SSN

SYNERGY

LEAVE NOTHING TO CHANCE

DEPARTMENT OF BIOMEDICAL ENGINEERING

VOLUME 7 ISSUE 6

CONTENTS

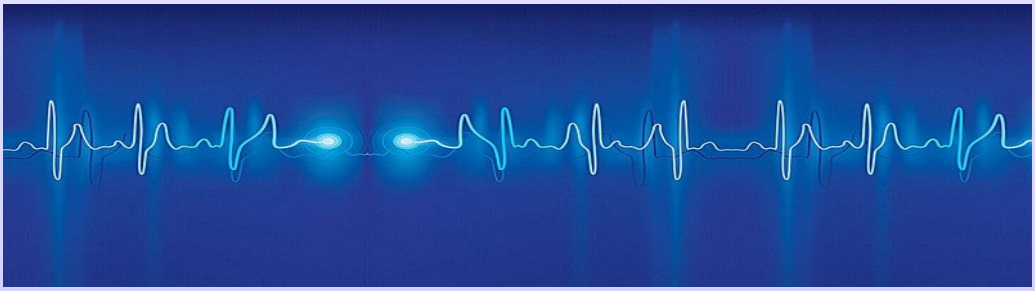
Editor's Desk

Welcome,

We are extremely happy to present the SIXTH edition of the seventh volume of Synergy.

This edition brings out many spotlight events of the department. It also gives an insight in to the exciting and interesting inventions in the field of Biomedical Engineering.

We congratulate our fellow mates for their achievements. The making of this edition was a great experience. We would like to thank everyone who helped us on bringing out this edition with suitable contents, images etc. and we bid farewell to our seniors who were very kind and helpful. We also thank the institution for giving us consistent support on all our endeavors.



HOD's Desk

It is a feeling of immense pleasure to once again put our heads together in releasing the next issue of our newsletter-SYNERGY. This volume brings out the campus updates and various events and activities organized by the department during April 2019 to June2019.

It also showcases the achievements of the students in various fields. I congratulate all the students for their accomplishments. I would like to thank all the faculty members for their seamless contribution to the department's growth and guiding the students to achieve their goals. Let's together continue to raise the glory of the department and make it a euphoric journey!

ROSHINI NADAR MALHOTRA

Roshni Nadar Malhotra recognized as 'Indian Business Leader of the Year 2019' by Horasis, an internationally renowned think

Roshni Nadar Malhotra, the eminent heiress of the IT giant HCL Technologies, believes 'philanthropy should be taken up by young Indians unlike classical music which usually witnesses elderly people.' Roshini has been impacting and making a difference through her refreshing ideologies in education, she is also an inspiration to a number of aspiring young women leaders who pursue a balance between corporate and social responsibility.

Roshini is born and brought up Delhi, an alumna of Vasant Valley School and a Communication with a focus on media, major, graduate from North Western University, US. She went on to do her master's in Business Administration with a major in Social Enterprise Management from the Kellogg School of Management.

Roshini has a brief experience in the media industry and has worked with Sky News UK and CNN America as news producer prior joining her father's empire.

After joining HCL as the CEO, Roshni is leading with diverse strategy for the overall direction of the corporation including the key areas of determining its governance structures, treasury, risk and portfolio management, and the diversification plans of HCL. But she spends a notable time on the VidyaGyan initiative that aims to nurture future leaders from rural India who can act as catalysts of change for their communities, villages and the nation.

Roshni envisions VidyaGyan to be an aspirational platform and a beacon of hope for underprivileged meritorious students to dream big and achieve even bigger. She believes that children, who are born without a silver spoon in their mouth, should also be given equal opportunities and similar platform to make it big in their lives.

The 34-year old, Roshni, is a Young Global Leader of the World Economic Forum, a unique and diverse community of the World's most outstanding, next generation leaders. In 2015 she was also felicitated with The World's Most Innovative People Award for Philanthropic Innovation by The World Summit on Innovation & Entrepreneurship (WSIE), in partnership with the UN.

Source: http://www.businessworld.in/article/BW-Most-Influential-Woman-Of-India-Roshni-Nadar-Malhotra-CEO-HCL/07-03-2019-167907/

SECOND BOARD OF STUDIES MEETING :

The department of Biomedical Engineering organized Second Board of Studies meeting on 15.4.19.The proposed syllabus for all the semesters of B.E Biomedical Engineering under CBCS, to be offered under autonomous status R-2018 and the third and fourth semester M.E. Medical Electronics syllabus under CBCS, to be offered under autonomous status R-2018, was discussed and approved during the meeting. **Dr. A. Kavitha**, Professor & Head Chairman, Prof. S. Ramakrishnan, Biomedical Engineering Division, Department of Applied Mechanics, IIT Madras, Chennai, Prof. Renu John, Associate Professor &Head, Department of Biomedical Engineering, IIT Hyderabad, Dr. C. M. Sujatha, AssociateProfessor, Department of ECE, CEG Campus, Anna University, Chennai, Ms. S. Sivaranjani, Research Scholar, Department of ECE, CEG Campus, Anna University, Chennai Meritorious Alumnus and Faculty members were present.

BOS Members along with Department Faculty

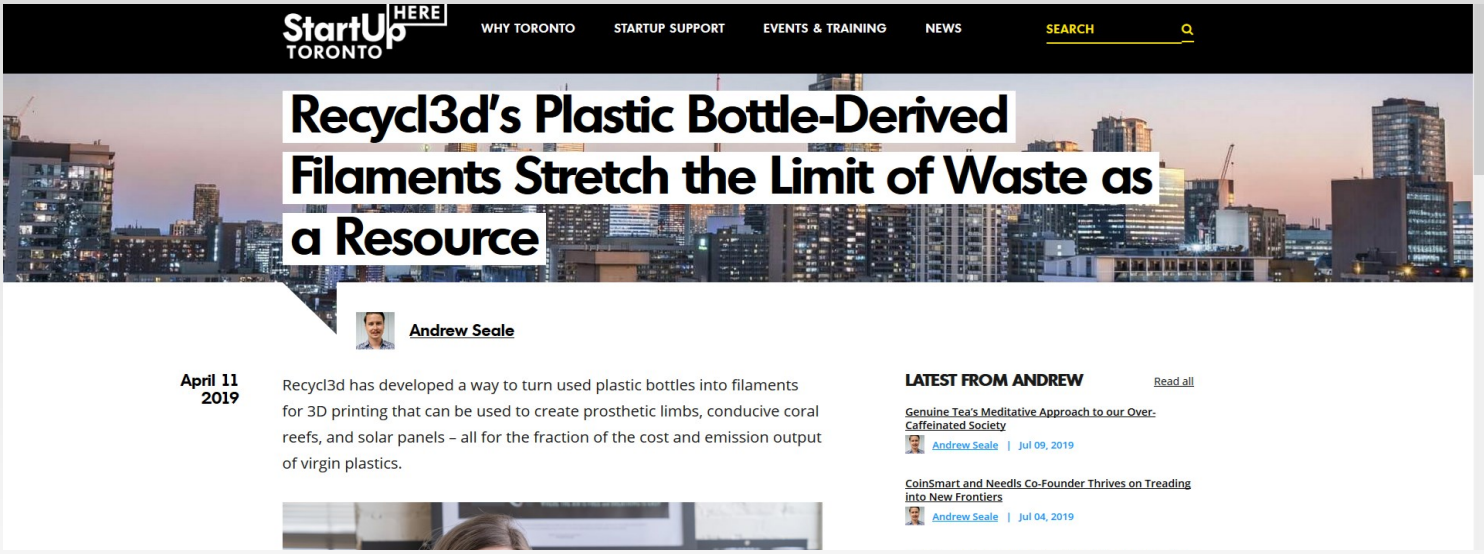
SSNCE AND RECYCL3D, CANADA JOINT PROJECT IS FEATURED IN START UP TORRONTO

Recycl3D's Plastic Bottle-Derived Filaments Stretch the Limit of Waste Resource:

The collaboration between Recycl3d and SSN BME was initiated by **Dr. A. Kavitha** Prof. and HOD., BME and **Ms.R.Nithya**, Asst. Prof.,BME with the project titled " Production and commercialization of 3D-Printed Exoskeletons for assistive and rehabilitative purposes ". With the fruitful outcome of this project and to meet up the company's requirement to recycle polymer waste, has ended up by signing this new project titled " Production and Commercialization of 3D-Printing Filaments from Recycled Plastic ".

Recycl3d has developed a way to turn used plastic bottles into filaments for 3D printing that can be used to create prosthetic limbs, conducive coral reefs, and solar panels – all for the fraction of the cost and emission output of virgin plastics.

Recycl3d could've stopped at turning plastic water bottles into filaments for 3D printing. Instead, the startup has stretched the limit of waste as a resource, creating a material that is not only conducive but also an organic photovoltaic capable of convert energy into electricity. All from the millions of water bottles finding their way to landfills and waterways.



Omar Saleh is the genius behind it, says Nicole McCallum, who co-founded Recycl3d alongside the Egypt-born, University of Waterloo educated chemical engineer. "He's the type of guy you can text on a Tuesday afternoon, and say 'hey Omar can you figure out water desalination for us' and he'll come up with an idea by the end of the week," says McCallum. "He's the Batman to my Robin."

The pair were connected in 2016 by Hariharan Krithivasan, also a co-founder, and have since built a business around the material, working with **Dr. S. Arun Karthick**, Asso. Prof., along with **Dr. A. Murugasen**, Asst. Prof., Chemistry Dept. of **SSN College of Engineering** in Chennai and the University of Waterloo. Since then they've only scratched the surface of the material's potential. Under the Recycl3d Planet not-for-profit banner, the company uses the filament to print prosthetics.

The startup plans to be 3D printing solar panels using the plastic bottle-derived filaments by the end of the year at a fraction of the cost and emissions of virgin products. But McCallum says it's the conducive and photovoltaic nature that is most disruptive.

"You could print (coral reef) that is also conducive so you could track the ecosystem under-water in real-time," she says. "We have a hybrid filament that we have proof of concept and we outperformed specs from Samsung and Hyundai's research labs in organic photovoltaics in 2018."

McCallum is currently based in Waterloo, but she says she's uprooting to join the Toronto startup scene. She points out that while she's been spoiled by the startup ecosystem in Water-loo, she's looking to immerse herself further in Toronto's social enterprise community.

"Part of that is to access a more diverse set of services and humans within the entrepreneur-ial scene," she says. "I do love Waterloo but Toronto seems to be a strong social entrepreneur-ship hub."

Recycl3d is a part of CSI's Climate Ventures, which has helped McCallum identify the right support network. But there's still a disconnect between funding and social enterprises. Part of the challenge, McCallum admits, is social entrepreneur's grappling with the right lan-guage to convince venture capitalists there's a revenue model behind their idea.

"(Having a revenue model) is one of the differentiators between social enterprise and tradi-tional forms of creating change like social safe-keeping, social advocacy – not every social and environmental service can be paid for," she says. And there isn't always a way to generate money. But if there is, you've got to figure out how to speak to Bay Street. "I've been laughed out of the room so many times by people," she says. "The nice thing about having an econom-ics business background is I can quantify most the weird crazy hippie ideas I come up with."

INTERN STUDENTS FROM DREXEL UNIVERSITY:

- Ms. Rhea Jain, Drexel University, USA has joined for a research stay for two months, for the project titled "Synthetic Vocal Fold Fabrication". Supervisor: **Dr. S. Pravin Kumar**, Asso.Prof., BME & Co-supervisor - **Ms. R. Nithya**, Asst. Prof., BME. This project is supported by the Faculty Internal Funding scheme of SSN Trust.

- Ms. Anna Masciantonio, Drexel University, USA has joined for a research stay for two months, for the project titled "Virtual Reality in training children with neuro-developmental disorders". Supervisor: **Dr. A. Kavitha**, Professor & HoD, BME, with Co-supervisors –Ms. **S. Vidhusha** Asst. Prof., **IT & Ms.B.Divya,** Asst. Prof., BME.

Ms. Rhea Jain

Ms. Anna Masciantonio

BIOMEDICAL INSTRUMENTATION LAB VISIT:

Two faculties Mrs. R. Janaki, **Asst. Prof.,** and Mrs. K. Nithyakalyani, **Asst. Prof.,** from SMK Fomra Institute of Technology visited Biomedical Instrumentation lab on 27/06/19 to discuss about Biomedical Instrumentation Lab experiments of 2017 Regulation. They had a discussion with **Dr. S. Bagyaraj** Asso. Prof., and **Ms. B. Divya** Asst. Prof., regarding the designing and implementation of experiments . They were trained for executing experiments in the lab.

Photo taken during the discussion

SMART INDIA HACKATHON 2019- HARDWARE EDITION

Smart India Hackathon 2019 is a nationwide initiative to provide students a platform to solve some of pressing problems we face in our daily lives, and thus inculcate a culture of product innovation and a mindset of problem solving. The last edition of the hackathon saw over 5 million+ students from various engineering colleges compete for the top prize at 35+ locations. In SIH 2019, the students would also have the opportunity to work on challenges faced within the private sector organisations and create world class solutions for some of the top companies in the world, thus helping the Private sector hire the best minds from across the nation.

The students of our department made use of this opportunity and applied for various problem statements that were proposed by the SIH. About 6 teams from the department enrolled for the preliminary round and submitted several abstracts on both software and hardware category. From which two of the teams got selected for two of the problem statements in hardware category and attended the final round of SIH 2019 at BSDU, Jaipur. The team and it's members is as follows:

TEAM BIOSES:

- Arvindh Swaminathan.M.B—Team Leader
- Ananya.R
- Kavya.V.Kannan
- Kezia Sharon
- Jagadesh.A
- Vaishali.H

Problem Statement: Right Dosage for the patients

Organisation: GE Healthcare

Mentor: Dr. V. Mahesh, Asso. Prof., BME

TEAM TECHDOCS:

- Suhashine.S—Team Leader
- Varshini Vinodhkumar

Problem Statement: Non Invasive Blood Pressure Monitoring

Organisation: GE Healthcare

Mentor: Dr. B. Geethanjali, Asso. Prof., BME

PLACEMENT TRAINING:

The 7th semester is considered very crucial for the B.E students, as it would decide upon their future as either job or higher studies. The college helped the students have a training session for their placement in the upcoming months. During the session, two days were allotted for core specific training and other four days were allotted for general training (coding). Students were benefitted in due course of the training sessions.

For the final year students of biomedical department, the two day core specific training was a practicum based session, where many medical equipments, their functioning, service mechanism and calibration procedure were demonstrated. Students felt useful with the knowledge gained during the two day session. The medical equipments that were demonstrated are:

1. Ventilator
2. Infusion Pump
3. Defibrillator
4. Patient monitor
5. Electrocardiograph

During demonstration of the equipment

SHAPE 2019:
(SSN Higher secondary school Awareness Program in Engineering)

SHAPE (SSN High school Awareness Program in Engineering). This is a two-week summer internship program for school children entering XII Std. This is given the name SHAPE since this program aims at helping the school students understand the potential of the various engineering disciplines and make an informed choice for shaping their career. This program held from 29th April 2019 to 11th May 2019 at SSNCE campus.

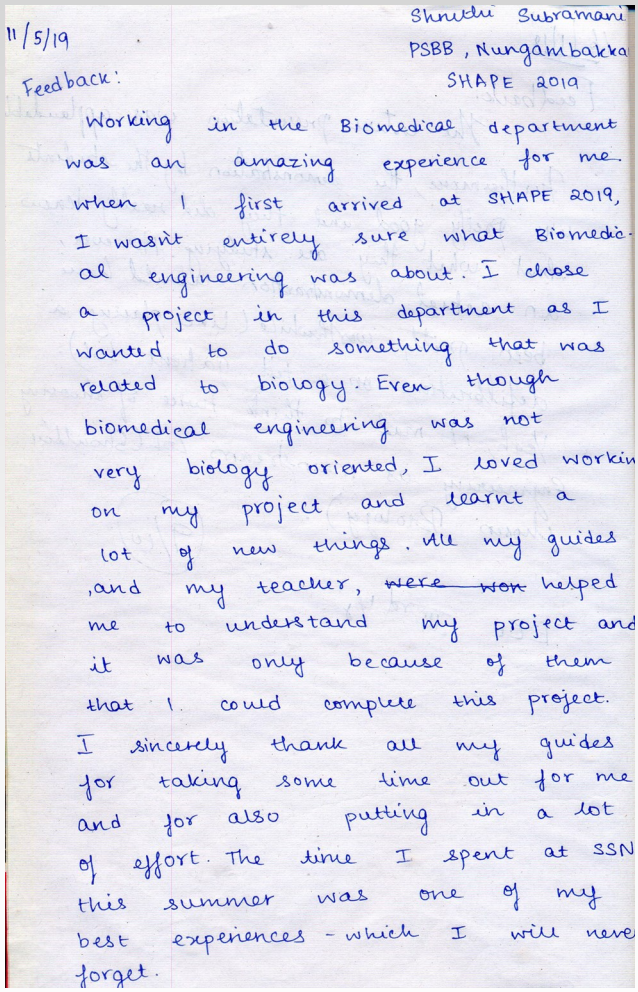
All the school interns had introduction about SSNCE and visited various department in the SSNCE. Then they had department specific training program. The schools interns were trained to do project in the various fields of Engineering. Department of BME trained the interns to do the following projects namely,

1.Acquisition of EMG for Tamil Sign Language
2.Multichannel Bio-signal data acquisition
3.Blood group identification and estimation of Haemoglobin
4.3D Printing of Finger Design

On the last day of the internship program all the SHAPE interns demonstrated the department specific projects done by them at Carrier Development Cell. These projects were well appreciated by the Schools interns Principal, Teachers and their parents.

Total of four students were part of SHAPE at the Biomedical Department. They were guided by our **faculties Dr. L . Suganthi,** Asso. Prof., BME**, Ms. B. Divya,** Asst. Prof., BME**, Ms. R. Nithya** Asst. Prof., BME **and Dr. R . Sachin,** Asst. Prof., BME. The details of the students is as follows:

1. Ms. Shruthi Subramani, PSBB Nungambakkam
2. Ms. Shreya, PSBB Nungambakkam
3. Mr. Surendira Balaji, DAV Gopalapuram
4. Mr. Naren. S. Narayanan, The Hindu Senior Secondary School, Indra Nagar.



11/5/19

Shruthi Subramani
PSBB, Nungambakka
SHAPE 2019

Feedback:

Working in the Biomedical department was an amazing experience for me. When I first arrived at SHAPE 2019, I wasn't entirely sure what Biomedical engineering was about. I chose a project in this department as I wanted to do something that was related to biology. Even though biomedical engineering was not very biology oriented, I loved working on my project and learnt a lot of new things. All my guides, and my teacher, ~~were won~~ helped me to understand my project and it was only because of them that I could complete this project. I sincerely thank all my guides for taking some time out for me and for also putting in a lot of effort. The time I spent at SSN this summer was one of my best experiences - which I will never forget.

Feedback from a student who did intern at our department

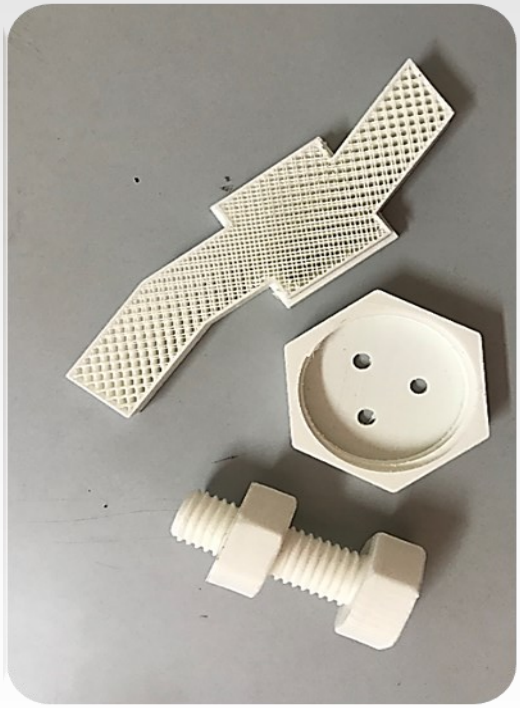
Photos taken during the intern period

NEW MEMBER OF OUR CHT LAB FAMILY:

CoLiDo H4080 is a professional FDM 3D Printer associates with spacious build volume 400 x 380 x 800 mm. Capable of handling thermoplastics filaments for Advanced Mechanical Properties. Incorporates with more types of filaments such as PLA, ABS, PA (Nylon), PC (Polycarbonate) and more.

CoLiDo H4080 also features Duo Z-axis stabilized structure and new Resume Printing function, offering a tried-and-trusted 3D printing experience. You can print high strength industrial parts with reliable CoLiDo H4080 3D Printer.

- The only 3D printer brand allows tool less print object removal – SIMPLY BY YOUR HAND!
- Industrial level quality and smooth build surface
- Extra large build size – 400 x 380 x 800 mm
- Patented constant thermal control
- Resume printing management
- Steel frame design



PROJECT PROPOSALS SUBMITTED:

- **Dr. S. Arun karthick**, Asso. Prof., BME, submitted a Project Proposal Titled "Nasal Filter for Respiratory Protection by Molecularly Functionalized Nanofibrous Matrix against PM2.5" under SERB for the scheme SRG.

- **Dr. V. Mahesh**, Asso. Prof., BME, submitted a proposal on “Developing a predictive model for assessing human respiratory condition using machine learning techniques “to SERB under MATRICS.

- **Dr. J. Vijay** (PI), Asso. Prof., BME, submitted a Proposal titled "An Automated Medical Image Retrieval and Classification System in PACS Environment for Clinical Decision Making" to DST (under Core Research Grant), Dr. N. Venkateswaran (Co-PI) Prof, ECE and **Ms.Nithya** (Co-PI) AP/BME.

- Dr. Bikesh Kumar Singh, NIT Raipur, **Dr. B. Geethanjali,** Asso. Prof., BME and Dr. Sai Krishna Tikka, AIIMS, Raipur submitted a proposal titled “Design and validation of neurofeedback model to enhance the brain cognition in Indian children with learning disability “ to SERB.

- **Dr. R. Subashini**, Asst. Prof., BME and Dr. P. Senthilkumar Asso. Prof., Chemical Engg., submitted a project proposal titled "*In Vitro* and *In Vivo* Evaluation of Gelatin Hydrogel/ Nano Zinc Oxide Composite for Biomedical Applications” to DST-SERB CRG.

- **Dr. S. Pravin Kumar** (PI), Asso. Prof., BME with Co-PIs: **Dr. A. Kavitha,** HoD, BME and **Dr. S. Arun Karthick,** Asso. Prof., BME, submitted a project proposal titled "Objective Diagnostic Measures with Computational and Experimental Modelling of Self-Induced Vibration of Vocal Folds and Influence of their Impairments on Human Voice” to DST-SERB CRG.

PAPERS PRESENTED IN CONFERENCES:

- Geetha. S, **Divya. B,** Asst. Prof., BME, and **Nirmala. K,** Asso. Prof., BME, "Morphological Analysis of Lymph Nodes Using CT Images", Springer Technically Sponsored First International Conference on Advance in Electrical and Computer Technologies 2019 (ICAECT 2019), Coimbatore on 26-27 April 2019.

- Lakshmi Parvathi M, Megha Priya R, Nandhini D and **Nirmala. K**, Asso. Prof., BME, "Detection of Colorectal Cancer with Colonoscopy Images", International Conference on Recent Trends in Electronics, Computing and Communication Engineering ICRTECC 19, Saveetha School of Engineering, Chennai on 25-26 April 2019

- Jan G. Svec, **Pravin Kumar Subbaraj**, Asso. Prof., BME, Jitka Vydrová: "Mucosal Waves on the Vocal Folds Revisited: Updated Findings and Concepts", 48th Annual Symposium: Care of the Professional Voice, The Westin, Philadelphia, USA, May 29 – June 2, 2019.

- P. Aichinger, S. Bulusu, **S. P. Kumar**, Asso. Prof., BME, J. G. Svec: "Extracting vocal fold kinematic parameters from video kymograms via simulation of clinically observed data", Medical Imaging Cluster Festival, Van-Swieten-Saal, Medical University Viena, Vienna, Austria, June 2019.

- R. P. Subramanian, S. Parvathy, **Arun Karthick S,** Asso. Prof., BME, "Enhanced antibacterial activity of Cerium Oxide Nanoparticles: Phytosynthesis, Physicochemical Characterization and Biological Application", International Conference on Chemistry- our health, our future, Organized by Indian Council of Chemists, Paris, 6-8 June 2019.

PATENTS PRESENTED:

The following projects were presented in Patent Committee Meeting at SSNCE on 26.6.19:

1. "An automated multi-modality medical image retrieval using hybrid CNN approach" Inventors - Preethi Kurian M.E., Medical Electronics, II year and **Dr. Vijay J**, Asso.Prof., BME.

2. "A microbial fuel cell outer casing"- **Dr. R. Subashini**, Asst. Prof., BME, Viswanath S, Alumni, Saranya V, III year, Janani M, III year.

PAPERS PUBLISHED:

- Sumathi Krishnaswamy and **Mahesh Veezhinathan**, Asso. Prof., BME, "An approach for detection of edges in carotid ultrasound images and analysis of intima-media complex using morphological features", Int. J. Biomedical Engineering and Technology, 29(4), 345-365, 2019.

- Shankar Thariga, **R Subashini**, Asst. Prof., BME, Saravanan Pavithra, Prabakaran Meenachi, Prasanna Kumar, Panner selvam Balashanmugam, Ponnusamy Senthil Kumar "In vitro evaluation of biodegradable nHAP-Chitosan-Gelatin-based scaffold for tissueengineering application", IET Nanobiotechnology, 13 (3): 301-306, 2019. (IF:1.92)

ALUMNI INTERACTION:

A talk was given by Mr. Saravanaprakash, Technische Universitaet Dresden, Dresden, Germany to PG Medical Electronics students, on PhD and Industrial opportunities for BME graduates in Europe on 23.5.19.

Saravana Prakash, Alumni

FACULTY INTERACTION:

- **Dr. S. Pravin Kumar**, Asso. Prof., BME had a research meeting with Dr. Ramakrishnan, Head, Dept. of Applied Mechanics, IIT Madras on 12.4.19.

- **Dr. B. Geethanjali**, Asso. Prof., BME acted as an External Interview Panel Member for faculty recruitment process at SMK Forma Institute of Technology on 24.4.19.

- Synopsis meeting of Mrs. Vidhusha Asst. Prof., IT, Part time- Research scholar, Anna University, under guidance of **Dr. A. Kavitha**, HOD, BME was conducted on 25.4.19.

- Mr. Nagendran (Assistant Physical Director) and **Dr. Mahesh V**, Asso. Prof., BME, participated in the state level staff Badminton Tournament organized by Sri Sairam College of Engineering, Chennai on 27.4.19.

- **Ms. Divya. B** , Asst. Prof., BME, attended a talk by Mr. Kartic Vadyanathan, Founder of Play2Learn organized by CSE Dept., SSNCE on 14.5.19.

- A project Kick-off meeting was held for the project titled " Design and Development of Disc-Shaped Donors and Inorganic Acceptors for Hybrid organic/Inorganic Solar Cells". Prof. Ramasamy, **Dr. S. Arun Karthick,** Asso. Prof., BME, Dr. Muthu Senthil Pandian, and Dr. Balaji Bhargav were gathered for the meeting and had a conference call with the funder of the project Mr. Omar, CEO, RECYL3D, Canada on 29.5.19.

- **Dr.J. Vijay**, Asso. Prof., BME, interacted with Mr. Dewendar Prasad, NIEPMD to discuss the exchange of faculty members for their newly establishing Programme Bachelor in Prosthetics and Orthotics programme (4 1/2 years) on 7.6.19.

- **Dr. J. Vijay**, Asso. Prof., BME has attended Patent Committee meeting, as steering committee member at SSNCE on 26.6.19.

IN-HOUSE INTERNSHIP:

Internships for BME students was offered from 20.5.19 to 18.6.19 based on the initiatives from the Center for Healthcare Technologies to promote undergraduate research skills. The following students took internship in the department:

1. Srija. S, T Akshara Reddy of III year BME, Functional connectivity analysis using EEG, Guide: Prof. **Dr. A. Kavitha**, HoD, BME and **Ms. B. Divya**, Asst. Prof., BME.
2. Ms. Varsha, III year BME, "Wearable healthcare device" supervised by **Dr. S. Pravin Kumar**, Asso. Prof., BME.
3. Kawya. P, III year BME, Acquisition and analysis of EMG while writing, Guide: **Ms. R. Nithya**, Asst. Prof., BME.

INTERNSHIP:

- Prem Aravindan. J, Nithya Mylakumar. M, Niharika. G and Sathish Kumar. S of final year BME attended hospital training at the Salem Neuroscience Foundation for a period of 10 days from May 29-June 09, 2019.
- Lindhiya. L.An of Final year BME attended a management intern at SPI CINEMAS for a period of one month from from June 01-30, 2019.
- Praveen Kumar. S of Final year BME attended an intern at INDIA JAPAN ELECTRONICS for a period of one month from June 01-30, 2019.
- Jagadesh. A of Final year BME attended an intern at SCHNEIDER INDIA PVT. LTD. For a period of one month from June 01-30, 2019.

HIGHER STUDIES:

We congratulate the students of the academic year 2015-2019 BME who got their admissions in various universities across the world and India for pursuing their Post Graduation in the field of Biomedical Engineering. The list of students is as follows:

1	Abarna R	RWTH AACHEN UNIVERSITY
2	Anjana K R	Centennial College, Canada
3	Aparna B	University of California San Diego
4	Apurva S	University of Stirling
5	Arunkumar K	University of British Columbia, Vancouver
6	Bhargav M	Monash University
7	Divya R	University of California Berkeley
8	Harshni V	Northeastern University
9	Janani Aishwarya Ai-	University of California, Davis
10	Jerome Jayakar S A	RWTH AACHEN UNIVERSITY
11	Kanimozhi S	Vellore Institute of Technology,
12	Meghna Murali K T	Brown University
13	Pavithran P G	Cleveland State University
14	Poornacharanya R	University of Texas at Dallas
15	RManuj	Cornell University
16	Swetha K V	University of Washington
17	Viswath Narayanan R	Cornell University

Top 10 medical innovations for 2019:

1. Pharmacogenomic testing

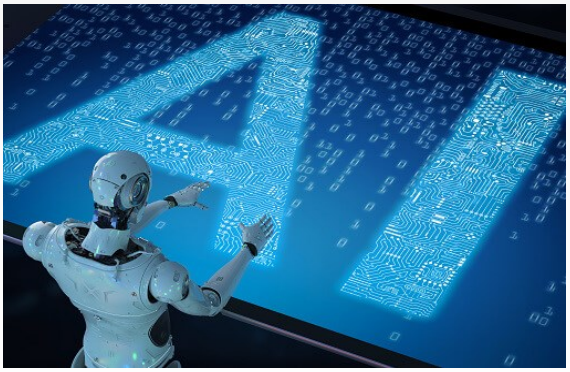
Pharmacogenomic testing determines patients' genetic makeup to tailor prescribed medical treatments based on individual drug metabolism. Pharmacogenomic testing, for example, can determine how patients will respond to opioid therapy, potentially decreasing opioid abuse.

Outside clinical consensus on the benefits of pharmacogenomic testing is split, with some experts optimistic about the technology and others pessimistic. Clinicians have been slow to implement pharmacogenomics, despite technological advances in the field and greater access to genetic testing. Stakeholders in the United States and Europe are examining the clinical utility of pharmacogenomics and establishment of appropriate guidelines.

2. Artificial intelligence

The *Encyclopedia Britannica* defines artificial intelligence (AI) as "the ability of a digital computer or computer-controlled robot to perform tasks commonly associated with intelligent beings. The term is frequently applied to the project of developing systems endowed with the intellectual processes characteristic of humans, such as the ability to reason, discover meaning, generalize, or learn from past experience."

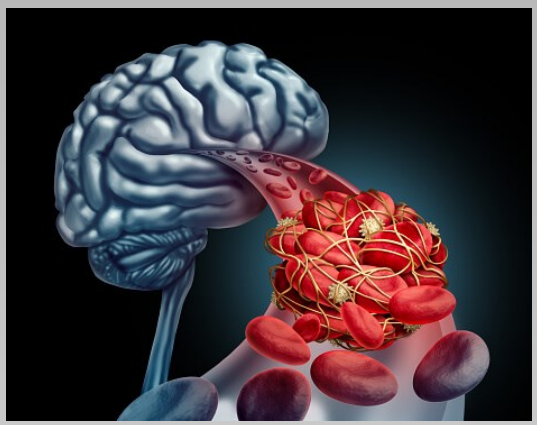
Although AI technologies have matched human performance of tasks, such as mathematical calculations or playing chess, they have yet to match human adeptness at covering wide domains of information.



With respect to health care, AI can assist medical diagnosis and aid physicians in identifying pathology on diagnostic scans. Furthermore, AI can help interpret mounds of electronic health data.

3. Treatment of acute stroke

In 2018, the American Heart Association (AHA) and the American Stroke Association (ASA) released new guidelines for patients with acute stroke. One big revision was the recommendation for an extended window for the treatment of stroke.

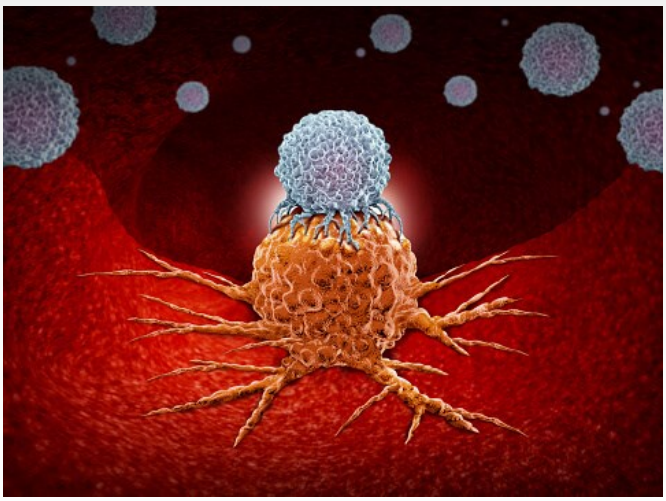


Here is a summary of the change, according to the American Heart Association Stroke Council:

"These 2018 guidelines are an update to the 2013 guidelines, which were published prior to the six positive 'early window' mechanical thrombectomy trials (MR CLEAN, ESCAPE, EXTEND-IA, REVASCAT, SWIFT PRIME, THRACE) that emerged in 2015 and 2016. In addition, in the last 3 months, two trials (DAWN and DEFUSE 3) showed a clear benefit of 'extended window' mechanical thrombectomy for certain patients with large vessel occlusion who could be treated out to 16-24 hours."

4. Immunotherapy

Immunotherapy has revolutionized cancer treatment by leveraging the immune system to fight tumors. In particular, immune checkpoint inhibitors have demonstrated great potential in the treatment of solid-tumor types, such as melanoma and non-small cell lung cancer. The hope is that someday immunotherapy options will exist for all types of tumors.

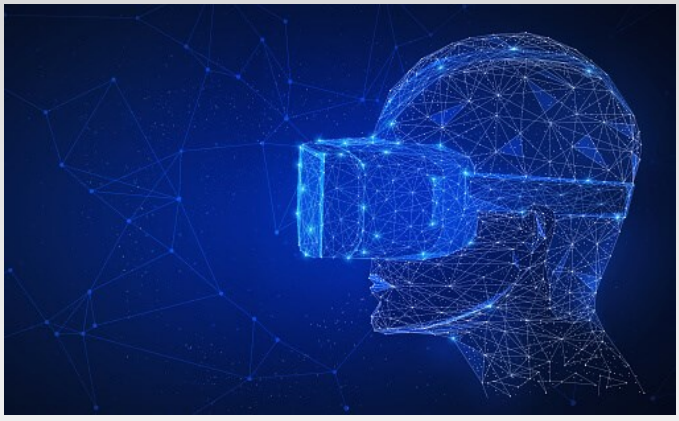


5. 3-D printing

3-D printing allows the user to create health products specific to the patient, including prosthetics, implants, and airway stents. These customized creations enhance comfort and performance because they are modeled after the patient's body measurements, while offering minimal risk of postoperative complications. 3-D printing also has applications in surgical planning, such as with heart surgery or even face transplant.

6. Virtual reality/mixed reality

Virtual reality/mixed reality (VR/MR) applications have become popular in medical education. With its immersive approach, VR/MR is good for all kinds of learners: audio, visual, and kinesthetic. VR is a completely computer-generated version of the world and requires the use of VR goggles. MR, or augmented reality, superimposes computer-generated images or sounds onto real-world settings and needs only be displayed on a screen. VR/MR permits medical students to experience and learn from life-and-death scenarios in a low-stakes environment. Other applications of VR/MR include surgical simulation and diagnostic imaging.



7. Stroke visor

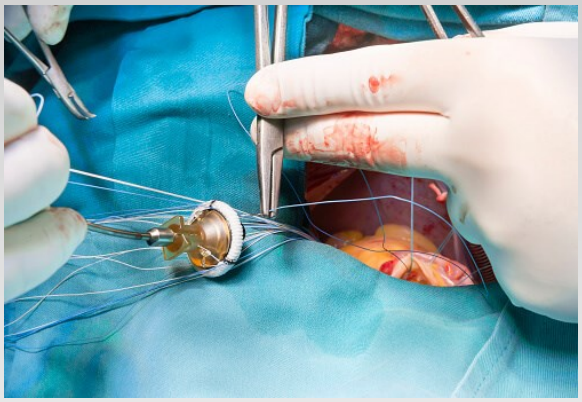
In 2018, the FDA cleared the Cerebrotech Visor, which is a noninvasive spectroscopy device that measures changes in the distribution of cerebral fluids and couples these findings with machine-learning to enhance algorithms and detect certain brain pathologies, such as stroke, trauma, and swelling. In particular, this technology helps detect hemorrhagic stroke, which—although less common than ischemic stroke—accounts for 40% of stroke deaths.

8. Robotic surgery

Robotic approaches to surgery are less invasive and faster, and are often associated with improved clinical outcomes, such as decreased recovery time and reduced pain. Robotic approaches to surgery also guide surgeons in the operating room. Currently, robotic surgery is used in a gamut of procedures from spine to endovascular.

For instance, the *da Vinci* Surgical System, which is probably the best-known robotic surgery platform, translates the surgeon's hand movements to smaller movements made by the robot inside the body, all visualized via laparoscopy. The *da Vinci* System has been used on more than 3 million patients globally.

9. Heart valve replacement



Advances in technology now allow for the performance of heart surgery percutaneously. Replacement of the aortic, mitral, or tricuspid valves via catheter obviate the need for open-heart surgery and improves surgery results.

10. RNA therapeutics

RNA therapeutics stymie RNA genetic abnormalities before these abnormalities are translated into functioning or nonfunctioning proteins. Examples of this technology include antisense nucleotides and RNA interference, and are applicable to rare genetic diseases, cancer, and neurologic illness.