanotech that fights viruses and bacteria.

5G-ENABLED DEVICES

If the biggest drivers of cutting-edge technology—AI, IoT, and Big Data—are to reach their full potential in healthcare, they need a reliable and lightning-fast internet connection. Enter 5G. With a reliable real-time connection, the most immediate benefits will be seen in telemedicine, expanding access to care for millions. But that's only the beginning. More connected devices, with more authentic data streams, open up the possibility of a revolutionized healthcare system.

With next-to-zero latency, 5G-connected sensors and medical devices can capture and transmit data nearly instantaneously. That will improve patient monitoring, which will in turn improve patient outcomes. Futurists are already considering the benefits of a marriage between 5G, healthcare, and robotics.

But patients won't have to wait long to see a change: experts say 5G-enabled devices will rapidly bring on a new healthcare paradigm, nicknamed 4P, which is predictive, preventative, personalized, and participatory.

TRICORDERS

For decades, tricorders have been medical technology's version of the flying car: its origins are in science fiction, and the concept is both elegant and eminently useful. As far back as the 1960s, tricorders were imagined to be palm-sized devices that could quickly and accurately monitor a wide array of vital signs, while also performing simple diagnostics. Unlike flying cars, however, tricorders have finally made the leap from the screen and into users' hands.

Basil Leaf Technologies has rolled out a very real tricorder, known as DxtER. It can be used by the patient, in their own home, without any medical training. With a sophisticated diagnostics engine, DxtER pulls patient data from multiple sources and runs them through algorithms that recognize 34 different health conditions, including stroke, tuberculosis, pneumonia, and diabetes. Live long, and prosper.

HEALTHCARE'S DIGITAL ASSISTANTS

Digital assistants like Alexa and Google Home have changed the way people interact with technology; in 2021, those digital assistants are taking on a similar role in healthcare. Natural language processing and ambient listening have natural applications in the capture, analysis, and utilization of health data.
In 2020, Epic and Cerner, the designers of the two largest electronic health records (EHR) systems, began integrating voice-enabled virtual assistants on their software. AI startup Saykara has launched a new voice assistant that can listen to, and understand, a physician-patient conversation, without being prompted through voice commands.

SMARTER PACEMAKERS

The artificial pacemaker, which dates back over 100 years, is still a critical piece of medical technology: over a million patients use them. By delivering electrical impulses to heart muscle chambers, they can prevent or correct life-threatening heart arrhythmias. Remotely monitoring these devices is an essential part of their functionality. Traditionally, that monitoring has been far from optimal, relying on complex interfaces that the patient may not fully understand.

In 2021, pacemakers will get a little bit smarter. By enabling pacemakers with Bluetooth technology, they can be linked with smartphone-based mobile apps that patients better understand and utilize. That, in turn, will improve remote monitoring, and, as a result, patient outcomes. Medtronic, one of the largest medical technology companies in the world, has already rolled out its next-gen patient monitoring system for pacemakers. More will follow.

A LAB ON A CHIP

If it's taking too long to get samples to the lab, why not bring the lab to the samples? That was the idea of researchers at Stanford University, who recently developed what they call "a lab on a chip" based on CRISPR enzyme Cas12. About half the size of a credit card, it contains a complex network of channels smaller than the width of a human hair and can deliver a coronavirus test's results in under 30 minutes.

Researchers say that the test could be modified to detect other infections, too, by recalibrating the CRISPR enzyme for a different genetic marker. As the Covid-19 pandemic taught the world, testing is the first step in combating infectious disease. With a lab on a chip, that testing can be done quickly, safely, cheaply, and more efficiently.

WEARABLES WITH A PURPOSE

Fitness trackers have been on the rise for years: FitBit shipped 9.9 million of its wearable devices in 2019. But the next trend in wearables for medical technology is more specific. For diabetes patients, wearable continuous glucose monitors (CGMs) are set to become thpe new normal.

Wearable CGMs remove the need for intermittent glucose testing and instead keep track of one's blood sugar levels in real time. This allows users to see the immediate impacts of food and exercise, and shape their lifestyles accordingly. It can also catch cases of hyperglycemia immediately. Medical technology companies are jumping in with two feet: Dexcom, a CGM developer, had revenue of $1.9 billion in 2020 and expects a 15 to 20 percent jump in 2021

The Continuing Importance of Edge Computing

Each device and sensor on a factory floor collects, processes, and packages up data for analysis. But with more IIoT devices in service, traditional cloud computing just can't keep up. By working with data at the device level, you maximize performance, minimize costs, and improve overall latency and scale.

The speed of 5G networks will make edge computing even more valuable to industry, which will allow manufacturing to more quickly adapt to any type of connected solution and provide more intelligent, real-time analysis. With edge computing, automation and innovation will flourish thanks to an upsurge of APIs for higher programmability and the removal performance bottlenecks.

Digital Twins

According to Gartner, 75% of organizations taking advantage of IoT are using digital twins or are in the process of establishing the technology for them. Digital twins are the virtual representation of a physical device or object. The virtual twin allows research-and-development teams to gather data to simulate physical objects in real-time situations.

Manufacturing is at the forefront of this technology, as it allows these businesses to differentiate their products and services from competitors while establishing new revenue streams. As more factories adopt IIoT, as well as artificial intelligence (AI) and machine learning (ML), more manufacturers will use digital twins to simulate processes and streamline production.

Managed Cloud Services

The digital transformation and IoT-centric workplaces require a robust cloud service to support devices, applications, and databases to remain agile and competitive. IIoT also needs a robust cloud, which is leading to more reliance on managed cloud services in manufacturing.

Manufacturers are turning a distributed cloud that's designed to execute at the point of need. The emphasis will be on a public cloud architecture that improves the management of information and relies on the services offered by public cloud providers. Hybrid options will still be there, but the shift will continue to move away from private clouds to a distributed public cloud architecture.

These managed cloud services can be designated for specific device and data management, generating valuable and useful insights about connected products in manufacturing environments.

AWS, Google Cloud, and Microsoft Azure are already on board with this trend, and IoT data platforms are quickly connecting, too.

The Role of AI

AI and ML have been trending upwards for the past few years, but we can expect to see a greater connection between AI and IIoT. AI will drive—and improve—IoT's decision-making process. AI in IoT pushes computationally intensive analytics to the edge for scale and performance. That includes APIs for custom programming and load-balancing and distributed capabilities.

Manufacturers need the capability to granularly define analytics and machine-learning models on the platform for greater performance and faster response times. How can you attain this? By training data. This is the key to manipulating the output data used to set up ML models and enable automation and decisioning to benefit a plant in real time.

In addition, data and infrastructure management solutions will likely continue to expand their use of AI and ML technologies to deliver more automated IT operations to companies. These AI-driven systems will manage more day-to-day tasks, as well as strengthen policies and anticipate and respond to potential threats and challenges.

How **IoT** is enabling **Energy Savings** for the **Smart Factory** of today

Fusion of shop floor and office floor.

With modularized machines being interconnected through standardized protocols like OPC UA TSN and fixed cable connections being replaced with wireless protocols like 5G, we will also see a transformation on the office floor. Programs running on industrial controllers, edge devices, and cloud systems will work even more tightly with apps and dashboards, and eventually lead to a fusion of the shop floor and the office floor. Increasingly powerful hardware systems will not only enable complex AI algorithms running on the production equipment, but also induce a new level of human-machine interaction through

automated processing of text data and through natural language processing, widely established in the consumer industry with smart voice assistants.

Robots and autonomous systems automating production and material handling.

Flexible production in the factory of the future will require robots and autonomous handling systems to adapt faster to changing requirements. While classic programming and teaching of robots isn't suitable for preparing the system to handle the huge and fast-growing number of different goods, future handling equipment will automatically learn through reinforcement learning and other AI techniques. The prerequisites—massive calculation power and huge amounts of data—have been established over the past years.

The Human Element

Industry 4.0 revolves around advances in technology. AI, edge computing, virtual testing, and IIoT are all important drivers of the new manufacturing plant. But none of this works without the human element. While automation will continue to shift plant personnel roles away from tedious, repetitive tasks, employees will move on to decision-making roles based on data support.

To have successful IoT deployments, human workers need to think differently on the job, and that will require an on-going effort to train employees for often high-tech tasks. Human interaction is necessary to update and monitor IIoT devices, requiring new skills. Employees will also need to reshape their activities on the factory floor, and management must have a better understanding of how data generated from the devices will impact the supply chain.

Machines aren't replacing humans. Instead, there's a new synergy between human and machines to ensure streamlined production and processes. This means investing time, budgets, and energy to ensure that it's done right, and that involves recognizing where the new job opportunities will be and what type of retraining is necessary.

We can expect to see these trends and predictions (and more) play out in 2021-22. We look forward to seeing IIoT continue to improve product development and delivery, making factories even more efficient, ensuring greater safety, and advancing the skillsets of manufacturing employees around the world