Synergy

A BIOMEDICAL NEWSLETTER

VOLUME 09 ISSUE 01

2020

CONTENT

EDITORS DESK

Warm greetings to everyone!!!

"Education doesn't mean just to fill your head; it's meant to inspire your mind. Always keep learning new things and try to know your inner-self".

In this edition of the department's newsletter we share with you the great accomplishments of our students.

This edition covers the happenings in the department from the months of July to December 2020. We highlight the achievements and participation of the students and faculty.

Presenting to you the first issue of the ninth volume of SYNERGY

"Your Work is *going to fill a large part of your life, and the only way to be truly satisfied is to do what you believe is great work. And the only way to do great work is to love what you do. If you haven't found it yet, keep looking. Don't settle."- Steve Jobs*

Wishing you all a very Happy New Year 2021

Editorial board.

HOD'S DESK

It gives me great pleasure in writing the foreword for our department's newsletter, SYNERGY. This issue highlights the notable activities in the campus and in the department of biomedical engineering. It also highlights the accomplishments of faculty and students during the months of July to Dec 2020.

2020 was definitely the most enduring year.
We all had literally enough!
Enough scary moments...
Enough threats...
Enough worries...
And Enough stress too.
But yet, most of us were fortunate enough to escape from the PANDEMIC, economic issues, professional uncertainties and personal disparities.

I thank the Almighty for keeping us healthy and alive to face the upcoming year strongly.

Another new year...
Another new decade...
Another new beginning…

Let's pray for more strength, courage, empathy and maturity to treat all with respect and live life more gratefully.

Wish you and your family a very healthy, happy, peaceful and successful new year 2021!

Dr. A. Kavitha

CAMPUS UPDATES

SHIV NADAR FOUNDATION

HCL

Roshni Nadar Malhotra featured at #55 in the 17th Forbes 100 Most Powerful Women List

The Forbes Most Powerful Women list 2020 features the toughest and smartest women leaders from 30 countries. The list represents female leaders born across four generations and in categories including Business, Media, Technology, Finance, Politics and Philanthropy, while ranking them on the basis of four metrics: Impact, Spheres of influence, Media mentions and Money (GDP, revenue, assets under management, or net worth).

The 2020 list also assessed how women leaders responded to the challenges presented by COVID-19 within the context of their fields or industries.

DEPARTMENT VENTURES

University Rank

Students of B.E Biomedical Engineering 2016-2020 batch bagged two gold medals and overall 6 University ranks.

KAVYA VIJAYA KANNAN & LINDHIYA L AN BAGGED THE 1st RANK - GOLD MEDAL

SANDHANAKRISHANAN R - 2nd RANK

YOHANYA R - 7th RANK

ISHAASAMYUKTHA S - 10th RANK

BHUVANA DEVI M - 12th RANK

VAISHALI H - 14th RANK

DEPARTMENT VENTURES

Best Outgoing Student of the year 2016-2020

LINDHIYA L AN

Lindhiya's says

Thank you SSN...

It's was quite a surreal few moments when I heard that I was awarded the "**Best Outgoing Student of the College**" for the 2016-20 batch and that I was the first from BME department to get this. I am so glad to have this opportunity to share my experience at SSN and thank those who made it the most memorable.

On the outset, my heartfelt thanks to SSN institutions for creating multiple paths that a student could explore and giving the right support system for the same. In my case, the academic scholarships I received is the only reason I was able to fund my other extracurricular activities without additional financial burden on my family. Secondly, I thank my parents who were my SOS system 24/7 and I owe everything to them. Thirdly, Department of Biomedical Engineering and the Humanities Department that were very instrumental in shaping my academics. I specially thank Dr. Praveen Sam, Dr. S. Bagyaraj, Dr. K. Nirmala and Dr. T. Sree Sharmila for pushing me to grab the right opportunities at the right time.

DEPARTMENT VENTURES

I owe a lot to my seniors at SSN. Everyone who knows me at college knows that Jerom Zacharia (Jerom Anna as I fondly call him), from Mechanical Dept, 2018 batch, is a major reason behind this award. He exposed me to sports, cultural activities and a lot more academic opportunities available at SSN right in my first year. Finally I want to thank my friends and juniors from BME dept, Saaral Tamizh Mandram, SSN Classical Dance Team, squash team, and IEEE for all the love and laughter!

I made the list as short as possible, but the crux is that this is not individual accomplishment. All these amazing people and the right opportunities that they pointed me to, made it possible. It's a lot of their hard work that I am taking the credit for

Sharing a few highlights from my college life...

I started learning squash from my seniors in the first year. Our Physical Director Dr. Balaji gave me the opportunity to participate in many events including the All India Inter-University Squash Tournament held in Manipal and Jaipur, where I represented Anna University. I received the Sports Scholarship from the college for the same.

I joined the SSN Classical dance team through auditions in 2016. In 2020 I was chosen as the club representative and managed to take the team to an external competition for the first time ever, and we struck gold there (1st place in SRM MILAN Eastern group dance competition). I joined Saaral Tamizh Mandram as a spectator and later got the opportunity to learn silambam, parai, karagattam, kavadi, and lot more traditional art forms. I also formed and led a classical dance team inside Saaral.

DEPARTMENT VENTURES

Every year I received not only the academic scholarship for being the class topper but also free IEEE membership. This opened me to the world of technical professionals. I volunteered for several events and workshops as part of it and was the secretary of SSN Student Branch in my final year. I was privileged to be the placement coordinator of my batch. It was again a wonderful opportunity to interact with recruiters and improve my operational skills.

I ranked 1 in Anna University gold medalists list this year for holding a CGPA of 9.14. All the above experiences put together made it possible to get placed in a super dream company. I am currently 6 months into the job and having the best learning experience of my life.

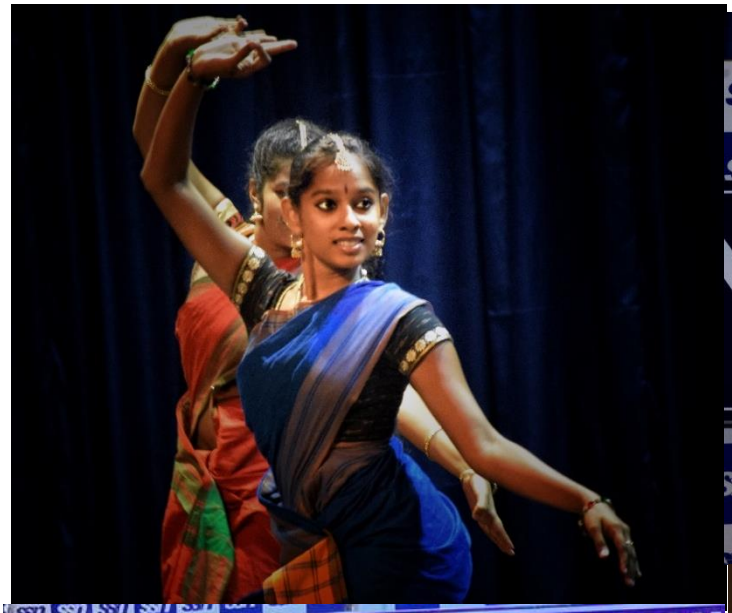
I thank SSN for giving such a rich experience. But I thank it more for giving me amazing people who invested unconditionally in my growth and development. To my juniors who are reading this, SSN holds a million opportunities. You just have to work hard, stand for what you believe and find the right support system.

I came in as a student who failed to secure a medical seat. But I am leaving with utmost satisfaction and fulfillment about what SSN has made me today. Always proud to be an SSNite!

Thanks and Cheers,
Lindhiya

DEPARTMENT VENTURES

Lindhiya's Reminiscence



DEPARTMENT VENTURES

A **MoU** was signed between ***Chettinad Hospital and Research Institute*** and ***Sri Sivasubramaniya Nadar College of Engineering***, on 24.12.2020. The MoU will promote academic interactions, collaborate research projects, etc., for the benefit of students, research scholars and faculty members. Dr. Murugesan, Director (Research) and Dr. Meignanakumar from Chettinad Hospital, Dr. Kala Vijayakumar, President, Dr.V.E.Annamalai, Principal, Dr. P. Ramasamy, Dean Research, Dr.A.Kavitha HoD/BME, Dr. J. Vijay and Ms. M. Dhanalakshmi from SSNCE were present during the event.

(From Right) Dr.V.E.Annamalai, Ms.M.Dhanalakshmi, Dr.A.Kavitha, Dr.KalaVijayakumar, Dr.P.Ramasamy, Dr. Murugesan, Dr. Meignanakumar, Dr. J. Vijay

FACULTY VENTURES

FACULTY INTERACTIONS

External Recognition

Dr. S. Bagyaraj AsP/BME as EXCOM MEMBER attended the online review meeting of IEEE EMBS Madras chapter held on 24.07.2020 at 4.00pm.

Dr. A. Kavitha, Dr. S. Pravin Kumar, Ms. Divya, Ms. Vidusha (IT) had a virtual research meeting with Prof. Hugo Gamboa and team from Physics Department, LibPhys-UNL Faculdade de Ciências e Tecnologia, Universidade NOVA de Lisboa on 27.07.2020.

Dr. S. Pravin Kumar, AsP/BME has conducted a series of research meetings with the research scientists Dr. Jan. G. Svec, and Hugo Lehoux from Voice Research Lab, Palacky University, Czech Republic on 08.07.2020, 15.07.2020, 22.07.2020, and 29.07.2020.

Dr. J. Vijay, AsP/BME attended the Board of Studies (BoS) meeting as university representative to discuss the curriculum proposed by the department of Medical Electronics, Vellalar college of Engineering (Autonomous), Erode on August 21st, 2020 through Online.

Dr. Vijay J, AsP/BME has been invited to deliver a talk on "Internet of Medical Things" in IEI sponsored Six days workshop on Getting started with Internet of Things (IoT) organized by the department of Electronics and Communication Engineering, Sri Sai Ram Institute of Technology, Chennai held on October 17th, 2020.

Dr. A. Kavitha, Prof & Head attended a BoS meeting for Adhiyamaan College of Engineering on 17.10.2020.

Dr. B. Geethanjali, AsP/BME was appointed as Advisory & Technical Committee member for International Conference on Biomedical Engineering & Software

FACULTY VENTURES

Technology (BEST 2021) January 28 – 29, 2021 Organized by Department of Biomedical Engineering, National Institute of Technology Raipur (NITR), Raipur Chhattisgarh.

Dr. L. Suganthi, AsP/BME nominated by Anna University as a member to serve in the board of studies in Department of Biomedical Engineering, Sona College of Technology, Salem on 05/11/2020 for two years.

Dr.L.Suganthi, AsP/BME has attended Online MTI Incubation Committee Meeting conducted by IITM HTIC MedTech Incubator on 14/12/2020.

FACULTY VENTURES

Workshop/seminar/FDP/Seminar /training/webinar attended

Dr. S. Arun Karthick, AsP/BME and **Dr. S. Bagyaraj,** AsP/BME attended a 5 day International FDP on" Exploring the Nuances of Deep Learning for Research Application - A Deeper Experience, organised by the Department of ECE, Karunya Institute of Technology and Sciences, Coimbatore from 13- 17 July 2020.

Dr. S. Arun Karthick, AsP/BME participated in the FDP on Advancements in Biomedical Engineering organized by Department of Biomedical Engineering, Karpaga Vinayaga College of Engineering and Technology held during 16-18 July 2020

Dr. V. Mahesh, AsP/BME has participated in two-day Faculty Development Program (FDP) on “Deep Learning Models and Applications” organized by Department of ECE, SSN College of Engineering, Kalavakkam, 603110, Chennai, during 20 - 21, July 2020.

Dr. S. Bagyaraj, AsP/BME has attended Two day FDP on “DEEP LEARNING MODELS & APPLICATIONS" held on 20- 21 July, 2020 organized by the Department of ECE, SSN College of Engineering.

Dr. S. Bagyaraj, AsP/BME attended an International FDP on "Perspectives of AI applications", organized by the Department of ECE, St.Joseph's Institute of Technology, Chennai-119 from 27 July - 1 August 2020.

Dr.B.Geethanjali, AsP/BME has participated in two day Faculty Development Program (FDP) on “Deep Learning Models and Applications” organized by Department of ECE, SSN College of Engineering, Kalavakkam, 603110, Chennai, during 20- 21, July 2020.

FACULTY VENTURES

Dr. R. Subashini, AP/BME has participated "International Webinar on Recent Developments in Biotechnology" from 29 June – 1July 2020, organized by St. Joseph's College of Engineering, OMR, Chennai – 119

Dr. S. Arun Karthick, AsP/BME participated in a webinar on Current Trends and Challenges in 3D Bioprinting Technology-2020 (CTC3DBT-2020), organised by Centre for Bio Materials, Cellular and Molecular Theranostics (CBCMT), VIT Vellore on 5 July 2020.

Dr. S. Arun Karthick, AsP/BME participated in IEEE - ABET Webinar on Accreditation and Quality of Engineering Education in South Asia, Organized by IEEE India Council on 8 July 2020

Dr. R. Subashini, AP/BME has participated Virtual symposium on "COVID-19 Disease Control - Opportunities and Challenges for Vaccines, Bio-therapeutics and Diagnostics" An Industry-Academia Interaction organized by Centre for Bio – Separation Technology (CBST) at Vellore Institute of Technology (VIT), Vellore, India during 9 - 10 July 2020.

Dr. R. Subashini, AP/BME has participated "Webinar on Pharmaceutical Chemistry-Advancements in Drug manufacturing" organized by the Department of Applied chemistry on 10 July 2020

Dr. S. Pravin Kumar, AsP/BME participated in the "REMOTE: The Connected Faculty Summit" hosted by Arizona State University, USA, held on July 13-14, 2020

Dr. S. Pravin Kumar, AsP/BME has attended a virtual training course on "Calibration of medical instruments" as a part of the Medical Device Quality Management Progrmamme by Jaankiraman Purushotaman, General Manager, Helix Pvt Ltd on 16th July 2020.

Dr. S. Arun Karthick, AsP/BME participation in the National Webinar on Computational Chemistry on Biofuel Development" (CCBD-2020) Organized by Department of Science, St. Joseph's College of Engineering, OMR, Chennai - 600 119 on 16th July 2020

Dr. B. Geethanjali, AsP/BME attended a webinar on Big Data and Covid19 on 16/06/2020 at 5:30 PM IST by Dr. Anil K Maheshwari, Professor of Management, and Director of MBA in Information Systems, at Maharishi International University, in Fairfield, Iowa, USA.

FACULTY VENTURES

Dr. S. Arun Karthick, AsP/BME participation in the two days International Webinar series on Carbon Nanostructures and its Applications" Organized by Department of Science, St. Joseph's College of Engineering, OMR, Chennai - 600 119 on 20 - 21 July 2020.

Dr. S. Pravin Kumar, AsP/BME has attended the Impact of COVID-19 on "Learners and Educators session", as part of Internet Governance Forum USA (IGF-USA) 2020 which has been held as a virtual event on 22-23 July 2020.

Dr. R. Subashini, AP/BME has participated "Bio – Talk Series Week: 4, Life and death in-between cancer cells" organized by the Department of Biotechnology, St. Joseph's College of Engineering, OMR, Chennai on 24th July 2020

Dr. B. Geethanjali, AsP/BME attended a webinar on " COVID-19 Driving Inevitable Changes In Healthcare Delivery" presented by Technecon Healthcare Date/Time: 25 Jun, 2020 @ 4:30 pm IST

Dr. V. Mahesh, AsP/BME attended a webinar on Signal Processing for Deep Learning and Machine Learning on 28 July 2020, organized by Mathworks.

Dr. B. Geethanjali, AsP/BME attended an Interactive Webinar "Introduction to Neurofeedback, biofeedback and Neurocognitve assessment by Gunjan Human Karigar Ltd on July 15 7 pm to 8.30pm

Dr. B. Geethanjali, AP/BME attended an Interactive Webinar on "ROBOTICS - CONNECTING ENGINEERING MINDS "BY Dr.S. K SAHA (McGraw Hill Webcasts) on July 22 nd from 5.30 pm to 6.30 pm

Dr. B. Geethanjali, AsP/BME Completed NPTEL Online certification course on " Demystifying the Brain " with score 93 %

Dr. Arun Karthick S, AsP/BME and **Dr. S.Bagyaraj,** AsP/BME attended a five days AICTE Training And Learning (ATAL) Faculty Development Programme on "Biomedical Instrumentation- Research Challenges" organised by Amal Jyothi College of Engineering during August 24 - 28, 2020

Dr. Arun Karthick S, AsP/BME and **Dr. S. Bagyaraj,** AsP/BME attended a two-day Faculty Development Programme on "High Impact Teaching skills and Mind mapping for better teaching" organised by Manipal Academy of Higher Education during Aug 19 - 20, 2020

FACULTY VENTURES

Dr. Arun Karthick S, AsP/BME attended a three-day Faculty Development Programme on "Real Time Applications in Nanotechnology" organised by Government College of Technology, Coimbatore during Aug 19 - 21, 2020.

Dr. J. Vijay, AsP/BME attended a Five Days AICTE Training And Learning (ATAL) Faculty Development Programme on "Big Data Analytics With Deep Learning" organized by the Department of Computer Science & Engineering Poornima Institute of Engineering & Technology, Jaipur during August 18 - 22, 2020.

Dr. L. Suganthi, AsP/BME attended Five Days online STTP on "Industrial IoT and Industry 4.0 - "Smart industry automation", organized by the Department of Electronics and Instrumentation Engineering, Kongu engineering college, from 11th August to 15th August, 2020.

Dr. S. Pravin Kumar, AsP/BME has participated in three days virtual workshop "Aspects of Outcome based Education and Use of Software" organized by vmedulife in association with Sri Venkateswara College of Engineering from 6.8.2020 to 8.8.2020

Dr. Arun Karthick S, AsP/BME attended a workshop on "Emerging Research Avenues in Biomedical Engineering" hosted by Department of Biomedical Engineering, PSG College of Technology, Coimbatore during Aug 17 - 18, 2020.

Dr. S. Bagyaraj, AsP/BME attended a workshop on "Emerging Research Avenues in Biomedical Engineering" hosted by Department of Biomedical Engineering, PSG College of Technology, Coimbatore during Aug 17 - 18, 2020.

Dr. J. Vijay, AsP/BME attended a workshop on Data science hosted by Boston India during August 27 - 30, 2020 through online.

Dr. S. Pravin Kumar, AsP/BME attended a webinar on Augmented Reality & its Applications by Mr Chetankumar G Shetty, conducted by McGraw Hill on 5/8/2020.

FACULTY VENTURES

Dr. S. Pravin Kumar, AsP/BME has participated international virtual webinar on "Diagnostic Application of Radiation in Medicine" organized by St. Joseph's College of Engineering on 7.8.2020

Dr. S. Pravin Kumar, AsP/BME attended a webinar titled "Awareness on Regulatory Services in Medical Field" on 10.8.2020 organized by Palasa learning, Pune.

Dr. S. Pravin Kumar, AsP/BME attended a webinar titled "Certificate in Biomedical Quality Assurance program" on 15.08.2020, Special Address was given by IBSC founders AMTZ, AiMeD & QCI.

Dr. V. Mahesh, AsP/BME attended an interactive webinar Augmented Reality & its Applications by Mr Chetankumar G Shetty, Senior Lead Innovation, PL Lab in Bajaj Finance on 5/8/2020 Duration: 60 minutes 5.30 pm to 6.45pm

Dr. V. Mahesh, AsP/BME attended webinar on Radiation in medicine organized by St.Joseph college of Engineering Chennai on 7.8.2020 at 10.30 am to 11.30 am

Dr. V. Mahesh, AsP/BME attended an International Webinar on Discrete Mathematics (IWDM) held on August 08, 2020 organized by the Department of Mathematics, SSN College of Engineering, Chennai, Tamil Nadu, India.

Dr. V. Mahesh, AsP/BME attended webinar on Brain computer Interface August 8 2020, 4.30 to 5.30 pm organized by Kongu Engineering College, Erode

Dr. V. Mahesh, AsP/BME attended a Webinar on Awareness on Regulatory Services in Medical Field" on August 10th, 2020, 5:00 PM Organised by: Astute Labs Pvt. Ltd.Speaker : Dr. Sandip Kulkarni, Managing Director - Astute Labs Pvt. Ltd

Dr. V. Mahesh, AsP/BME attended an International Webinar on Frontline: Clinical Impacts of COVID-19 virtual event 12 August 2020 from 6:00 pm to 7:30 pm organized by Monash University –Australia

Dr. V. Mahesh, AsP/BME attended a webinar on "Graph Colorings "organized by C. ABDUL HAKEEM COLLEGE, Department of Science and Humanities – Mathematics during on 18/08/2020.

FACULTY VENTURES

Dr. V. Mahesh, AsP/BME attended an International Webinar Life Sciences & Health Care, Medical Device Manufacturing and Cybersecurity, A Strategy on Thursday, August 20, 2020 at 6.30 am to 8 am organized by ISACA -Silicon Valley Chapter

Dr. L. Suganthi, AsP/BME attended a Webinar on Awareness on Regulatory Services in Medical Field" on August 10th, 2020, 5:00 PM Organised by: Astute Labs Pvt. Ltd. Speaker: Dr. Sandip.

Dr. J. Vijay, AsP/BME attended a webinar on "Miniaturized antenna for Wireless Capsule Endoscopy system: a Make-in-India approach' by Dr. Balaka Biswas, SRA-Scientist Pool, CSIR-CSIO, Chandigarh, India on 22nd Aug, 2020 from 03:30 PM to 04:45 PM. The event was organized by IEEE MTT-S and SBC Jadavpur University.

Dr. J. Vijay, AsP/BME attended a webinar on "Panel Discussion on Online Education Challenges in Assessment and Open Book Examinations" organized by IEEE CS, CSI and ACM Madras section on August 27, 2020 between 6:00 pm - 07:30 pm.

Dr. S. Arun Karthick, AsP/BME attended a webinar on "Augmented Reality & its Applications", hosted by McGraw Hill on Aug 5 2020.

Dr. S. Arun Karthick, AsP/BME attended a webinar on "Radiation in Medicine" hosted by St. Joseph's College of Engineering, Chennai, on Aug 7 2020.

Dr. S. Bagyaraj, AsP/BME attended a webinar on "Radiation in Medicine" hosted by St. Joseph's College of Engineering, Chennai, on Aug 7 2020.

Dr. S. Bagyaraj, AsP/BME attended a webinar on "Augmented Reality & its Applications", hosted by McGraw Hill on Aug 5 2020.

Dr. B. Geethanjali, AsP/BME attended an interactive webinar Augmented Reality & its Applications by Mr. Chetankumar G Shetty, Senior Lead Innovation, PL Lab in Bajaj Finance on 5/8/2020 Duration: 60 minutes 5.30 pm to 6.45pm

Dr. B. Geethanjali, AsP/BME attended webinar on Radiation in medicine organized by St.Joseph college of Engineering Chennai on 7.8.2020 at 10.30 am to 11.30 am

FACULTY VENTURES

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Dr. B. Geethanjali, AsP/BME attended webinar on Brain computer Interface August 8 2020, 4.30 to 5.30 pm organized by Kongu Engineering College, Erode

Dr. B. Geethanjali, AsP/BME attended a Webinar on Awareness on Regulatory Services in Medical Field" on August 10th, 2020, 5:00 PM Organised by: Astute Labs Pvt. Ltd. Speaker : Dr. Sandip Kulkarni, Managing Director - Astute Labs Pvt. Ltd.

Dr. B. Geethanjali, AsP/BME attended an International Webinar on Frontline: Clinical Impacts of COVID-19 virtual event 12 August 2020 from 6:00 pm to 7:30 pm organized by Monash University –Australia.

Dr. B. Geethanjali attended a webinar on "Graph Colorings "organized by C. ABDUL HAKEEM COLLEGE, Department of Science and Humanities – Mathematics during 18/08/2020.

Dr. B. Geethanjali, AsP/BME attended an International Webinar Life Sciences & Health Care, Medical Device Manufacturing and Cyber security, A Strategy on Thursday, August 20, 2020 at 6.30 am to 8 am organized by ISACA -Silicon Valley Chapter.

Dr. K. Nirmala, AsP/BME attended a webinar on "Scope of 3D Printing: Use Cases around Healthcare Sector in Handling COVID" on Saturday, August 8 2020, between 6 pm to 7 pm IST organized by IEEE CSI.

Dr. K. Nirmala, AsP/BME attended a webinar on "Information Systems for Public Health" on Thursday, August 20, 2020 between 3:00 pm to 5:30 pm organised by IEEE Madras section

Dr. R. Subashini, AP/BME attended a Webinar on Awareness on Regulatory Services in Medical Field" on August 10th, 2020, 5:00 PM Organized by: Astute Labs Pvt. Ltd. Speaker : Dr. Sandip Kulkarni, Managing Director - Astute Labs Pvt. Ltd

FACULTY VENTURES

Dr. R. Subashini, AP/BME attended an International Webinar on Frontline: Clinical Impacts of COVID-19 virtual event 12 August 2020 from 6:00 pm to 7:30 pm organized by Monash University –Australia.

Dr. Sachin G. Sarate, AP/BME attended a webinar on "Preparing Open Book Exam", organized by Department of Chemical Engineering, SSN CE at 2:00 pm to 3:00 pm on 10/08/2020

Dr. Sachin G. Sarate, AP/BME attended a seminar on "Assessment of intra-articular distance from Multi-modal Knee Osteoarthritis images" by research scholar Ms. Subha B. at 2:00 pm to 3:00 pm on 13/08/2020

Dr. Sachin G. Sarate, AP/BME attended a webinar on "Open Book Exams, Not a paradigm shift" organized by Department of Mechanical Engineering SSN CE at 10:00 am to 11:00 am on 08/08/2020

Dr. S Arun Karthick, AsP/BME attended a 5 Day workshop on "Incorporating Universal Human Values in Education" An AICTE Initiative from 21-25 Sep 2020.

Ms. B. Divya, AP/BME attended a conference "Connect Next Conference" organized by La Fondation Dassault Systemes, India on September 17, 2020

Dr. B. Geethanjali, AsP/BME attended a Webinar on Machine learning Based voice and speech emotion detection (09.09.2020) from 6 pm to 7 pm organized by NoviTech Ernakulam

Dr. B. Geethanjali, AsP/BME attended webinar on Gliomas Brain disease detection using Machine Learning (17.09.2020) from 6 pm to 7 pm organized by NoviTech Ernakulam

Dr. V. Mahesh, AsP/BME, attended a Webinar on Machine learning Based voice and speech emotion detection (09.09.2020) from 6 pm to 7 pm organized by NoviTech Ernakulam

Dr. K. Nirmala, AsP/BME attended webinar on "Machine Learning for non-Coders: Your turn to become a ML Expert" by Dr. Rik Das, ACM Distinguished Speaker, Assistant Professor, Program of Information Technology, Xavier Institute of Social Service, Ranchi held on 5th Sep 2020 organized by CSI Madras section.

FACULTY VENTURES

Dr. S. Arun Karthick, AsP/BME attended a webinar on "Fibrous Silica Catalysts for Green Engineering" on 9/9/2020 organized by SSN College of Engineering.

Dr. S. Arun Karthick, AsP/BME attended a webinar on "Guide for Ethical Leadership" on 19/9/2020 organized by SSN College of Engineering.

Dr. R. Subashini, AP/BME, attended a webinar on Model-based Process Development of Continuous Chromatography for Antibody Separation" on 02-09-2020, organized by SSN College of Engineering.

Dr. R. Subashini, AP/BME attended two days National Open Workshop on "Getting Aligned to the Publishing Process"- Author Workshop on 25-09-2020 and 28-09-2020, organized by Elsevier (Science & Technology).

Dr. B. Geethanjali, AsP/BME, attended two days National Open Workshop on "Getting Aligned to the Publishing Process- Author" Workshop on 25-09-2020 and 28-09-2020, organized by Elsevier (Science & Technology).

Dr. B. Geethanjali, AsP/BME has successfully completed a 30 days Webinar on "MatLab Master Class Series" from Sep.1 to Sep 30. (8.00 to 8.45 PM) by Pantech solutions in association with IETE Mumbai.

Dr. V. Mahesh AsP/BME has successfully completed a 30 days Webinar on "MatLab Master Class Series" from Sep.1 to Sep 30. (8.00 to 8.45 PM) by Pantech solutions in association with IETE Mumbai.

Dr. J. Vijay AsP/BME attended an open workshop on "Getting aligned to the publishing process" by Elsevier Academy on 28 September 2020.

Dr. R. Subashini AP/BME completed the online course in coursera, Titled: 'Disaster Preparedness', 7 weeks course authorized by University of Pittsburgh, on 26th September 2020.

Dr. R. Subashini AP/BME attended an one week (six days) online short term training programme (STTP) on "Impact of polyphenols in enzyme inhibition and formulation of healthcare apparels" sponsored by AICTE, New Delhi and organized by Department of Biotechnology, jointly with Department of Textile and Fashion Technology, Kumaraguru College of Technology, Coimbatore, conducted from 12 -17 October 2020.

FACULTY VENTURES

Dr. B. Geethanjali AsP/BME attended an two days online workshop on " Data Analysis in R using STATCRAFT " from 8th to 9th October 2020, organized by Ganpat University, Faculty of Computer Applications ,Gujarat .

Dr. V. Mahesh AsP/BME attended an two days online workshop on " Data Analysis in R using STATCRAFT " from 8th to 9th October 2020, organized by Ganpat University, Faculty of Computer Applications ,Gujarat

Dr. R. Subashini AsP/BME attended an two days online workshop on " Data Analysis in R using STATCRAFT " from 8th to 9th October 2020, organized by Ganpat University, Faculty of Computer Applications ,Gujarat

Dr. K. Nirmala AsP/BME attended IEEE R10 Panel of Conference Organizers (POCO) workshop on 10 - 11October, 2020 through online organized by IEEE Madras Section.

Dr. K. Nirmala, AsP/BME attended DST-SERB sponsored workshop on Deep learning for healthcare on 9th October 2020 organized by CSE department, Sri Sivasubramaniya Nadar college of Engineering.

Ms. B. Divya, AP/BME attended DST-SERB sponsored workshop on Deep learning for healthcare on 9th October 2020 organised by CSE department, Sri Sivasubramaniya Nadar college of Engineering.

Ms. Divya B, AP/BME attended a webinar organized by IEEE Nuclear and Plasma Science Society of IEEE SB Sahrdaya College of engineering and technology on the title" PET: An innovative medical imaging device using HEP technologies". The session was handled by Dr Patrick Le Du on 3 Oct 2020

Dr. K. Nirmala, AsP/BME attended a webinar titled "Medical Textiles for Fighting with Covid-19" organized by IEI on 10th October between 5:30 to 7:30pm.

Dr. K. Nirmala, AsP/BME attended webinar on "Scope of 3D Printing: Use Cases around Healthcare Sector in handling COVID" by Mr. Surendranath Reddy held on 8 August 2020 organised by CSI chennai chapter.

Dr. B. Geethanjali, AsP/BME attended webinar on Missing Component in Startup Product Development Ecosystem in Safety & Security Critical Industries conducted by LDRA Software Technology on 29.10.2020.

FACULTY VENTURES

Dr. V. Mahesh, AsP/BME attended webinar on Missing Component in Startup Product Development Ecosystem in Safety & Security Critical Industries conducted by LDRA Software Technology on 29.10.2020.

Dr. V. Mahesh, AsP/BME attended webinar on Top 5 Data Governance Strategies for Life Sciences conducted by Egnyte Life Science on 29.10.2020 , 10.30 to 11.30 PM.

Dr. S. Bagyaraj, AsP/BME attended webinar "The long-term functional effects of tDCS in acute stroke patients" organised by Neuroelectrics Amsterdam, Berlin, Rome, Stockholm, Vienna on Oct 27, 2020 at 04:00 PM .

Dr. V. Mahesh, AsP/BME attended webinar on Mental Health: Importance and the need for more professionals in India Hosted by Dr. Manjushree Palit, Jindal Institute of Behavioural Sciences on 30.10.2020 , 5.30 to 6.30 PM

Dr. V. Mahesh, AsP/BME completed a certificate Program on Deep Learning from Great Lakes Executive Learning in October 2020.

Dr. S. Pravinkumar, AsP/BME completed a certification course on Deep Learning Onramp conducted by Math Works on 15-10-2020.

Ms. M. Dhanalakshmi, AP/BME attended 5 day FDP on "End to End Processes in Data Analytics" organized by IT department, SSNCE, during November 2-6,2020.

Ms. R. Nithya, AP/BME Assistant Professor, attended 5 Days online FDP on "End to End Processes in Data Analytics" Conducted by IT Department SSNCE, from 02 – 06 November 2020.

Dr. Mahesh Veezhinathan, AsP/BME attended One-week International Faculty Development Program on RECENT ADVANCES IN COMPUTER SCIENCE AND ALLIED DOMAINS RACSAD – 2020, Conducted by Sharda University Greater Noida, from November 23 -28, 2020

Dr. B. Geethanjali, AsP/BME attended One Week International Faculty Development Programme on “Recent Advances in Computer Science and Allied Domains” (RACSAD – 2020) through online mode during from November 23 - 28, 2020 organized by School of Engineering & Technology, Sharda University, Greater Noida, India.

FACULTY VENTURES

Dr. J. Vijay, AsP/BME attended 5 day faculty development programme on End to End process in Data Analytics" organized by the department of IT, SSNCE during November 2 - 6, 2020.

Dr. B. Geethanjali, AsP/BME attended a webinar on Quantitative Data Analysis in R using STATCRAFT on 11 November 2020 organized by Sri Sivasubramaniya Nadar College of Engineering in collaboration with STATCRAFT, Bangalore

Dr. R. Subashini, AP/BME has attended a Webinar on the response of the DBT's Autonomous Institutes to Covid-19 organized by India Alliance on 11 November 2020.

Dr. R. Subashini, AP/BME has attended a Webinar on "The Teaching of Biochemistry: CBME Curriculum Decoded" organized by the Orient Blackswan Team, on 27.11.2020.

Ms. M. Dhanalakshmi AP/BME has attended a webinar on, "QUANTITATIVE DATA ANALYSIS IN R USING STATCRAFT" organized by Dept. of ECE, SSNCE on November 11, 2020.

Dr. B. Geethanjali, AsP/BME attended a webinar on the topic "Defibrillator Basics under Biomedical Engineer training course for critical care area-Session-2" conducted by Nihon Kohden India held on 27.11.2020.

Dr. B. Geethanjali, AsP/BME attended 10 Hours Virtual Training on" Medical Implants Design using ANSYS Software" held from 16.11.2020 to 20.11. 2020 conducted by CADFEM INDIA

Dr. R. Subashini, AP/BME has attended a "Virtual Training on Medical Implants Design using ANSYS Software", organized by CADFEM India Pvt. Ltd. 16th - 20th Nov, 2020

Dr. J. Vijay, AsP/BME attended Webinar on Online Education Quality Assurance on 19-20 Nov 2020 organized by AICTE to know the best practices from Australia and India about online/MOOC education.

Ms. R. Nithya, AP/BME Assistant Professor has attended one day Webinar on "Quantitative Data Analysis in R using STATCRAFT" organized by ECE Department, SSNCE on 11.11.2020.

FACULTY VENTURES

Dr. Mahesh Veezhinathan, AsP/BME has attended one day Webinar on Quantitative Data Analysis in R using STATCRAFT organized by ECE, SSN on 11 November 2020.

Dr. Mahesh Veezhinathan, AsP/BME has attended a Webinar on "Medical Device Industry: Era of Innovation & Expansion post COVID" by Messe Frankfurt Trade Fairs India Pvt. Ltd. on 6 November, 2020.

Dr. A. Kavitha HOD/BME attended Virtual/ Online International Summit on 'Atmanirbhar Bharat: India as Manufacturing Hub for Global Health (Promoting Innovation and Entrepreneurship in Medical Devices and Tele Health) on 26th and 27 November 2020.

Dr.K.Nirmala, AsP/BME has participated in the two day International Workshop on "Deep Learning Models and its Applications" organized by the Department of Electronics and Communication Engineering, Sri Sivasubramaniya Nadar College of Engineering, Chennai during December 8-9, 2020.

Dr. B.Geethanjali, AsP/BME has participated in the two day International Workshop on "Deep Learning Models and its Applications" organized by the Department of Electronics and Communication Engineering, Sri Sivasubramaniya Nadar College of Engineering, Chennai during December 8-9, 2020.

Dr.B.Geethanjali, AsP/BME attended webinar on "Applications of Graph Theory "organised by the Department of Science and Humanities-Mathematics Mohamed Sathak A. J college of Engineering on 22-12-2020

Dr. Mahesh Veezhinathan, AsP/BME has attended Webinar on Development of National Medical Technology Roadmap, Organized by PHDCCI on 22.12.2020.

Dr. Mahesh Veezhinathan, AsP/BME attended a Webinar on National Mathematics Day Organized by Mohamed Sathak AJ Engineering College on 22.12.2020

Dr. Mahesh Veezhinathan, AsP/BME attended a webinar on Statistical Data Analysis in R using Statcraft, organized by Dept. of Statistics, University of Kerala, on 04.12.2020.

Dr. S. Pravin Kumar, AsP/BME has attended an International Webinar IEEE SA Summit: Mobile Health: Necessity for Access, Validation and Trust to Meet the Rising Demand for Remote & Rural Patients organized by IEEE, USA on 10.12.2020

FACULTY VENTURES

Divya B, AP/BME participated & completed successfully AICTE Training And Learning (ATAL) Academy Online FDP on "Biomedical Instrumentation" from 2020-12-7 to 2020-12-11 at UNIVERSITY B D T COLLEGE OF ENGINEERING DAVANAGERE.

Divya B, AP/BME participated & completed successfullyAI CTE Training and Learning (ATAL) Academy Online FDP on "Wearable Devices" from 2020-11-30 to 2020-12-4 at Sri Ramakrishna Institute of Technology.

Dr.K.Nirmala, AsP/BME participated and completed successfully AICTE Training and Learning (ATAL)Academy online FDP on "Precision Health Technology" conducted by Thiagarajar College of Engineering from 14-12-2020 to 18-12-2020.

Workshop/seminar/FDP/Seminar /training/webinar Organized

Dr. S. Pravin Kumar, AsP/BME and **Dr. B. Geethanjali,** AsP/BME organized an interactive Webinar on "Remote Engineering Lab using NI Platform" on July 25.7.2020 (12 noon to 2 pm) the resource persons are Visweswaran .J National Instruments and Ajay Kumar from Cognibot.

M. Dhanalakshmi, AP/BME organized webinar for "Core placement training" on 28 July 2020. Mr. D. Jagadeesh kumar, Engineer, Biomedical department, Rajiv Gandhi Government Hospital, Chennai gave a talk on "Overview on applications of Biomedical equipment in Hospitals" for final year UG and PG students.

M. Dhanalakshmi, AsP/BME organized webinar for "Core placement training" on 29 & 31 July 2020. Mr. Shantha kumar, Director and Mrs. Dolly Shanthakumar Asst. Director, Vital Bio-systems, Chennai, handled the session year UG and PG students. The first day's session was on "Opportunities & Challenges in a Covid 19 Era for Biomedical Engineers" – providing an overview of the Medical Devices Industry in India, Opportunities during this pandemic for Biomeds, opportunities in entrepreneurship & skills required for success in this industry. The second day's session was on "Student to Bio-Medical Engineer - Effective Transition".

Dr. S. Pravin Kumar, AsP/BME organized an IEEE - EMBS webinar on 3D designing and modelling webinar on 27.08.2020. Speakers: Lokesh Kumar (3rd year, BME), Mr Vishnu T U, Founder, Machenn Innovations. The event was arranged for all the 2nd and 3rd years and optional for other years.

Ms. M. Dhanalakshmi, AP/BME organized core placement training on "Opportunities in Healthcare and philips outlook" by Mr. V. Gnanakumar, Regional

Business Manager (US), Philips health systems, Chennai on 7 August 2020, for final year UG and PG students between 2.30 PM and 4.00 PM.

Ms. M. Dhanalakshmi, AP/BME organized core placement training on "Healthcare Industry & Moving Forward in Tough Times" by Ms. Ranjit Kaur Chandel, Business Manager, Philips Health systems, Delhi on 14 August 2020, for final year UG and PG students between 3.00 PM and 4.00 PM.

Ms. M. Dhanalakshmi, AP/BME organized core placement training on "Risk Management" by Mr. Sudhakar Rao. J, Manager, Regulatory Affairs, HCL Technologies on 19 August 2020, for final year UG and PG students between 2.00 PM and 4.00 PM.

Dr. K. Nirmala, AsP/BME **Ms. B. Divya,** AP/BME and **Dr. L. Suganthi,** AsP/BME organised one day workshop on "wireless Body area Network" on 19th August for for Third year, Final year UG and II year PG students between 10: 00 AM to 2:30 PM

Ms. B. Divya, AP/BME, **Dr. K. Nirmala,** AsP/BME and **Dr. L. Suganthi,** AsP/BME organized a webinar on the title "Optical Coherence Tomography" by Mr.Lijo Varughese Chacko,Senior Electronics Design Engineer, on 8 August 2020 for Third year, Final year UG and II year PG students between 2.00 PM to 3.00 PM

Dr. J. Vijay, AsP/BME and **Dr. S. Bagyaraj,** AsP/BME organized a webinar on "Open Book Examination Practices" for the benefit of faculty members, presented by Dr. Dinesh Bhatia, Associate Professor, Department of Biomedical Engineering, North Eastern Hill University, Shillong, Meghalaya on August 06, 2020 between 02:00 pm - 03:00 pm.

Dr. S. Pravin Kumar, AsP/BME organized a webinar on "Voice Biomechanics" by Dr. Jan G. Švec, Palacký University, Olomouc, Czech Republic on 16.09.2020.

Dr. J. Vijay, AsP/BME organized a webinar on "Hybrid U-net models for medical Image Segmentation" by Dr. Alex Noel Joseph Raj, Professor,College of Engineering Shantou University, China on 29.09.2020.

Dr. Sachin Gaurishankar Sarate, AP/BME gave a Webinar on "Reign your mind with Anapana and Vipassana meditation" to Youth Red Cross SSN on 13/09/2020 from 9:00 am to 11:00 am to 127 III semester students.

Dr. L. Suganthi, AsP/BME, **Dr. K. Nirmala,** AsP/BME, **Ms. B. Divya,** AP/BME organized one day workshop with hands on titled "Exploring virtual Reality: A

Handson workshop for beginners" on 19th September 2020 for third year, final year UG and second year PG students. Hands on sessions were conducted by trainers from Verena Haptic and VR Chennai.

Ms. B. Divya, AP/BME and **Dr. S. Pravin Kumar,** AsP/BME conducted a workshop on the title "PCB designing Using Altium Designer" for third year BME students on 24/10/2020. Sessions were handled by experts from Sai Incubation Center, Coimbatore, Tamilnadu.

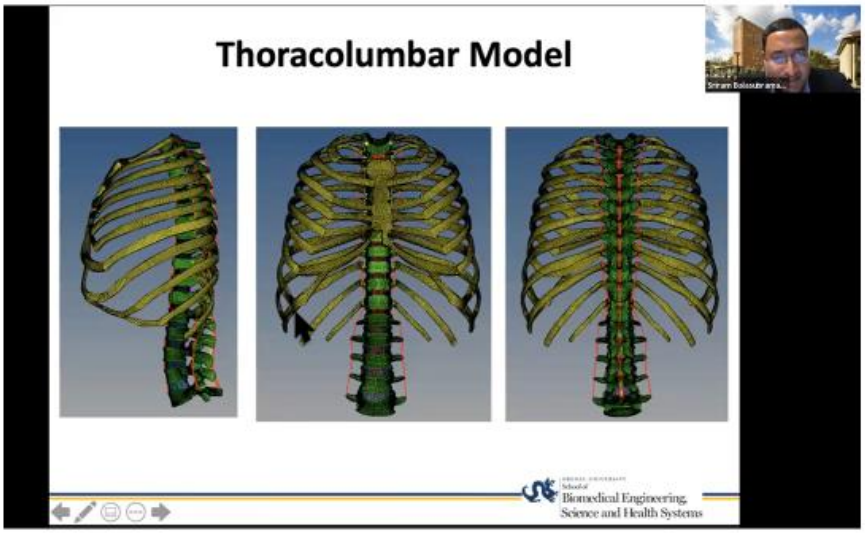
Dr. A. Kavitha, HOD/BME and **Dr. S. Pravin Kumar**, AsP/BME organized a one credit course titled "Pediatric Biomechanics – Deformities, Treatment, Injury Prevention and Computational Modeling" for third year BME students during 16.11.2020 to 26.11.2020. The course was offered by **Dr. Sriram Balasubramniam, Associate Professor, Drexel University, Philadelphia, USA**. It covered both theory and practical components.

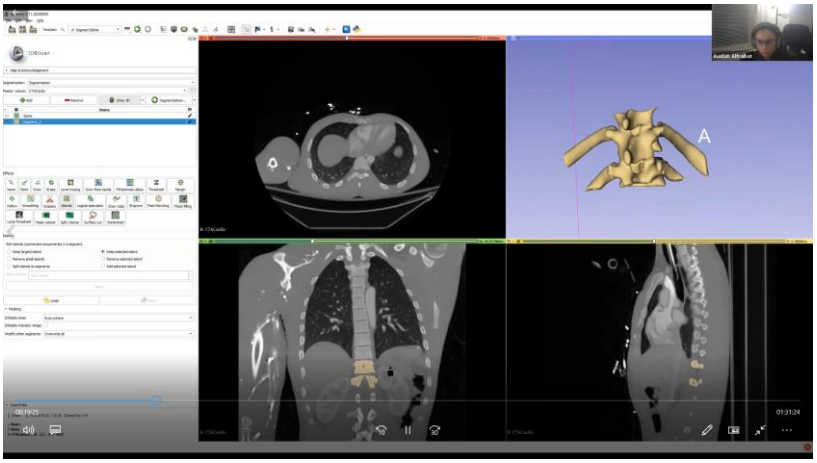
Goals of the Course:

1. Familiarity with bony landmarks, anatomical terminology and structures of the different body regions.
2. Gain knowledge about the etiology, diagnosis and treatment of pediatric spine and rib cage deformities.
3. Understand the paediatric medical device development process, testing and regulatory pathway.
4. An understanding of the paediatric biomechanics of the different body regions, associated injury mechanisms and tolerance.
5. Recognize the significance of various injuries, how to rank order and quantitatively compare their severity, and how to assess overall severity of multiple injuries
6. Identify the biomechanical and legal basis of automotive safety regulations.
7. Describe the different measuring capabilities of various paediatric crash test dummies including Hybrid III and Q-series crash test dummies.
8. Become familiar with computational modeling tools, and understand the steps involved in creating custom models for biomechanics applications

Syllabus Total hours: 15

- Pediatric Injury Biomechanics
- Kelvin-Voight model-based assessment of CPR manikin chest compression – Lab
- Pediatric Orthopedic Biomechanics
- Spine and Rib cage deformities and Treatments,
- Finite Element Modeling of functional spinal unit -Lab





Screen shots of one credit online course

SSN IEEE EMBS Students Chapter organized a inter college quiz event "Bio-Pedia 1.0" on November 30, 2020. The topics for the quiz covered BME gate syllabus. There were 25 participants from various colleges. The event was conducted through Kahoot (Online/Virtual) platform. Faculty Advisor: **Dr. S. Pravin Kumar**, Event Coordinators: Ansar Ahamed S, Varsha Seshadri, Raj Kumar A J, Nanthini N, and Rebecca Maria G

FACULTY VENTURES

Interaction with other organization

Dr. S. Pravin Kumar, AsP/BME has coordinated the Phase 2 of the COVID home care team project in collaboration with Vital Biosystems, Chennai.

Dr. S. Pravin Kumar, AsP/BME has initiated a NDA which is signed on 06.07.2020 with Vital Biosystems and MOU with the same organization will be initiated soon.

Dr. S. Pravin Kumar, AsP/BME has arranged an internship to develop 3D designs for Co2 incubator for Mr. Sandhanakrishnan (IV year) at NexGen-India.

Dr. A. Kavitha, HoD and **Dr. S. Pravin Kumar,** AsP/BME participated in a brainstorming session on the Veterinary Research Project (Data Analytics, AI, IOT, Mobility, Blockchain) on 8th Aug. 3 pm to 5 pm. Dr. Selvarj, Madras Veterinary College, Dr. Balamurugan, R-ERS, HCL Maniappan Rajagopalan, Technology Director, HCL, Upendrasrinivasan Rangasamy, Technical Architect, HCL, Dr. A. Kavitha, HoD/BME SSN and Dr. S. Pravin Kumar, AsP/BME, SSN have participated in the meeting. An MoU was signed between Kornerstone Devices and Sri Sivasubramaniya Nadar College of Engineering on 19.8.2020. This MoU envisages scientific collaboration for joint product development, internships and other corporations of mutual value.

Dr. L. Suganthi, AsP/BME had an online meeting on 7/09/2020 with IITM Healthcare Technology Innovation Centre and Verena Haptic and VR Chennai and discussed the possibilities of pre incubating the collaborative project Immersive VR based Hi-fidelity Digital Rectal Examination setup with Haptics Feedback.

FACULTY VENTURES

Dr. S. Bagyaraj, AsP/BME and **Dr. S. Arun Karthick,** AsP/BME interacted with Mr.M.Karthikeyan, Director, Nissi Engineering Solution Pvt. Ltd., No.14, Shanthi Street, Cholapuram, Ambattur, Chennai - 600053 on 12.10.2020 for collaborative project proposal submission in DST BDTD scheme.

Dr. A. Kavitha, Prof & Head attended a meeting with Prof. Renu John, Dr. Ramkumar of CfHE-IITH and The President and Principal on 27.10.2020.

Ms. M. Dhanalakshmi, AP/BME visited Chettinad Hospital and Research Insititute on 3.11.2020 and 20.11.2020 to initiate MoU with the Hospital. She had discussion with the Medical superintendent regarding MoU procedures, collaboration research and exchange of clinical data.

Dr. L. Suganthi, AsP/BME nominated by Anna University as a member to serve in the board of studies in Department of Biomedical Engineering, Sona College of Technology, Salem on 05/11/2020 for two years.

Dr. L. Suganthi, ASP/BME has attended 4th meeting for BOS - Bio Medical Engineering, conducted by online at Sona College of Technology (Autonomous), Junction Road, Salem – 636005 on 09-12-2020.

Dr. S. Bagyaraj, AsP/BME attended the first DC meeting organised by the Supervisor, Dr. D.Ashok Kumar, Associate Professor, Dept. of Biomedical Engineering, SRM Institute of Technology, for his Research scholar Ms. J. Porkodi

FACULTY VENTURES

Invited talks

Dr. S. Pravin Kumar, AsP/BME and **Dr. B. Geethanjali** AsP/BME delivered a Special Talk webinar on "Medical Signal Analysis" on Jul 29, 2020 11am – 12.40 pm organized by PSNA College of Engineering and Technology

Dr. S. Bagyaraj, Delivered an online session on " fNIRS a promising BCI technique" in the Online FDP on "Machine Learning Techniques for Brain-Computer Interface Applications" organised by the Department of CSE, Karunya Institute of Technology and Sciences, Coimbatore from 30th July to 1st August 2020.

Dr. J. Vijay, AsP/BME has been invited as a resource person to deliver a talk on "Innovative practices in Curriculum design" in AICTE sponsored STTP on "Effective and innovative Teaching, Best practices and learning strategies (ElTBPLS)" held during 17th to 22nd August 2020. The department of Electronics and Communication Engineering, Vellalar College of Engineering, erode organized the STTP.

Dr. S. Bagyaraj, AsP/BME delivered a guest lecture on "Brain Computer Interface and Its applications" for Students of Dept. of Biomedical Engineering, Vel Tech High Tech Dr. Rangarajan Dr.Sakunthala Engineering College, on 18th Sep 2020 in online mode

FACULTY VENTURES

Dr. B. Geethanjali, AsP/BME presented a webinar on "EMISSION TOMOGRAPHY" organized by SMK FOMRA INSTITUTE OF TECHNOLOGY on 19th of September 2020 duration of talk was from 9.30 am to 11.30am and 76 participants attended the webinar

Dr. S. Arun Karthick, AsP/BME presented a webinar on "Scaffolds for Tissue Formation" organized by Dept. of Biomedical Engg., Rajalakshmi Engineering College on 24.9.2020.

Dr. K. Nirmala, AsP/BME delivered a talk on "Retinal Image analysis" in Five days Student development Program organised by the department of Medical Electronics, Velalar College of Engineering and Technology, Erode on 17.10.20

Dr. S. Bagyaraj, AsP/BME **d**elivered an invited talk on "Diagnostic and Therapeutic Equipment" on 21st October, 2020 during the Faculty Development Programme on "FDPOM-77 Biomedical Electronics & IoT in Healthcare" organised by NITTTR, Taramani, Chennai- 600 113.

Dr. L. Suganthi, AsP/BME conducted Microprocessor and microcontroller virtual Lab for III year CSE and IT students of Prince Shri Venkateshwara Padmavathy Engineering College, on 31/10/2020.

Dr. Sachin Sarate, AP/BME was invited for a guest lecture series on Human Anatomy and Physiology from 18/11/2020 to 20/11/2020 at Excel Engineering College (Autonomous), Pallakapalayam Post, Komarapalayam 637303, Tamil Nadu.

Dr. Sachin Sarate, AP/BME Delivered a guest lecture series on "Human Anatomy and Physiology - The Excretory, Digestive and Nervous System" in online mode at the department of BME, Excel Engineering College, Chennai from 18.11.2020 to 30.11.2020.

Dr. Sachin Sarate, AP/BME delivered a guest lecture series on "Anatomy and Human Physiology" online for the III semester students of Department of BME, Excel Engineering College, Komarapalayam from 18.11.2020 to 20.11.2020.

Dr. J. Vijay, ASP/BME, invited as a resource person to deliver a talk in the title "Image Retrieval for Medical Applications" in AICTE sponsored STTP programme "Biosensors, Medical Imaging and Signal Processing Techniques for Disease

FACULTY VENTURES

Diagnosis" on December 14, 2020 organized by the Department of Biomedical Engineering, PSNA College of Engineering and Technology, Dindigul.

Dr. A. Kavitha, HoD/BME gave a talk on "AI in diagnosis of neurodegenerative diseases" at STTP organized by department of information technology, SSNCE, on 18.12.2020.

Dr. S. Pravin Kumar, ASP/BME delivered a guest lecture on "AI for Epilepsy Detection" in the Six days Short Term Training Programme on AI in Healthcare organized by Department of Information Technology, Sri Sivasubramania Nadar College of Engineering, Kalavakkam on 17.12.2020.

Dr. S. Arun KarthicK, ASP/BME delivered a invited talk on "Bioenzyme and Nano-enabled Smart Biosensors" on 11.12.2020 during the Faculty Development Programme on "Intelligent Bio-Sensors" organized by Department of Biomedical Engineering, SRM Institute of Science and Technology, Chennai in association with Biomedical Engineering Society of India (BMESI) from 7-12, Dec 2020.

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FACULTY VENTURES

Faculty Research Activities

Publications

Journal Publications

Nithya Rajagopalan, Venkateswaran Narasimhan, Swetha Kunnavakkam Vinjimoor, Janani Aiyer, “Deep CNN framework for retinal disease diagnosis using optical coherence tomography images”, Journal of Ambient Intelligence and Humanized Computing, Aug 2020

Rajagopal Anitha, **Rajakannu Subashini,** Gomathi Kannayiram, Dasararaju Gayathri, “Chronic Inflammatory-Modulating Potential of Cassia auriculata With Proinflammatory Cytokine IL-1beta and Its Anticancer Effect on Lung Cancer Cell line”, Anti-Cancer Agents in Medicinal Chemistry, volume20, DOI: 10.2174/1871520620666200811111114.

Bulusu, S., **S. Pravin Kumar,** J. G. Švec, and P. Aichinger. "Fitting synthetic to clinical kymographic images for deriving kinematic vocal fold parameters: Application to left-right vibratory phase differences", Biomedical Signal Processing and Control 63: 102253. https://doi.org/10.1016/j.bspc.2020.102253.

Bagyaraj S, Apurva S, Asha R,Sangeetha B and D Vaithiyanathan, “Brainwave classification for divergent hand movements”, Indian Journal of Pure & Applied Physics, Volume 58, No. 10, pp. 765-773.

G. Praveen, S. Om Prakash, Sangeetha B, Asha R, **Suganthi. L, Divya B**, “Wireless Real-Time Electrogastrography Monitoring System”, Journal of Computational and Theoretical Nanoscience, Volume 17, Number 8, August 2020, pp. 3724-3732(9), 2020.

FACULTY VENTURES

S. Varsha, B. Harsha, **S. Pravin Kumar, A. Kavitha**, Shriraam Mahadevan, "Portable refrigeration system for insulin storage", Indian Journal of Endocrinology and Metabolism, 24(5), 473, 2020.

Monica R and **Nirmala K,** "Assessment of Fetal growth from Ultrasound Images using Images Processing Techniques", International journal of Advanced Research in Basic Engineering Sciences and Technology, Vol.6, Issue.8, 2020.

Mahalakshmi Nachiappan, **Vijay Jeyakumar**, T.P.Anand, "Design of compact Implantable Meandered and Sharp Edged Meandered Shaped Antenna for Biomedical Application", European Journal of Molecular & Clinical Medicine, Volume 7, Issue 11, Pages 87-93, 2020.

Conference Publications

Saikiran Subramani, Suhashine Sukumar, Zuber Ahmed, Vishaal Venkat, Sriram.V, **Geethanjali B,** presented a paper titled "Analyzing the Performance of Blood Pressure Parameters Using EMF Method" in International Conference on Trends in Electronics and Informatics (ICOEI 2020-IEEE) held on June 15 – 17, 2020. The conference was conducted via Online Mode.

Dr. R. Subashini, has Participated Virtual conference on "COVID-19 Disease Control- Opportunities and Challenges for Drug discovery And Development; Drug repurposing and Alternative medicine" organized by Centre for Bio – Separation Technology (CBST) at Vellore Institute of Technology (VIT), Vellore, India during 24 th – 25 th July 2020.

Ananya R, Ishaasamyuktha S, Vaishali Harimani, **Mahesh Veezhinathan**, **Geethanjali B,** Bhuvaneshwari Rajendran, presented a paper titled "Processing of EEG signals for the classification of Epilepsy" in IEEE International Conference on Communication and signal processing (ICCSP'20), organized by Aadhiparasakthi Engineering College, between 28.7.2020 and 30.7.2020.

Varsha N K, Ajith K, Aadarsha Nanthakumar, Sandhanakrishnan R, Suhashine Sukumar, **Pravin Kumar S,** Design and Measurement of Articulatory Conditions for Physical Vocal Fold Models, IEEE International Conference on Smart Electronics and Communication, Kongunadu College of Engineering and Technology, Trichirappali, 10-12, September 2020.

FACULTY VENTURES

Akshara Reddy T, Kawya P, Srija S and **Dhanalakshmi M** presented a paper titled "An alternate foot brace for clubfoot correction" in IEEE B-HTC 2020 (2020 IEEE Bangalore Humanitarian Technology Conference) between 8.10.2020 and 10.10.2020.

Sandhanakrishnan R, Rhea Jain, Suhashine Sukumar, Subramanian RP, **Arun Karthick S, Pravin Kumar S** presented a paper entitled Modelling of Human Vocal Folds and Systematic Investigation of their Vibrations from Kymogram in 2020 IEEE REGION 10 CONFERENCE (TENCON), Osaka, Japan during November 16-19, 2020.

S. Varsha, B. Harsha, **S. Pravin Kumar, A. Kavitha**, and Shriraam Mahadevan presented a paper titled "Portable Refrigeration Unit for Insulin Storage" in the Endocrinology week, organized by Endocrine Society of India during 16.11.20 to 22.11.20.

Prasidha Prabhu, **S. Pravin Kumar, A. Kavitha,** and Shriraam Mahadevan presented a paper entitled "Statistical Model Analysis and Prediction of Pima Indians Type 2 Diabetes" in the Endocrinology week, organized by Endocrine Society of India, Kolkata during November 16-22, 2020.

Monica R**, Nirmala K, Vijay Jeyakumar, Divya B** presented a paper entitled "Assessment of Fetal Biometry Using Ultrasound Images", in 2020 IEEE International Conference on Advances and Developments in Electrical and Electronics Engineering (ICADEE 2020), organized by Karpagam college of Engineering during 10-11 December 2020

Ruba M, **Vijay Jeyakumar**, Gurucharan M K, Kousika V, Viveka S, Non-Contact Pulse Rate Measurement using Facial Videos, In Proceedings 2020 IEEE International Conference on Advances and Developments in Electrical and Electronics Engineering (ICADEE 2020), Coimbatore, 2020. pp 180-185.

Suganthi L, Divya B, Nirmala K presented paper titled on Portable Assistive system for Visually Impaired using Raspberry Pi in 2020 IEEE International Conference On Advances And Developments In Electrical And Electronics Engineering (ICADEE 2020) organized by Karpagam College of Engineering, Coimbatore

FACULTY VENTURES

S. Bagyaraj presented a paper titled "Automatic True Vessel Identification by Efficient Removal of False Blood Vessels for Detection of Retinal Diseases" RTU TEQIP-III Sponsored 2nd International Conference on Communication and Intelligent Systems (ICCIS 2020) Jointly Organized in Virtual Format by Global Institute of Technology, Jaipur and Rajasthan Technical University, Kota in association with Birla Institute of Applied Sciences, Uttarakhand and Soft Computing Research Society, December 26-27, 2020

R. Anitha and **R. Subashini** presented a paper titled "Assessment of in vitro biological activities of cassia auriculata aerial plant parts" in the International Conference on Innovations in Biotechnology and Life Sciences 2020 at Delhi Technological University, during 18.12.2020 to 20.12.2020.

Patents

M. Dhanalakshmi, Viswanth, Praveen kumar and Om Prakash filed the complete specification for the invention titled "Composite blades for lower extremity amputees" in Indian Patent Office with application number 201941031300.

Preethi Kurian, **Vijay Jeyakumar**, Unsupervised Multimodality Medical Image Retrieval System, (Patent Application No: 202041043275 filed on 05.10.2020) was published online on 19 September 2020.

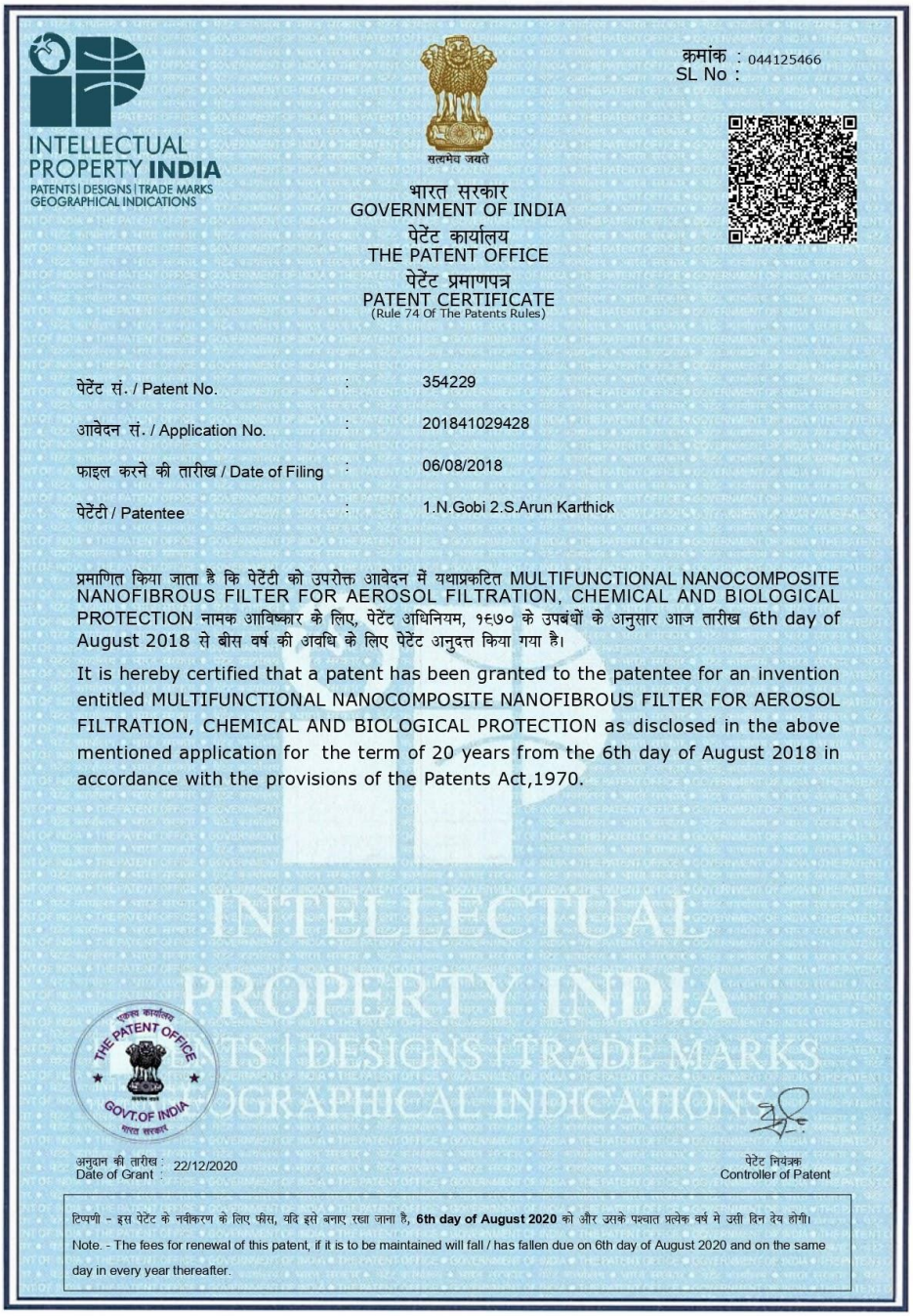
S. Subashini, S N Jaya Sree, **Vijay Jeyakumar, Nirmala K,** Smart Phone enabled Dermatoscope for Automated Skin Lesion Classification using Convolutional Neural Network (Patent Application No: 202041043279, 05.10.2020) was published online on 19 September 2020.

A patent filed by **Arun Karthick S** while being a PhD scholar along with his supervisor N. Gobi at Anna University, has been granted “Multifunctional nanocomposite nanofibrous filter for aerosol filtration, chemical and biological protection”, Application No: 201841029428.

A patent filed by **Arun Karthick S** while being a Post-Doc at IIT-M, has been granted “An enhanced carbon dioxide sorbent nanofibre membrane and a device thereof”, Application No: 201841031076.

FACULTY VENTURES

A patent filed by **Arun Karthick S** while being a Post-Doc at IIT-M, has been granted “Multilayer multifunctional nasal filter” Application No: 201741007433.



INTELLECTUAL PROPERTY INDIA
PATENTS | DESIGNS | TRADE MARKS
GEOGRAPHICAL INDICATIONS

सत्यमेव जयते

क्रमांक : 044125466
SL No :

भारत सरकार
GOVERNMENT OF INDIA
पेटेंट कार्यालय
THE PATENT OFFICE
पेटेंट प्रमाणपत्र
PATENT CERTIFICATE
(Rule 74 Of The Patents Rules)

पेटेंट सं. / Patent No.	:	354229
आवेदन सं. / Application No.	:	201841029428
फाइल करने की तारीख / Date of Filing	:	06/08/2018
पेटेंटी / Patentee	:	1.N.Gobi 2.S.Arun Karthick

प्रमाणित किया जाता है कि पेटेंटी को उपरोक्त आवेदन में यथाप्रकटित MULTIFUNCTIONAL NANOCOMPOSITE NANOFIBROUS FILTER FOR AEROSOL FILTRATION, CHEMICAL AND BIOLOGICAL PROTECTION नामक आविष्कार के लिए, पेटेंट अधिनियम, १९७० के उपबंधों के अनुसार आज तारीख 6th day of August 2018 से बीस वर्ष की अवधि के लिए पेटेंट अनुदत्त किया गया है।

It is hereby certified that a patent has been granted to the patentee for an invention entitled MULTIFUNCTIONAL NANOCOMPOSITE NANOFIBROUS FILTER FOR AEROSOL FILTRATION, CHEMICAL AND BIOLOGICAL PROTECTION as disclosed in the above mentioned application for the term of 20 years from the 6th day of August 2018 in accordance with the provisions of the Patents Act,1970.

पेटेंट कार्यालय THE PATENT OFFICE GOVT.OF INDIA भारत सरकार

अनुदान की तारीख : 22/12/2020
Date of Grant :

पेटेंट नियंत्रक
Controller of Patent

टिप्पणी - इस पेटेंट के नवीकरण के लिए फीस, यदि इसे बनाए रखा जाना है, **6th day of August 2020** को और उसके पश्चात प्रत्येक वर्ष मे उसी दिन देय होगी।
Note. - The fees for renewal of this patent, if it is to be maintained will fall / has fallen due on 6th day of August 2020 and on the same day in every year thereafter.

FACULTY VENTURES

Book Chapter Publications

Balu S., **Jeyakumar V.** (2021) A Study on Feature Extraction and Classification for Tongue Disease Diagnosis. In: Peter J., Fernandes S., Alavi A. (eds) Intelligence in Big Data Technologies-Beyond the Hype. Advances in Intelligent Systems and Computing, vol 1167. Springer, Singapore. https://doi.org/10.1007/978-981-15-5285-4_34.

Dinesh Bhatia, **S. Bagyaraj, S. Arun Karthick**, Animesh Mishra, Amit Malviya, Vincenzo Piuri, Sandeep Raj, Angelo Genovese, Rajshree Srivastava, Role of the Internet of Things and deep learning for the growth of healthcare technology, Academic Press - An Imprint of ElSEVIER, 113-127, 10.1016/B978-0-12-822226-3.00005-2, 11/16/2020.

Projects Applied for External Funding

Dr. A. Kavitha and **Dr. S. Pravin Kumar** have submitted India - Portugal proposal on "Learning Online based on Human Computer Interaction and Biosignals - LeBIOS", with Prof Hugo Gamboa and his team from Universidade NOVA de Lisboa, Portugal. The proposal is being submitted to the International Cooperation (Bilateral) Division under CALL FOR INDIA PORTUGAL JOINT PROPOSAL Scheme.

Dr. B. Geethanjani and **Dr. V. Mahesh**, submitted faculty Internal Project Proposal titled “Analyzing the effectiveness of biofeedback techniques using cardiovascular parameters”.

Dr. R. Sundareswaran (Maths) and **Dr. V. Mahesh,** submitted faculty Internal Project Proposal titled “Analysing Diabetic Neuropathy - A Graph theoretic Approach”.

Dr. S. Bagyaraj, Dr. S. Arun karthick, and **Dr. Sachin GS** submitted a proposal on title "Design and development of 16 channel functional Near Infrared Spectroscopy system for measuring hemodynamics in Brain: Prefrontal Cortex" under DST scheme BDTD, Temporary Registration Number: TPN / 57274 0n 16.10.2020. Budget Amount is Rs.24,68,400/- for a duration of 2 years with Industry Partner: Nissi Engineering Solution Pvt. Ltd., No.14, Shanthi Street, Cholapuram, Ambattur, Chennai - 600053

FACULTY VENTURES

Dr. A. Kavitha, **Dr. S. Pravin Kumar** and **Ms. Divya** presented their proposal titled "Virtual Reality for Neurodegenerative Disorders" to the committee members on Aug 19th submitted under DST-TIDE scheme.

Dr. S. Bagyaraj, Dr. S. Arun karthick, and **Dr. Sachin GS**, presented the shortlisted project proposal titled "Design and development of 16 channel functional Near Infrared Spectroscopy system for measuring hemodynamics in Brain: Prefrontal Cortex [TPN/57274] to the Expert Advisory Group (EAG) on Biomedical Device and Technology Development (BDTD)-DST on 14th December 2020 (Monday) on a virtual platform.

Dr. J. Vijay, ASP/BME BME submitted a proposal. Title: An Integrated framework to aid Non-Contact Measurement of Vital parameters for Mass Infection Screening" Submitted to AICTE – RPS (AQIS). Budget: Rs. 2478737.00 Investigators: Vijay Jeyakumar (PI), Nirmala K (Co-PI), Sachin G Sarate (Co-PI)

Online Course

Dr. R. Subashini, AP/BME completed the following course in coursera. Science of Exercise, 5 weeks course authorized by university of Colorado Boulder.

Dr.B.Geethanjali, AsP/BME completed an online course on Data Science in Real Life this course was conducted by John Hopkins University through Coursera online learning platform

Dr.B.Geethanjali, AsP/BME completed an online course on Fundamental Neuroscience for Neuroimaging this course was conducted by John Hopkins University through Coursera online learning platform

FACULTY VENTURES

Dr.V.Mahesh, AsP/BME completed an online course on Fundamental Neuroscience for Neuroimaging this course was conducted by John Hopkins University through Coursera online learning platform on 9th July, 2020

Dr.V.Mahesh AsP/BME completed an online course on Data Science in Real Life this course was conducted by John Hopkins University through Coursera online learning platform. 18thJuly, 2020

Dr.V.Mahesh, AsP/BME completed an online course on Deep Learning, conducted by Great Lakes Executive Learning, online learning platform

Dr.R.Subashini, AP/BME completed the following course in coursera. Biochemical Principles of Energy metabolism, 8 weeks course authorized by Korea advanced Institute of Science and Technology (KAIST)

Dr. R. Subashini, AP/BME completed the online course in coursera, Titled: Bacteria and chronic infections, 7 weeks course authorized by university of Copenhagen on 15th August 2020 with a grade of 100%.

Dr. K. Nirmala, AsP/BME has completed a three weeks online course in coursera on the title "Internet on Things: Multimedia Technologies" conducted by University of California San Diego on 8 th August 2020 with grade of 100%

FACULTY VENTURES

Dr. S. Pravin Kumar, AsP/BME Completed the certification course on "Exploratory Data Analysis with MATLAB" conducted by MathWorks on Coursera, which is a part of the Practical DataScience with MATLAB Specialization.

Dr. S. Pravin Kumar, AsP/BME has completed a certification course on "Medical Technology and evaluation" offered by University of Minnesota with a Grade of 100% on Coursera.

Dr. S. Pravin Kumar, AsP/BME has completed a Short-Term Course on "New European Medical Device Regulation EU MDR 2017/745" organized by Monir El Azzouzi, Easy Medical Device, Switzerland during 18.07.2020 to 24.07.2020.

Dr. S. Pravin Kumar, AsP/BME Completed the certification course on "Data Processing and Feature Engineering with MATLAB" offered by MathWorks on Coursera, which is a part of the Practical Data Science with MATLAB Specialization.

Dr. S. Pravinkumar, AsP/BME completed an online course on "Data Science in Real Life" conducted by John Hopkins University on Coursera.

Dr.A.Kavitha, HoD/BME completed an online course on "Neural networks and Deep learning " authorized by Deeplearning ai and offered through coursera

FACULTY VENTURES

RESEARCH SCHOLARS ACTIVITY

Mrs. M. Dhanalakshmi (Reg.No.1322499712) attended synopsis approval meeting on 30.7.2020. She gave a presentation on the title "An assessment and intelligibility modification for dysarthric speakers" before the Doctoral committee members through online mode. Dr. K. Malathy, Prof, Dept. of ECE, Anna Univeristy, Prof. S. Palanivel, HoD, Dept of Computer science and engineering, Annamalai university and Dr. P. Vijayalakshmi. P Prof, Dept of ECE, SSNCE was present during the meeting.

Dr. A. Kavitha, Prof & Head conducted the provisional registration confirmation meeting for her Part-time research scholar Ms. B. Divya, Assistant Professor at BME with DC members Prof. Najumnissa Jamal from BS Abdur Rahman Crescent Engineering College and Dr. Kayalvizhi from Agni Institute of Technology on 14th August, 2020.

Dr. Vijay J, AsP/BME conducted a Doctoral committee meeting for his research scholar Ms.Subha B (Part-time) through Google Meet to confirm her Ph.D registration with the members on August 14, 2020.

Dr. R. Subashini AP/BME conducted Synopsis approval meeting for full time research scholar Mrs. R. Anitha (Reg. No. 1623599128) through zoom online platform on 19.8.2020 with DC members D. P. Senthilkumar, Associate Prof, SSNCE and Dr. K. Gomathi, Associate Prof, Dr. MGR Educational and Research Institute, Maduravoyal, Chennai.

Mrs. R. Nithya (Reg. No.1425499172) attended synopsis approval meeting on 11.9.2020. She gave a presentation on the title "Development of Decision Support System for Detection of Retinal Disorders" before the Doctoral committee members through online mode. Dr. A. Kavitha, Prof, Dept. of BME, SSN college of Engineering, Dr. S. Shenbagadevi, Prof, Dept of ECE, Anna University, Chennai, and Dr. N. Venkateswaran (Supervisor) Prof, Dept. of ECE, SSN college of Engineering, were present during the meeting.

FACULTY VENTURES

Dr. L. Suganthi conducted the Doctoral Committee meeting for her Research scholar Ms. R. Anandha Praba, (Reg.No.18244991371, Part-time) on October 7th, 2020 (Wednesday) at 11:00 AM.

Dr. L. Suganthi conducted the Doctoral Committee meeting for her Research scholar Ms. E. S. Selva Priya, (Reg. No. 18244997199, Full-time) on October 7th, 2020 at 3:00 PM.

The Part time scholar Ms. S. Vidhusha (Reg. No. 1325499708), guided by **Dr. A. Kavitha**, Prof and Head, Dept. of BME, defended her Ph.D. thesis titled, "Characterisation and Classification of High functioning and low functioning autism using fMRI and deep belief networks", on 14.12.2020 and fulfilled the requirements of Ph.D. awarded by School of information and communication, Anna University, Chennai.

Dr. A. Kavitha, HoD/BME conducted confirmation DC meeting for her research scholar Mrs. S. Sathya Bharathy (Part-time Anna University scholar) on 12.12.2020 through online mode.

STUDENT PURSUITS

External Recognition Co-curricular

Srinidhi II year BME participated in Youth Talent Icon (virtual talent competition) on 6th July. The results are yet to be announced.

Raghupathy J II year BME participated in HCL IITK hackathon on Cyber security Programming on 25th July. He performed till qualifier round.

R.Sowmya II year BME participated in Basic English and science online quiz, by Rani Anna Government College for Women, Tirunelveli 2nd July.

N.V. Saravanan II year participated Quiz – on Life of Gandhi, Organized by NSS Cell of TKM college of Engineering 27th July.

K. Chandramouli II year BME completed a Course on Career Edge – Knockdown the lockdown by TCS iON 14th July.

Indhumathy R II year BME participated in Quiz – on Life of Gandhi, Organized by NSS Cell of TKM college of Engineering 28th July.

Siva adhithya II year BME participated in a competition The Data Scientist's Toolbox by John Hopkins on 28th July.

S. Sidtharth II year BME completed a course in Coursera - Biology Meets Programming: Bioinformatics for Beginners – UC Sandiego 12th July.

Janani II year BME participated in Writer's block by Picartzo 20th July.

Siva Adhitya II year BME participated in AI For Everyone by Deeplearning AI 26th July.

Suhashine IV year Paper Presented in ICOEI 2020 on 15th June got published in IEEE Explore 19th July.

Akshara reddy T IV BME year presented a paper at ICESCS Conference 3rd July.

Kawya P IV year BME presented a paper at ICESCS Conference 3rd July.

Srija S IV year BME presented a paper at ICESCS Conference 3rd July.

STUDENT PURSUITS

Oviya MS III year BME participated in quiz competition regarding Electronics in 27 July.

Oviya MS III year BME participated in the international webinar on Data science from Credo system on 25th July.

Sowmya EC I year PG participated in International virtual seminar on 'Indoor Air Quality Maintenance and Improvement for Cleanrooms in Hospitals and Laboratories' KPR institute of Engineering and technology 11 July.

Sowmya EC I year PG attended a webinar on Basics of Simulink by Mathworks 23 July.

Jeslin Libisha I year PG participated in International Virtual Conference on "Biomedical Engineering and Medical Imaging Systems" Virtual Conference at Dr. NGP IT 6,7 July.

Jeslin Libisha I year PG participated in International Virtual Seminar on "Indoor Air Quality Maintenance and Improvement for Cleanrooms in Hospital and Laboratories" KPRIET 11 July.

Jeslin Libisha I year PG participated in VLSI Physical Design using Cadence Innovus Tool (Short term course) organised by St. Joseph's College of Eng., 20-24 July.

Jeslin Libisha I year PG participated in VLSI in Research and industrial view point (3 days) SRMIST 16-18 July.

Jeslin Libisha I year PG participated in Introduction to Simulink for System Modeling and Simulation MATHWORKS Webinar 22 July.

Jeslin Libisha I year PG completed course in Introduction to Data Science in Python in Coursera.

Jeslin Libisha I year PG completed course in COVID19 Data Analysis Using Python in Coursera guided project.

STUDENT PURSUITS

Isa Bashir Salisu I year PG attended Webinar on "Handling, Management and Recyling of Biomedical Waste" VIGINANA BHARATHI Institute of Technology 4th July.

Isa Bashir Salisu I year PG attended BIOMEDICAL SCIENCE: Become a Diagnostic Imaging Professional in USA U. V. Patel College of Engineering - Ganpat University 4th July.

Isa Bashir Salisu I year PG attended International virtual seminar on "Indoor Air Quality Maintenance and Improvement for Cleanrooms in Hospitals and Laboratories" KPR institute of Engineering and technology 11th July.

Isa Bashir Salisu I year PG attended Webinar on "PROCESS SAFETY MANAGEMENT" Francis Xavier Engineering College 12th July.

Ananya R, Ishaasamyuktha S, Vaishali Harimani of IV year BME has presented a paper in IEEE sponsored 9th International Conference on Communication and Signal Processing (ICCSP'20) (Online) on 28th-30th July 2020, conducted by Adhi Parasakthi college, Melmaruvathur.

Ansar Ahamed IV year BME along with SSN IEEE EMBS, organized, conducted and participated in a IEEE webinar on 3D Designing dated August 27 2020.

Bhavadharani T, IV year BME completed a course in Coursera : Exploratory Data Analysis with MATLAB- Mathworks on August 15,2020.

Bhavadharani T, IV year BME completed a course in Coursera : Neural Networks and Deep Learning-deeplearning.ai on August 21,2020.

Bhavadharani T, IV year BME completed a course in Coursera : Data Processing and Feature Engineering with MATLAB- Mathworks on August 26,2020.

Bhavadharani T, IV year BME completed a course in Coursera : Structuring Machine learning Projects - deeplearning.ai on August 06,2020.

Janaki R IV year BME completed a course in Coursera 'Programming for Everybody' - University of Michigan 30th June 2020.

STUDENT PURSUITS

Janaki R, IV year BME completed a course in Coursera 'Python Data Structures' - University of Michigan 31st July 2020.

Janaki R, IV year BME completed a course in Coursera 'Exploratory Data Analysis with MATLAB' - Mathworks 18th August 2020.

Janaki R, IV year BME completed a course in Coursera 'Neural Networks and Deep Learning' - deeplearning.ai 24th August 2020.

Janaki R, IV year BME completed a course in Coursera 'Data Processing and Feature Engineering with MATLAB' - Mathworks 26 August 2020.

Divya Rajesh Kannan III year BME has completed a course in coursera called "Introduction to Genomic Technologies" on August 04, 2020.

Aishwarya II Year BME, Winner of NSS Day Quiz 2020 – by NSS SSN - 21/8/20 - online – Chennai.

Chandramouli K II Year BME participated in Quiz organised by Ministry of Defence on 10 Aug.

Chandramouli K II Year BME, participated in Quiz by Kongu Arts and Science College on 19 Aug.

Keerthi Vembu NVP of II year M.E., Medical Electronics, received a participation certificate from St. Joseph's College of Engineering, OMR Chennai, event named: International webinar on Radiation in medicine on 7th August,2020.

Keerthi Vembu NVP, JESLIN LIBISHA J & Sowmiya E.C of II year M.E. Medical Electronics Participated in webinar series on "Innovation startup and Entrepreneurship in Biomedical Engineering" conducted by Sathyabama Institute of Science and Technology, Chennai during 10.8.2020-14.8.2020.

Keerthi Vembu NVP, Muthueeswaran U, Ragavi & Isa Bashir Salisu of II year M.E. Medical Electronics Participated in one day online workshop on "Wireless Body Area Network" organised by Pantech Solution on 19/08/2020.

STUDENT PURSUITS

Sowmiya E.C, Isa Bashir Salisu & JESLIN LIBISHA J of II year M.E. Medical Electronics Attended webinar on "Opportunities and challenges in Artificial Intelligence" organized by IEEE- Product Engineering safety society on 4.8.2020.

Sowmiya E.C of II year M.E. Medical Electronics Attended webinar on "Framework for Automatic Assessment and Evaluation of Matlab Assignments and Examination using MATLAB grader" conducted by Mathworks and team on 17.8.2020.

Jeslin Libisha J of II year M.E. Medical Electronics Attended MatLab webinar on "Improve ASIC and FPGA Verification Productivity by Connecting to MATLAB and Simulink" conducted by the Mathworks team on 13/8/2020.

Bhavadharani T IV year BME completed a course in Coursera : Introduction to the Internet of Things and Embedded Systems- University of California, on September 28,2020.

Chetana Krishnan III year BME, **won best presentation and paper award** in ICIES conference conducted on 19th and 20 September 2020.

S. Sankamitra III year BME completed a course in Coursera - INTRODUCTORY HUMAN PHYSIOLOGY-19-09-2020.

Shivangi Pandey II Year BME, Winner of International Microorganisms Day Quiz 2020 – By Kumararani Meena Muthiah College of Arts and Science - 17/9/20 - online – Chennai.

Sowmiya EC, Keerthi Vembu NVP, Ragavi TK & Jeslin Libisha J II year M.E. Medical Electronics attended webinar series on "Biomedical Engineering concepts" organized by Bee Biomed on every sunday from 31st August till 27th September.

Sowmiya EC, Keerthi Vembu NVP & Jeslin Libisha J II year M.E. Medical Electronics attended webinar on "Demo on Medtronic prime module ventilator" conducted by Medtronics on 22 September.

Jeslin Libisha J, Ragavi TK & Keerthi Vembu NVP II year M.E. Medical Electronics attended one day online workshop on "Exploring virtual Reality: A Hands-on workshop for beginners " on 19 September.

STUDENT PURSUITS

Aishwarya V II Year BME participated in CryptoKnight Quiz - conducted by VIT PALS, Chennai on 24 Sep.

Aarya Raghavan, Shivangi Pandey & Aishwarya V II Year BME participated in Kryptos Quiz - conducted by SSN Tech club - 15/10/20 -online – Chennai.

Padmavati S completed a course in Coursera - Programming Fundamentals (Duke University) - Date of completion: 18/10/2020.

Prasidha Prabhu III year BME completed a course in Coursera - Business Metrics for Data Driven Companies (Duke University) - Date of completion: 12/10/2020.

Rebecca Maria III year BME completed a course titled " Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization" on coursera - 25.11.2020.

Rebecca Maria III year completed a course "Neural networks and deep learning" on coursera - 13.11.2020.

Chetana Krishnan III Year BME has actively participated and presented a virtual presentation entitled “Acquisition of Electrospirogram” and won the BEST PRESENTATION AWARD in the Virtual International Conference on Advancements in Nanotechnology (VICAN) held on 01-11-2020 organized by Association of Global Academicians and Researchers (AGAR) and Association of Indian Biologists (AIB), Tamil Nadu, INDIA.

Chetana Krishnan III Year BME won Best innovator award for exemplary presentation entitled "Acquisition of Electrospirogram" in the Virtual International Conference on Advancements in Nanotechnology (VICAN) held on 01-11-2020.

Prasidha Prabhu III year BME has participated and presented a paper on the topic ‘Statistical Model Analysis and Prediction of Pima Indians Type-2 Diabetes’ in the Endocrine 2020 National Conclave on November 18, 2020.

Varsha S and Harsha B III year BME presented an paper on the topic titled “Portable cooling system for insulin storage” under the guidance of Dr. A. Kavitha,

STUDENT PURSUITS

Dr. S. Pravin Kumar and Dr.Shriram Mahadevan. The abstract was published under the journal “Indian journal of Endocrinology and Metabolism” 24(5), 2020.

V. Sasya III YEAR BME published a paper titled "Prediction of Indian GDP using grey forecast model " in the International journal of innovative technology and exploring engineering (IJITEE) (Volume 10 issue 2 December 2020) under the guidance of Dr.S.Sophia and Dr. B.Prabha, Department of mathematics.

Mercy A, III year BME completed a course titled "Big data and language 1" in Coursera.

Priyamdhrshini M, III year BME completed a course titled "Biohacking you brains health" in Coursera.

Priyamvardhini M, III year, completed a course titled " Fundamental neuroscience for neuro imaging " in Coursera.

Raghavi L, III year BME completed a course titled "Programming for everybody (Getting started with python)" in Coursera.

STUDENT PURSUITS

External Recognition- Extra curricular activities

Saravanan, Arushi Sahu, Indhumathy R II year BME participated in National level online world population day awareness by The New College 14th July.

Oviya MS III year Participated as a writer in Eternal quest.

Oviya MS III year Participated in let's talk let's connect to host a session in 10th July.

Varsha Seshadri III year BME - **won first prize in eastern duals (dance)** in "Esperanza" - an intercollegiate online event organised by Kuruksastra on 1 Sep.

Aishwarya II Year BME, **Winner (1 st Place)** – Tamil Poetry Competition by Yuva Shakthi Youth Welfare Association (Chennai) on 15.8.20.

Varsha Seshadri III year BME - **winner in classical dance** in "E-magnum annual fest" organised by egytim academy on 12-13 Sep.

Aishwarya V, Hevanthika M & Monica V II Year BME participated in Guess Who NSS day event - conducted by SSN NSS- 10/10/20 -online – Chennai.

Aishwarya V II Year BME took part in the Remote revolution Dance series organised by Kaladiksha school of Bharathanatyam, Chennai on Oct -online.

Aishwarya V II Year BME took part in the Online classical Dance competition - Natananjili - Oct 5th -online – Chennai

Aarya Raghavan II Year BME, **won 1st place YRC SINGING EVENT** -SSN YRC - 04/10/20-Chennai.

Sri Sivasubramaniya Nadar College of Engineering
Kalavakkam - 603 110
(An Autonomous Institution, Affiliated to Anna University, Chennai)

Certificate of Participation

This is to certify that

Mr./Ms. AARYA RAGHAVAN
(Reg. No : 193003002)
of
II Year / Biomedical Engineering
Sri Sivasubramaniya Nadar College of Engineering
has won FIRST PRIZE in the "Singing" competition
organized by the Youth Red Cross (YRC) unit,
Sri Sivasubramaniya Nadar College of Engineering, Chennai
on October 04, 2020.

Dr. V. Thiyagarajan
Coordinator

Dr. Joseph Gladwin
YRC Programme Coordinator

Dr. V. E. Annamalai
Principal

Janani II Year BME participated in Webinar on blood donation awareness - blood connect - on 10/10/2020, Chennai.

Aarya Raghavan II year BME received “Honorable Mention award” for “Fighting against injustice towards harmony” in Online model United Nations on 21-22 Nov 2020, conducted by IGN MUN.

Varsha sesadhri III year participated in the event "Dance Off" Organised by Ignite Tamilnadu NG on 13 Nov 2020. She won Second place.

Raghupathy J II year BME participated in Nikon Photo Contest on 23 Dec 2020 – Online

Raghupathy J II year BME participated in Thinnai Talkies x Her and Now - SPI Edge on 06 Dec 2020 – Online

Aishwarya V, II year BME took part in the All India online Bharathanatyam competition - ITT Nrityanjali – 11 Dec 2020 – online.

Aishwarya V, II year BME Participated & performed in Abhinaya utsav 2020 - classical dance event - conducted by Thanjavur dhrsyakavya koodam on 20 Dec 2020 -online

STUDENT PURSUITS

Academic achievements

Jeslin Libisha I year PG completed course in Emotion AI: Facial Key-points Detection in courser guided project.

Sowmya EC I year PG completed course in The Data Scientists Toolbox in Courser.

JOHNS HOPKINS UNIVERSITY

COURSE CERTIFICATE

06/24/2020

SOWMIYA EC

has successfully completed

The Data Scientist's Toolbox

an online non-credit course authorized by Johns Hopkins University and offered through Coursera

Jeff Leek, PhD; Roger Peng, PhD; Brian Caffo, PhD
Department of Biostatistics
Johns Hopkins Bloomberg School of Public Health

Verify at coursera.org/verify/NDD7XZW8DGZQ

Coursera has confirmed the identity of this individual and their participation in the course.

Some online courses may draw on material from courses taught on campus but are not equivalent to on-campus courses. This certificate does not affirm that this learner was enrolled as a student at Johns Hopkins University in any way. It does not confer a JHU grade, course credit or degree; establish any relationship between this learner and JHU or other JHU affiliate; enroll or register this learner at JHU or other JHU affiliate or in any course offered by JHU; or entitle this learner to access or use the resources of JHU or other JHU affiliates beyond the online courses provided by Coursera.

Sowmya EC I year PG completed course in Build a Deep Learning Image Classifier with R.

coursera Project Network

COURSE CERTIFICATE

07/06/2020

SOWMIYA EC

has successfully completed

Build a Deep Learning Based Image Classifier with R

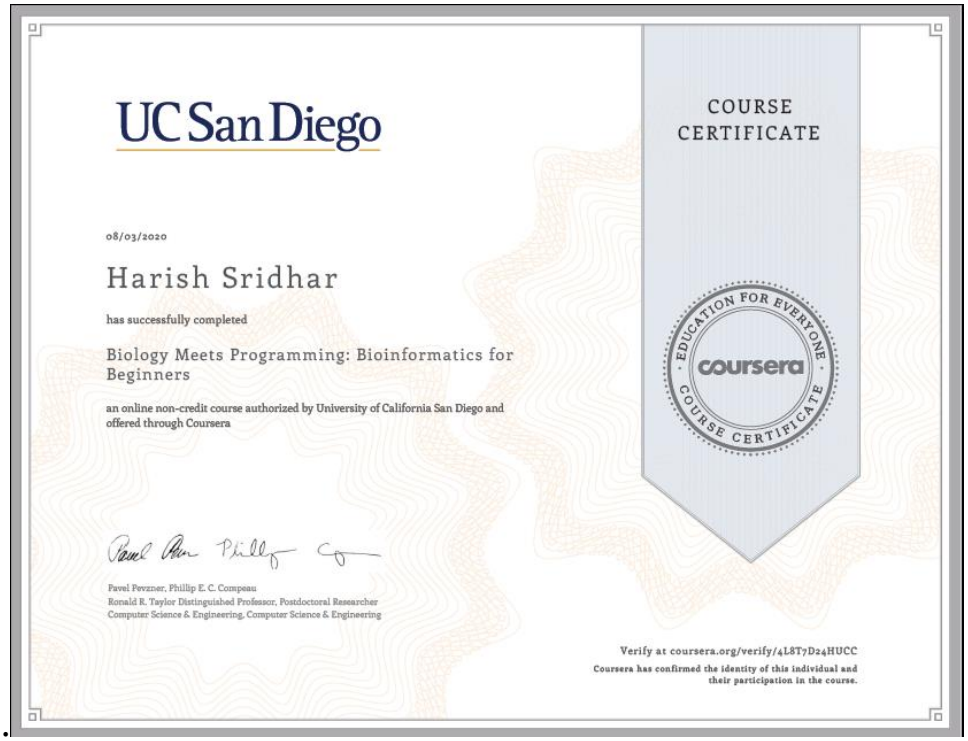
an online non-credit course authorized by Coursera Project Network and offered through Coursera

Snehan Kekre
Instructor
Machine Learning and Data Science

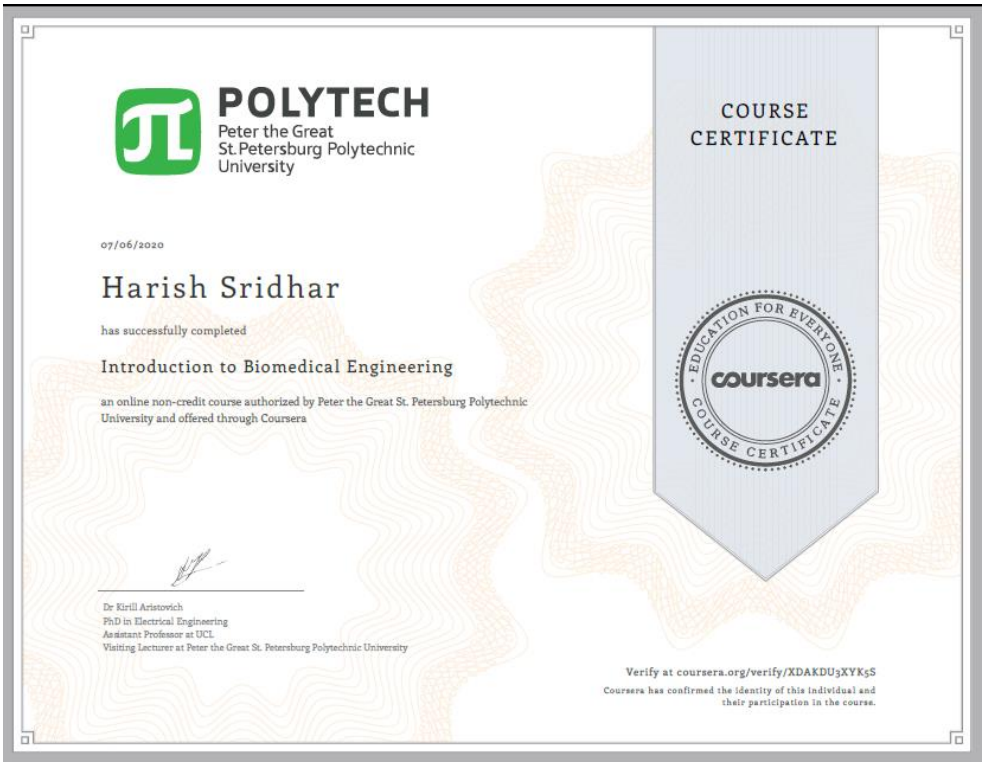
Verify at coursera.org/verify/QT3C4E4XHF7L

Coursera has confirmed the identity of this individual and their participation in the course.

Harish Sridhar II Year BME, Completed Coursera Course on - Biology Meets Programming: Bioinformatics for Beginners by University of California, San diego

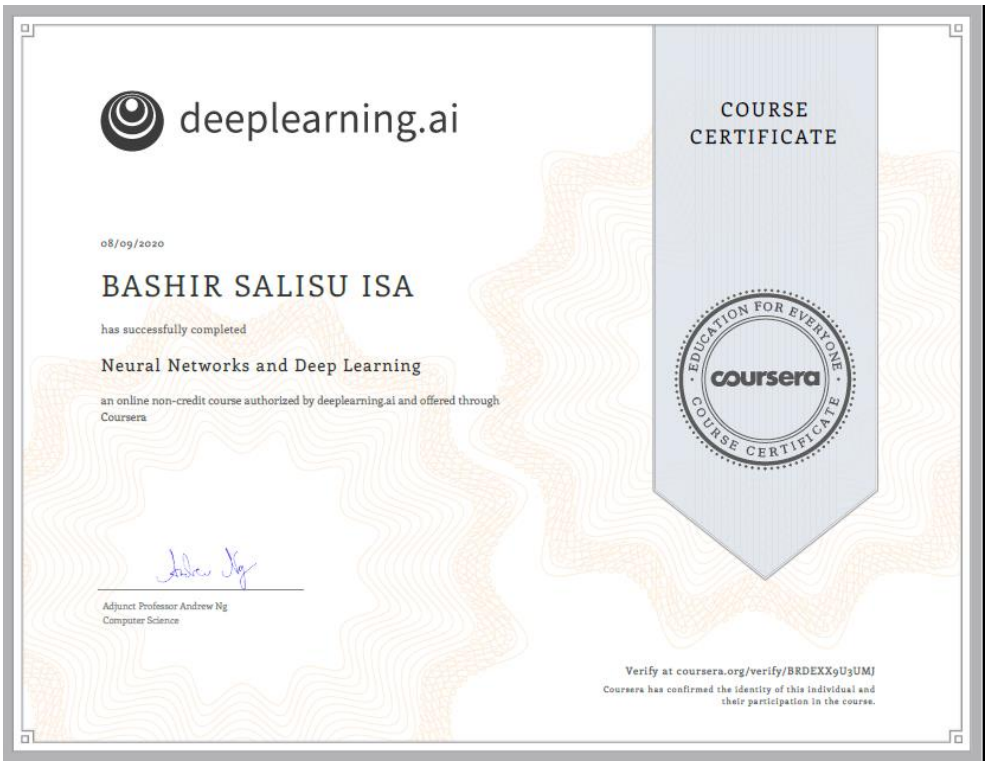


Harish Sridhar II Year BME, Completed Coursera Course on Introduction to Biomedical Engineering.

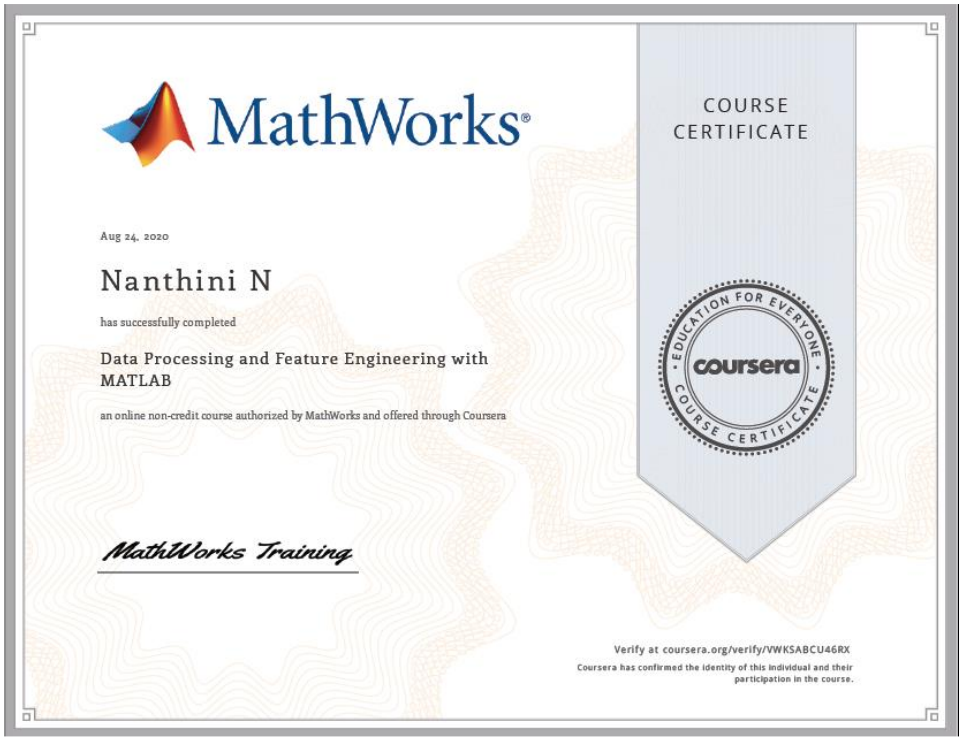


Siva Adhitya II year Couresra: Cameras, Exposure, and Photography by Michigan State University.

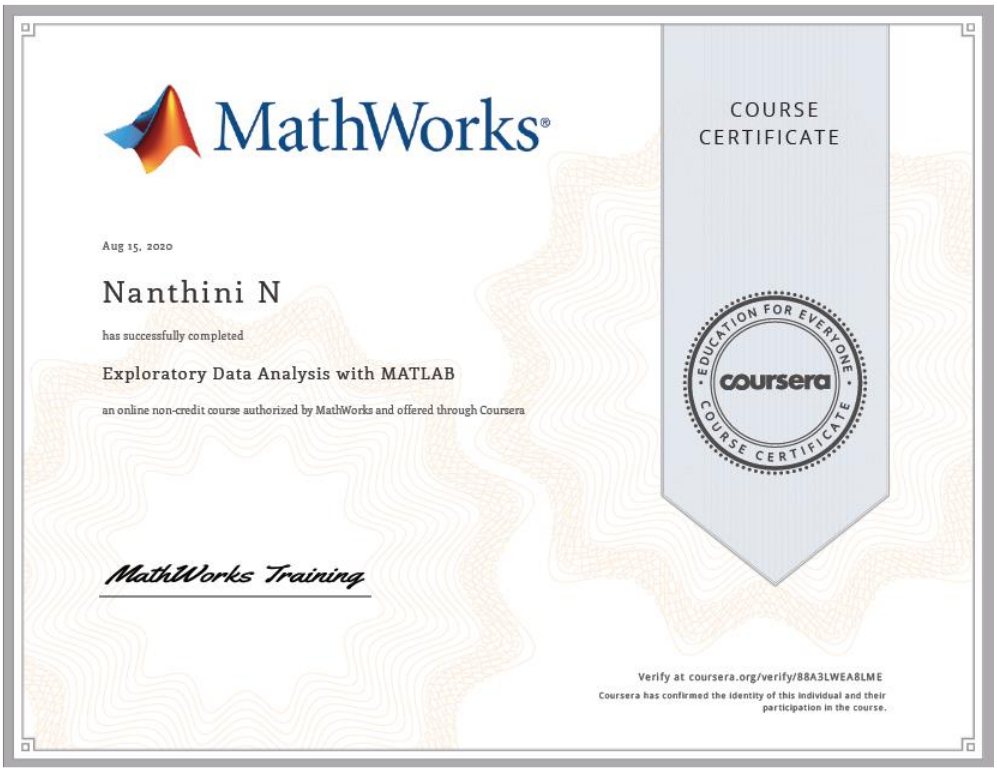
ISA BASHIR SALISU II year PG Medical Electronics Completed a course in Coursera - Neural Network and Deep Learning: Deep learning.



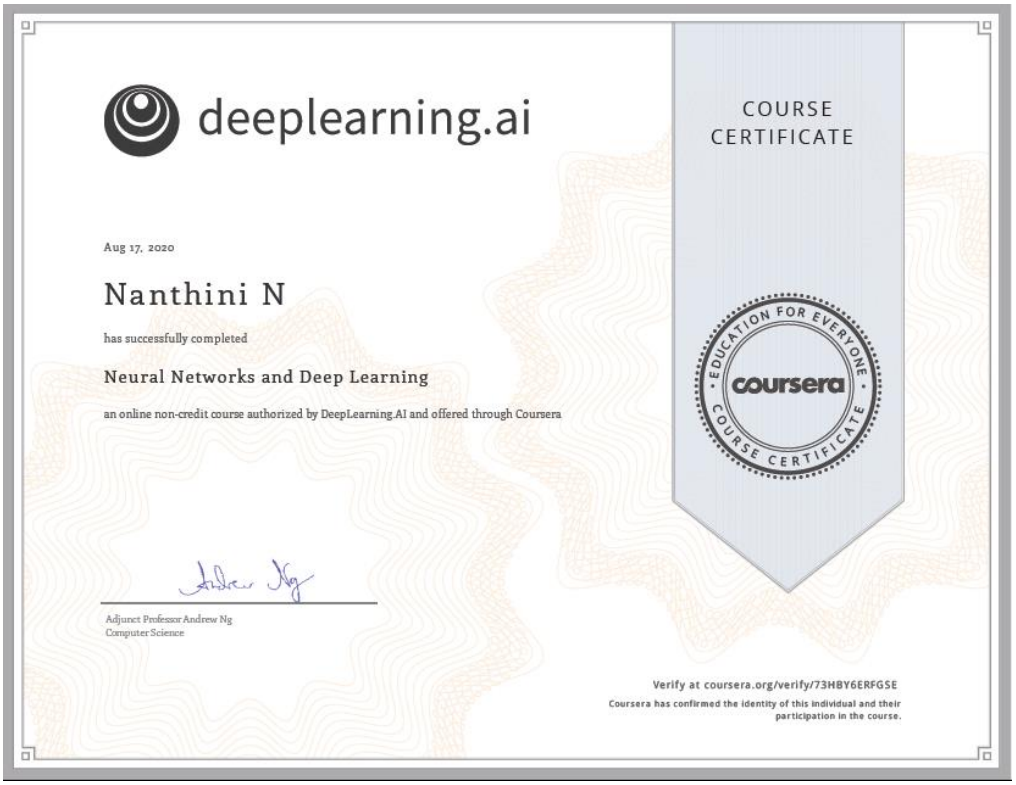
Nanthini N IV year BME completed a course in Coursera: Data Processing and Feature Engineering with MATLAB- Mathworks



Nanthini N IV year BME completed a course in Coursera: Exploratory Data Analysis with MATLAB- Mathworks



Nanthini N IV year BME completed a course in Coursera: Neural Networks and Deep Learning-deeplearning.ai



Nanthini N IV year BME completed a course in Coursera: Introduction to Psychology- Yale University

THINK PIECE

3D BIOPRINTING

The mind boggling ever-evolving trend

3D Bioprinting and its advances is an arena which has always fascinated me.

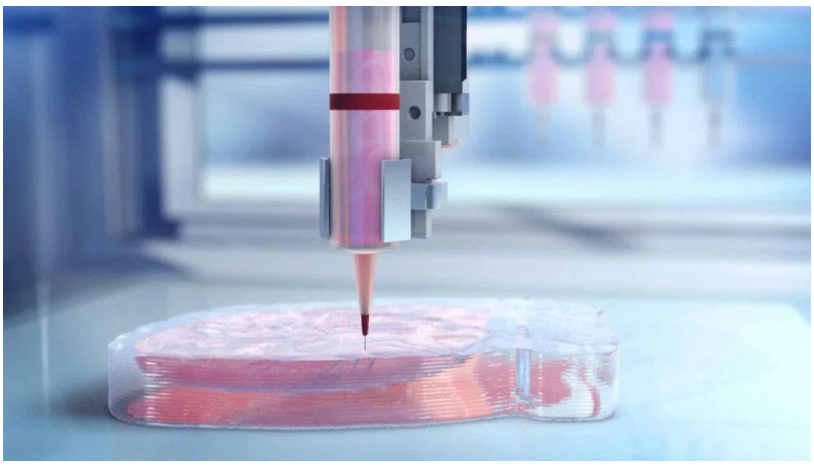
- HEVANTHIKA M II Year BME

Imagine being able to print replacement skin, bone, muscle and even organs? It could create human tissue for burn victims, create human organs in order to perform organ transplants which could be a lifesaving solution keeping in mind the growing need of donors for organ transplant cases. The 3D bioprinting technology could also allow the creation of various tissue structures, such as kidney tissue, skin tissue and what not? Even blood vessels and bones are printable.

And how intriguing is that?

3D Bioprinting being the impressive and useful technology it is, could be the next big thing in terms of tissue engineering and regenerative medicine which is why it is ever-evolving in the biomedical field. Making it more sought after is its popular application, drug testing. One of the key potential areas for using bio printed living materials is in the arena of medical testing, drug research and safety. And it doesn't end here. The future of 3D Bioprinting is burgeoning with much more promising aspects in the biomedical domain.

THINK PIECE



// FACT BOX

[3D Bioprinting is one of the most promising areas expected to improve the success rates in drug development immensely and is an attractive alternative to traditional organ transplantation. With our significantly growing technological developments and demand for cutting-edge research, 3D Bioprinting is one trend which is the perfect intellectual blend of biological applications with technology.]

First things first…understanding 3D Bioprinters.

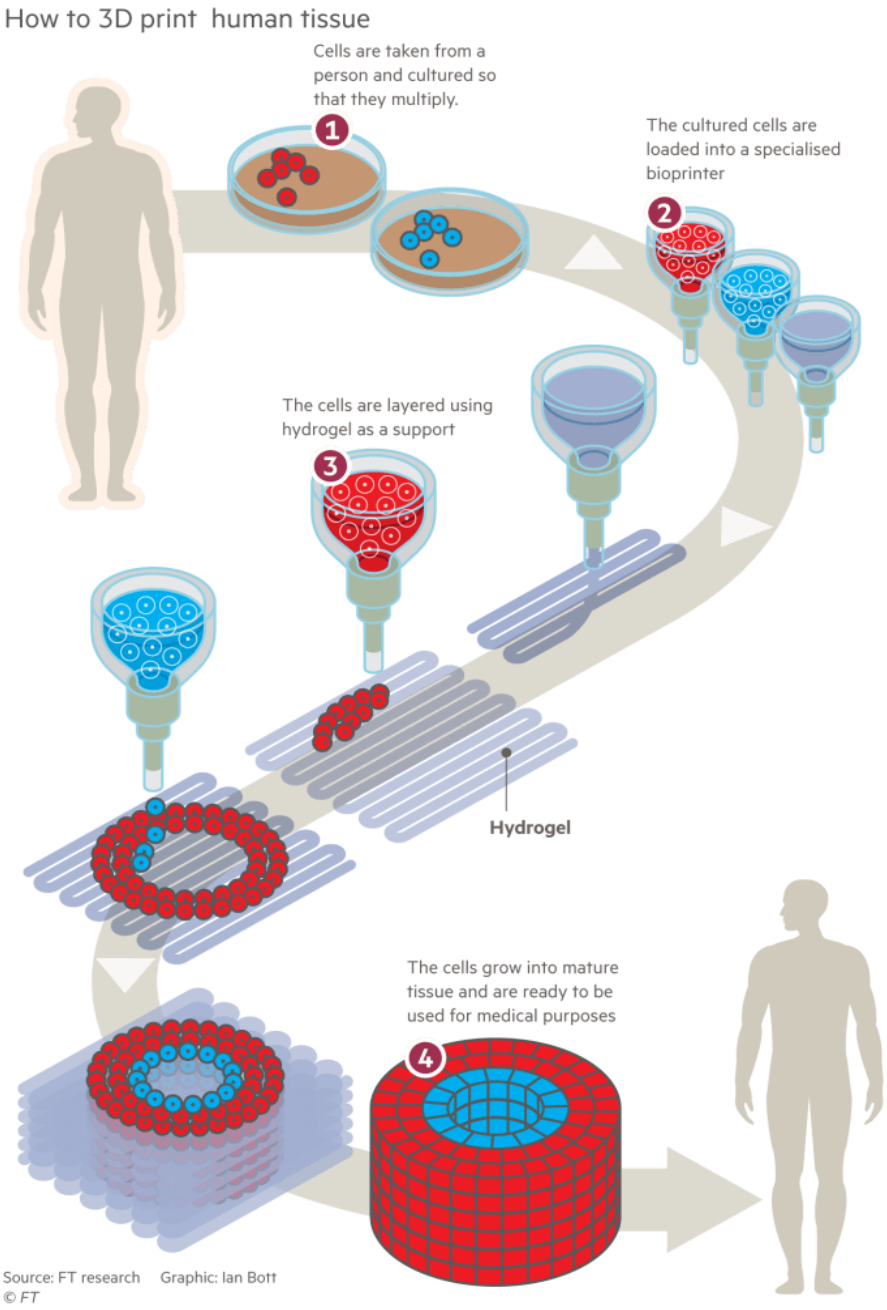
Everyone would be familiar with what a 3D printer is.

At its most basic, ***3D printing*** is a manufacturing process in which material is laid down, layer by layer, to form a three-dimensional object. 3D printers have been around relatively longer. They can print materials like polymer resins, metal, plastic and rubber which find applications in various industries.

Whereas 3D Bioprinting is a relatively emerging innovation.

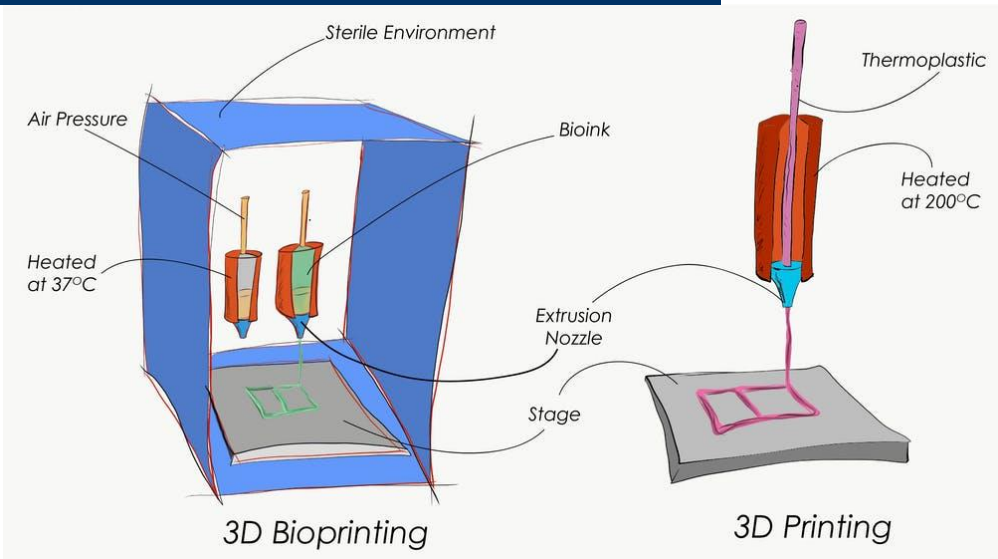
Three dimensional (**3D**) **bioprinting** is the utilization of 3D printing–like techniques to combine cells, growth factors, and biomaterials to fabricate biomedical parts that maximally imitate natural tissue characteristics. Generally, 3D bioprinting utilizes the layer-by-layer method to deposit materials known as bioinks to create tissue-like structures that are later used in medical and tissue engineering fields.

THINK PIECE



In simple terms, the 3D printing of living cells (3D Bioprinting) follows standard 3D printing methods, with a few twists. The printer, following a CAD file, lays down layer upon layer of material to build a shape. Instead of metals or plastics, bioprinters use bio inks as their materials. These biomaterials are tailored for cells to survive and grow in the specific architecture or structure that is intended.

THINK PIECE



// FACT BOX

[Bio-inks are materials used to produce engineered/artificial live tissue using 3D printing. These inks are mostly composed of the cells that are being used. The combination of cells and usually biopolymer gels are defined as a bio-ink. They can be agarose-based bio inks, alginate-based bio inks, collagen-based bio inks, hyaluronic acid-based bio inks, etc.]

Now let's jump into the next obvious question. **Why 3D Bioprinting?**

While saying 3D bioprinting is a revolutionary technology, it can be well validated with its progressing prospects in various applications like,

- Bio printed tissues and organs
- Drug testing
- Fabricate in-vitro tissue models for drug screening
- Disease modelling
- Tissue models for drug screening and toxicology screening
- Tissue models for cancer research
- Research in Tissue engineering
- Drug printing

And much more varied and numerous budding applications in the biomedical field.

Though young, the 3D bioprinting field is entering a very exciting time. This technology and industry will see explosive growth, with the potential to disrupt many aspects of healthcare and drug development.

A significant goal underlying the growth of 3D bioprinting technology is the possibility to bridge the enormous gap between the demand and the supply of organs for transplantation.

// FACT BOX

[On an average, 20 people die each day waiting for an organ transplant. Then imagine how much of a life-changing impact the boom of 3D Bioprinting can bring about in the medical industry.]

What if a person waiting for a new donor organ, which might never be available, could somehow receive a genetically identical, healthy version of the diseased organ?

It might sound far-fetched, but this could potentially be possible using 3D bioprinting technology. Theoretically, the patient's own cells could be used to build

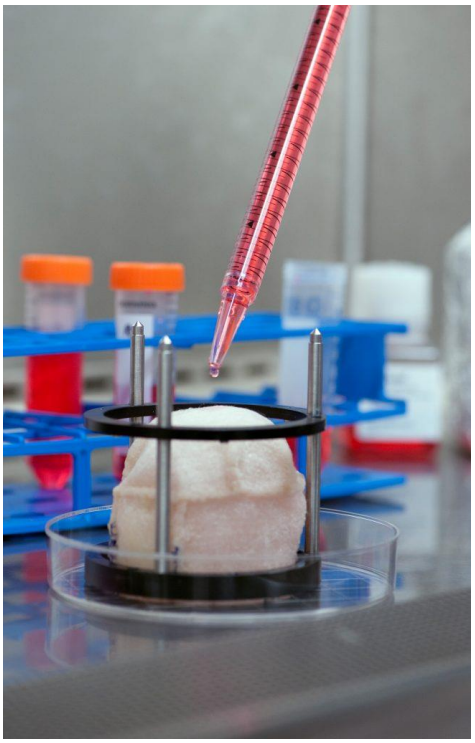
a new three-dimensional replica of the faulty organ. There would be no need for anti-rejection medications and very little risk of rejection at all!

Milestones in the 3D Bioprinting arena

Major breakthrough in 3D Bioprinting by Dr. Anthony Atala of Wake Forest Institute for Regenerative Medicine (WFIRM).

In 2006, Dr. Atala and his team were the first to successfully transplant a lab-grown organ into a human host. They implanted lab-grown bladders into young people suffering from poor bladder function due to a congenital birth defect. Ten years of research and implementation later, Dr. Atala and his team have developed a 3D printer capable of creating muscle, cartilage, and bone known as the Integrated Tissue and Organ Printing (ITOP) System.

Together with 400 colleagues and in a work that spans more than three decades, he has successfully implanted in human patients a variety of tissues regenerated from the patient's own cells.



THINK PIECE

Dr. Anthony Atala's success story in brief.

After more than a decade, a 3D bio printed bladder, created by Dr. Anthony Atala is sustaining the life of a patient. The 3D bio printed organ was made to replace patient Luke Massella's defective bladder in 2004. Since then, Massella has not required any further surgery.

Massella was born with spina bifida, which left a gap in his spine, and led him to undergo several surgeries at a young age. Unfortunately, a defective bladder caused his kidneys to fail, leaving him the possibility of being on dialysis for the remainder of his life. Thankfully, Dr. Atala came up with an alternative solution.

The bladder was made using a sample of Massella' bladder tissue, and modified inkjet printer, presumably used to build a sort of scaffold/host for the cells. Incubated in lab condition, the new bladder was grown in 2 months, and then successfully transplanted into the patient.

And that's the astounding success story of Dr. Anthony Atala which saved the life of a patient.

How fascinating is that the convergence of biology and technology could create such life-changing advancements in medical history.

// FACT BOX

[According to Dr. Atala, flat structures like skin are easiest to print, whereas tubular structures like blood vessels and hollow non-tubular organs like bladders are more complex. Solid organs like hearts, lungs, and kidneys, are the most difficult to bioprint as they have more cells per centimetre.]

// INTERESTING FACT BOX

[Watch Dr. Anthony Atala's TED TALK to learn more about his breakthrough in growing new organs through 3D Bioprinting, he also shows the kidney that was bioprinted at the TED TALK]

THINK PIECE

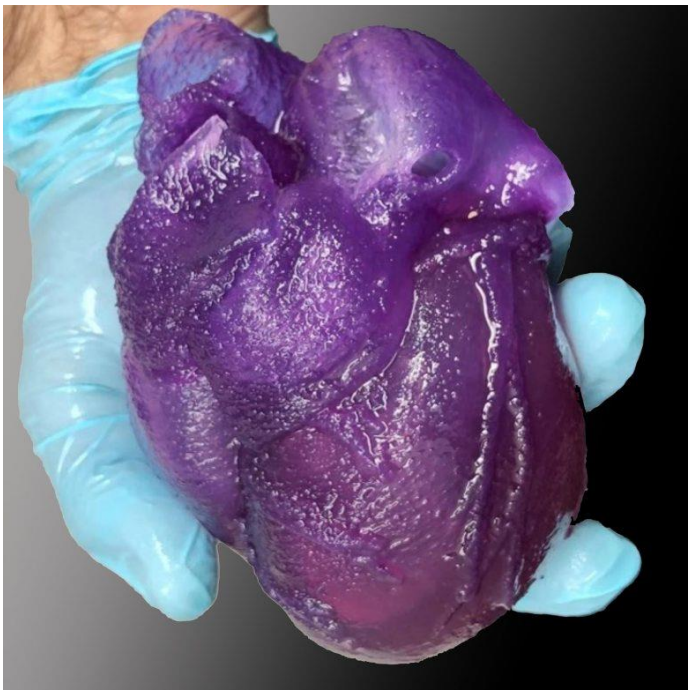
New Tool for Surgeons: 3D Bioprinted Heart by Carnegie Mellon University

Professor of Biomedical Engineering Adam Feinberg and his team have created the first full-size 3D bioprinted human heart model using their Freeform Reversible Embedding of Suspended Hydrogels (FRESH) technique. It was created from MRI data using a specially built 3D printer, the model mimics the elasticity of cardiac tissue and sutures realistically. This milestone represents the culmination of two years of research, holding both immediate promise for surgeons and clinicians, as well as long term implications for the future of bioengineered organ research.

The FRESH technique of 3D bioprinting was invented in Feinberg's lab to fill an unfilled demand for 3D printed soft polymers, which lack the rigidity to stand unsupported as in a normal print. FRESH 3D printing uses a needle to inject bioink into a bath of soft hydrogel, which supports the object as it prints. Once finished, a simple application of heat causes the hydrogel to melt away, leaving only the 3D bioprinted object.

While Feinberg's lab has proven both the versatility and the fidelity of the FRESH technique, the major obstacle to achieving this milestone was printing a human heart at full scale. This necessitated the building of a new 3D printer custom made to hold a gel support bath large enough to print at the desired size, as well as minor software changes to maintain the speed and fidelity of the print.

THINK PIECE



// FACT BOX

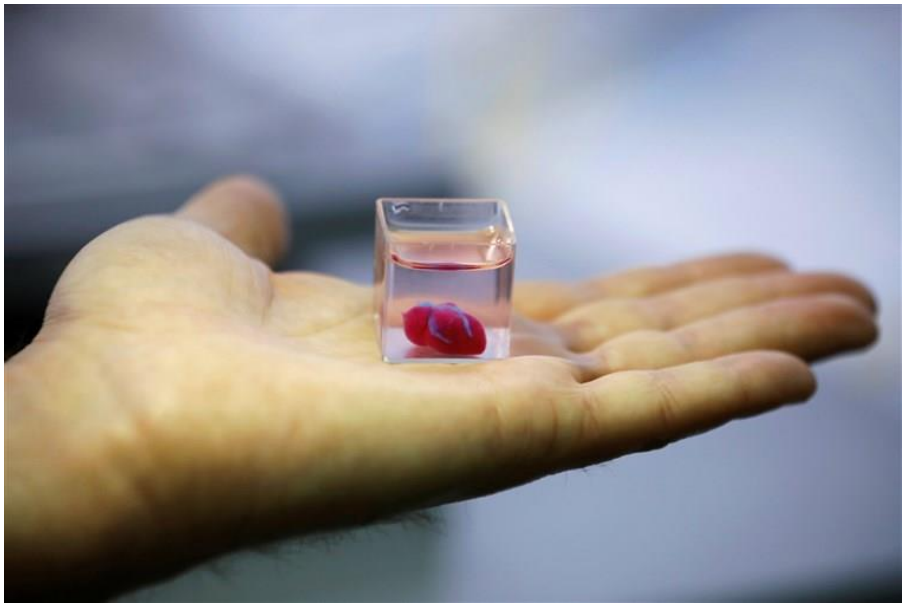
["While major hurdles still exist in bioprinting a full-sized functional human heart, we are proud to help establish its foundational groundwork using the FRESH platform while showing immediate applications for realistic surgical simulation," added the team]

A previous milestone in printing a 3D bioprinted heart was done by Israeli scientists who created the world's first 3D-printed heart using human cells.

Israeli researchers 3D bioprinted a miniature heart capable of contracting as real hearts do, with a blood vessel network to contract as our hearts do, and built anatomically like human hearts. The heart doesn't beat and is too small for use in people — it was only about the size of a rabbit's heart. But that little organ was considered a big advance in the ongoing effort to find new treatments for heart diseases.

THINK PIECE

As read above this was immensely succeeded by the Carnegie Mellon University in printing the first full-size 3D bioprinted human heart model using the FRESH technique.



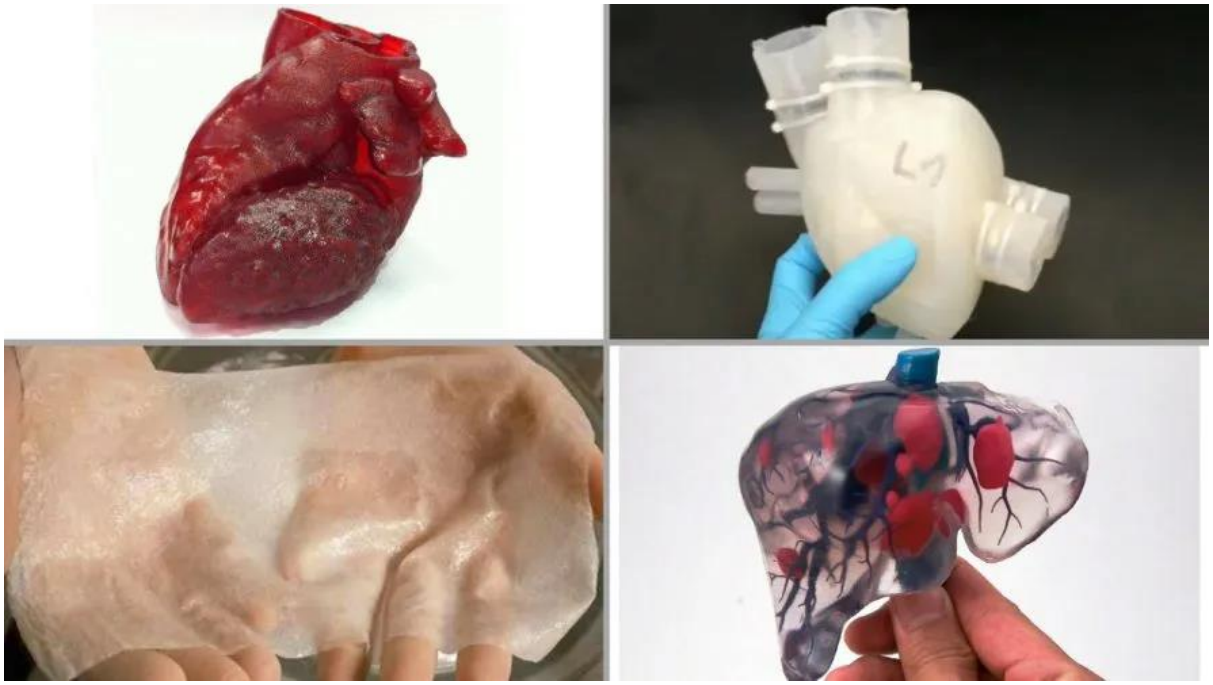
Not only these, there are much more humongous advancements made in the field of 3D bioprinting tissues and organs and even more in progress.

3D bioprinted skin has been created which is a prospective alternative for skin grafts as they can get infected, scar badly, bleed copiously, and recovery times are long. Since 3D bioprinted skin can be created quickly and be applied straight onto the wound, wounds can recover significantly better than with skin grafts which take longer. It also finds application is medical testing which is sought by companies like L'Oréal so that they can test products without requiring living humans or animals.

The possibilities for 3D bioprinting are seemingly endless.

Major breakthroughs have been achieved in the creation of 3D bioprinted lungs, intestines, liver, pancreas, corneas and many other organs as well. Bone and brain

models which are most complex to make are also making considerable advances. Though the progress of creating all kinds of 3D bioprinted organs hasn't reached its full precision, gradually and insightfully it is not far until it brings about life-changing revolutions in medical history.



While there are many technical challenges as well as ethical problems involved in 3D bioprinting, researchers across the globe are engaging in cutting-edge research to overcome them and make rigorous improvements. As a result, 3D bioprinting could potentially pave the way for a brighter and futuristic healthcare atmosphere in the coming years.

3D Bioprinting: The Future of Healthcare which will revolutionize Regenerative Medicine

Life-saving solution in Organ Transplantation

Organ transplantation is the most important prospect of 3D bioprinting as it is a growing criticality that people die unable to get donors for organ transplants and even if they do get there are possibilities of organ transplant failure. This means

that the chances of many life sustaining organs becoming available for transplantation are becoming slimmer. And the list for people waiting to receive an organ transplant is getting longer. With recent breakthroughs in "3D Bioprinting", the need for organ donors could one day be eliminated. This is where it gets interesting.

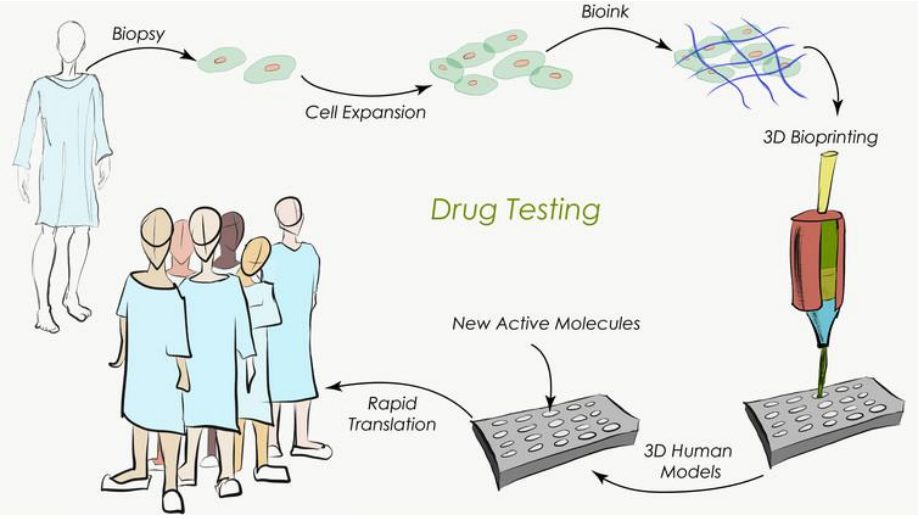
Instead of harvesting used organs, we'll be creating new artificial organs with advanced bioprinting techniques and the chances of rejection are also eliminated as the organ to be transplanted is created from the cells of the patient receiving the transplant themselves.

An Emerging Path to Better Drug Development

3D bioprinting is proving to be an effective means of testing new pharmaceuticals, meaning that drugs can be thoroughly assessed and brought to market more quickly, all without harming animals or any other test subjects.

It also aids in cancer research. Researchers can 3D print many different biological samples, which can then be tested with multiple cancer drugs to see how it reacts with an individual's cells.

Recent advances have enabled scientists to precisely position materials and cells to build functional tissue models for *in vitro* drug screening and disease modelling using 3D bioprinting technologies.



3D bioprinting aids in the battle against COVID?

Currently, bioprinting researchers are developing 3D Bioprinted Human micro-tissues, which are then infected with SARS-CoV-2. This allows them to study the disease progression in a tissue setup that closely mimics the native tissue micro-environment and physiology. The novel coronavirus is still being studied globally and we still do not understand much about it. Understanding the kinetics of the viral infection and disease progression better will aid in faster and effective vaccine development.

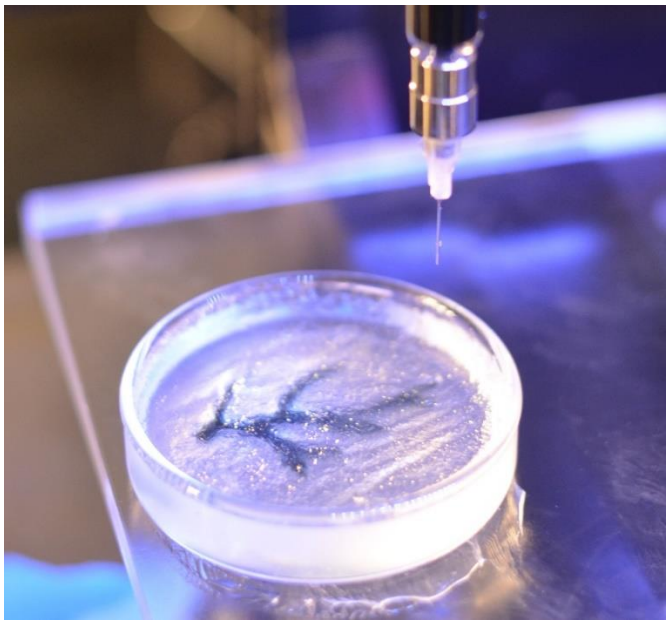
Indeed, 3D bioprinting is emerging as a promising technology in drug testing and development as well witnessing the changes it can bring about in regenerative medicine.

THINK PIECE

Conclusion

3D bioprinting's potential is enormous. In the near future, doctors may have the ability to print artificial skin cells for burn wound victims. Surgeons even have the ability to bioprint replacement organs — something that, once implemented at scale, may eliminate the need for risky organ transplants altogether.

Given its interdisciplinary nature, 3D bioprinting is accelerating at an ever-increasing rate. Those working in the field are making advances every day, in both the technology and in their understanding of how it can be used and improved. While we're not quite there yet, there is no doubt that the future of medicine will be very different with bioprinting involved.



And now, how fascinating is 3D bioprinting and its prospects to a biomedical engineer, isn't it?

// FACT BOX

[The rate at which this field is evolving is indeed mind-boggling and guess what? The next generation of 3D bioprinting, '4D bioprinting' has emerged too! Four-dimensional (4D) bioprinting, in which the concept of time is integrated with three-dimensional (3D) bioprinting as the fourth dimension, has currently emerged as the next-generation solution of tissue engineering as it presents the possibility of constructing complex, functional structures.]

THINK PIECE

A NEW REVOLUTIONARY TOOL FOR SURGEONS: 3D BIOPRINTED HUMAN HEART (USING FRESH TECHNIQUE)

- **Nithyashree B II year BME**

Using realistic models of human organs can help surgeons practice and train considerably before they resort to human dissection, thereby leading to more triumphant surgeries. The use of 3D models in medicine and anatomy is surprisingly ancient and not very new. Centuries ago, they were fashioned out of materials like clay, wax, wood etc. and they served as teaching tools or as illustrations of the mechanisms of disease.

However, there's much more complexity that is involved in this process than one can imagine. It's been challenging to recreate models which resemble the exact size, feel, and complexity to human organs at an affordable price. Professors of Biomedical Engineering Adam Feinberg, Eman Mirdamadi and their team from Carnegie Mellon University have successfully created the first full-size 3D bio-printed human heart model using their *Freeform Reversible Embedding of Suspended Hydrogels* (FRESH) technique. This technique provides the ability to embed soft biomaterials in a thermoreversible support bath at sizes ranging from a few millimetres to centimetres. Despite the fact that this is not the first time scientists have tried to make a 3D printed human heart, this model is considered remarkable because, all the previous attempts in the making of human heart model using stiff materials have failed due to the lack of resemblance of the natural tissues. Or when soft, tissue-like materials were used the model collapsed, making it difficult to reproduce large complex structures.

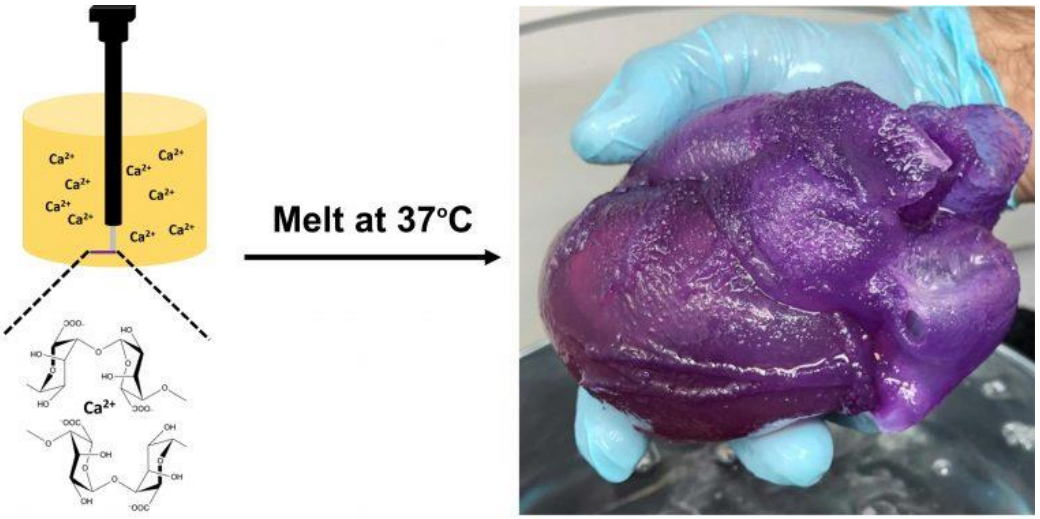
The team used a gelatin bath for bio printing, as the bath supports delicate soft polymer structures that would otherwise collapse in air during printing. And a minor software was used as well to maintain the speed and fidelity of the printer. The team

chose alginate (derived from seaweeds) to make the model as it is economically viable and closely resemble the properties of cardiac tissues. The researchers placed sutures in a piece of alginate for testing and it surprisingly held to a certain point when stretched suggesting that the surgeons could practice stitching up the heart model made from this material. Initially printing small organs was the only possibility but the team modified the FRESH 3D printer and used MRI scans from a patient to print a full-sized human heart. Furthermore to help the surgeons, they printed a section of coronary artery that they filled with fake blood. In conclusion the heart model was structurally accurate, soft, bio-compatible and reproducible which could be handled outside the gelatin bath.

“We can now build a model that not only allows visual planning, but allows for physical practice” says Feinberg. “The surgeon can manipulate it and have it actually respond like real tissue, so that when they get into operating site they’ve got an additional layer of realistic practice in that setting”.

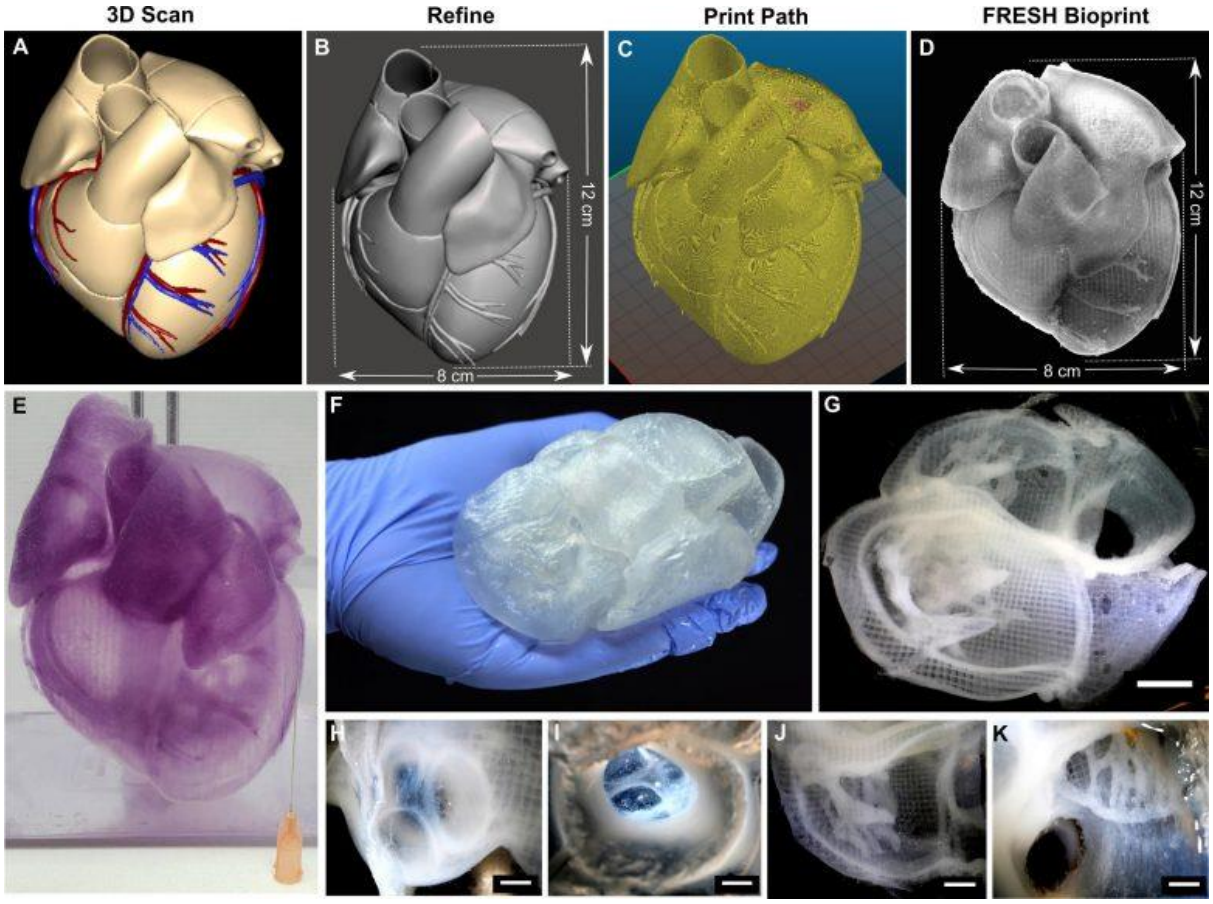
“While major hurdles still exist in bioprinting a full-sized functional human heart, we are proud to help establish its foundational groundwork using the FRESH platform while showing immediate applications for realistic surgical simulation.” added Eman Mirdamadi.

THINK PIECE



FRESH 3D Bioprinting at Large Scales with Alginate

Full-Sized FRESH 3D Bioprinted Heart Model



THINK PIECE

INTERNET OF THINGS

- **Janani T II Year BME**

This a swiftly uprising technology that has become one of the most sought-after advancements. It has been placed in the top 7 biggest technology trends in 2020 by Forbes. Well, let us now get on to the resolution of the topic.

In a nutshell, it deals with connecting devices and machines to the internet by wireless technologies collecting and sharing data. The process proceeds by availing sensors which makes real time data realizable. It doesn't require the intervening of human beings, well what more could you say! Techie future here we come 😎. With more than 7 billion connected IoT devices today, experts are expecting this number to grow to 10 billion by 2020 and 22 billion by 2025.The Iot was initially interested toward business and manufacturing, where its application was known as M2M or machine to machine, but later on it went to emphasise on modifying homes and offices with smart devices.

HISTORY OF THE IOT:

According to Kevin Ashton the then executive director of the Auto-ID Centre he coined the term "Internet of Things" in 1999 while working on a presentation for Procter & Gamble in the context of RFID supply chains. Although to be exact the term Iot is 16 years old. In 2012, the theme of Europe's biggest Internet conference LeWeb was the "Internet of Things". At the same time popular tech-focused magazines like Forbes, Fast Company, and Wired starting using IoT as their vocabulary to describe the phenomenon.

THINK PIECE

BENEFITS OF IOT:

The conveniences this would bring about just keeps surging every day. It is used in the domain of security for biometrics for instance and it is expanding the concept of smart homes. It is yet to revolutionize the entire system of healthcare by making it remotely available everywhere. People wouldn't have to travel to hospitals in the future.

Iot is proving its utility in many of the sectors like manufacturing, retail and healthcare. Let us focus on healthcare to elaborate its accomplishments.

Telemedicine:

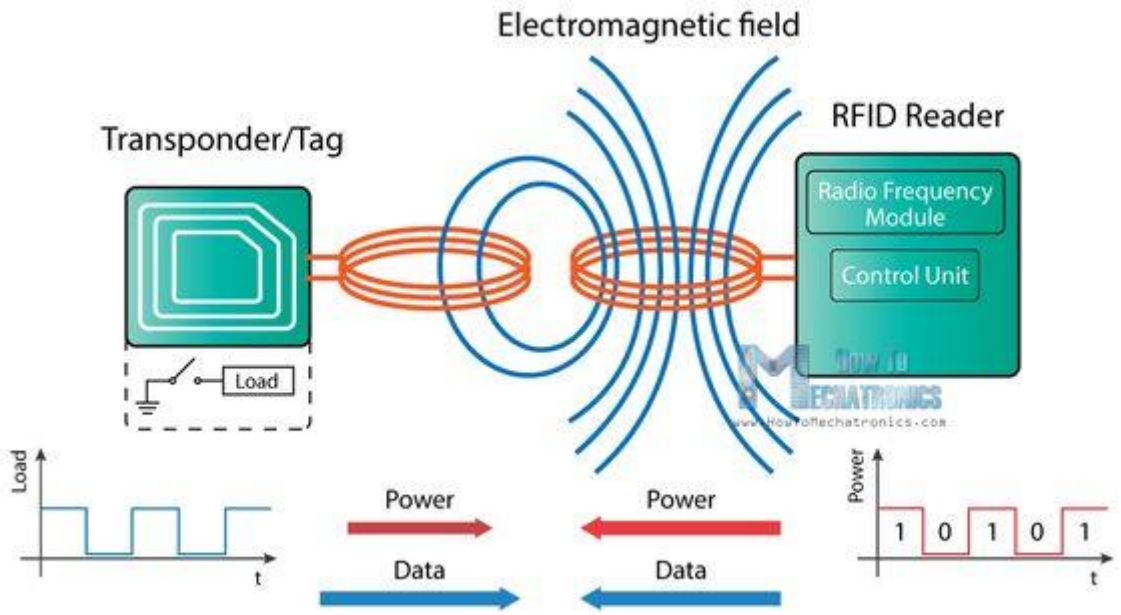
It can be simply defined as "the remote delivery of healthcare services". It has 3 common types:

1) Interactive Medicine – This is where patients and physicians are allowed to communicate in real-time while maintaining HIPAA compliance. This means the work has satisfied the security rules.

2) Store and Forward- This permits provider to share patient information with a practitioner in another location.
3) Remote Patient Monitoring- This allows remote caregivers to monitor patients that reside at home by using mobile medical devices to collect data.

RFID for Patient Monitoring:

It stands for radio frequency identification. It is a form of wireless communication using electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object. The components of an RFID system are an RFID tag or smart label, an RFID reader, and an antenna. The system executes by digitally encoding data in RFID tags which can be read by a reader.



The RFID reader is a network- connected device that can be portable or permanently attached. It uses radio frequency waves to transmit signals that activate the tag.

Once the tag gets activated, it sends a wave back to the antenna, where it is translated into data. There are two types of RFID tags, active and passive. Active tags are supplied with their own power sources to transmit data while passive tags require the external power from the reader.

Wearable devices that transmit data to doctors: These are most often implemented in the form of watches, bands, bracelets and other trackers that collect all the necessary information (heart rate, blood pressure, pulse, blood sugar, etc.) and send it to the doctor. There are already dozens of such IoT in healthcare examples already working as parts of healthcare services.

WHY USE IOT IN HEALTHCARE?

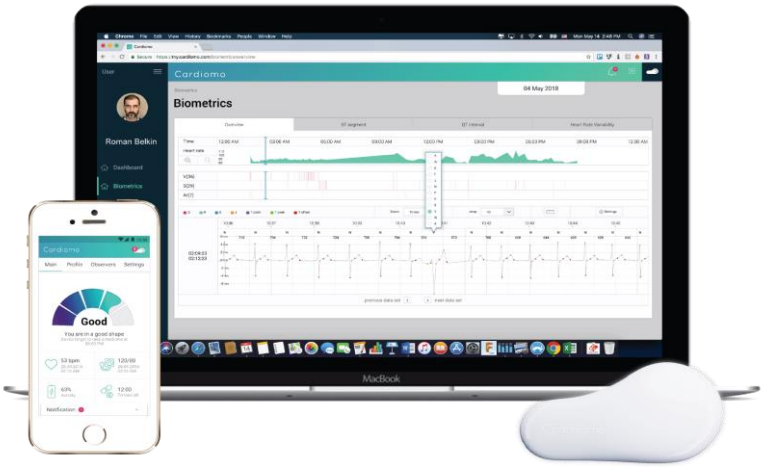
One of the biggest issues that doctors can't fight against is time. Yes, time wins all, it only needs a matter of seconds. We have heard of how there is a golden period stipulated according to the ailment of the patients, if they cannot receive treatment within the duration, they lose their dear lives. Even on normal days, sometimes

hospitals don't have the staff power to service all patients. The Pandemic escalated this problem in times and showed the weaknesses in existing healthcare processes. Integrating Iot can significantly speed up the process of providing assistance.

CURRENTLY USED PRODUCTS

1) CARDIOMO

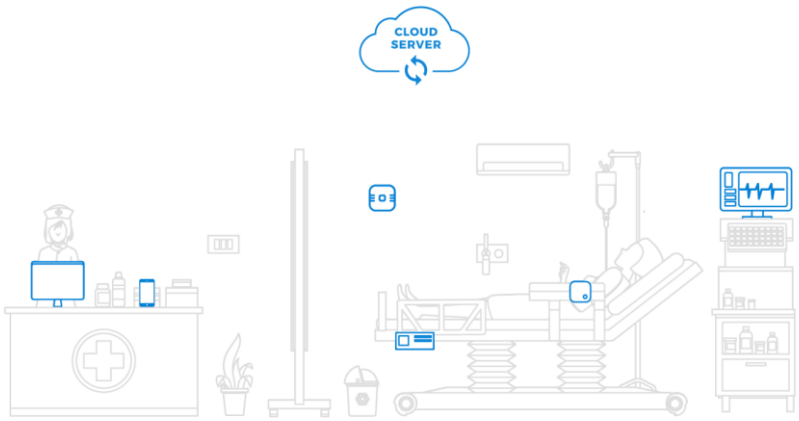
Cardiomo is a product designed to monitor the state of a body. It is a special sticker with sensors that track basic biometric parameters such as body temperature, pulse, pressure, etc. All this information is then transmitted to a dedicated mobile application. The developers position Cardiomo as a product that allows **monitoring of the status of elderly patients**.



2) SMART HOSPITAL

Smart Hospital by Z-works is a full-fledged virtual hospital. Its creators provided the ability to read a huge amount of data, from body temperature to motion features. In total, Smart Hospital is able to obtain and analyse more than 20 types of data.In addition, Smart Hospital allows choosing the appropriate treatment method, depending on the information obtained from the analysis of biometric parameters:

heart rate, breathing rate, body temperature, etc. The developers believe that Smart Hospital is able to save people from a long wait for medical care in the future.



2) RAPIDSOS

It is a mobile application that contains all the necessary information – health-profile, live incident data, etc. Emergency API Suite from RapidSOS can turn a device or an app into a lifesaver. It can be connected to wearables, home security systems, and even cars. Thanks to this app, when an emergency service receives your call, the operator immediately sees all the key data: the name of the patient or the victim, their location, blood group, etc. Thus, the ambulance team will be prepared with everything you need when they arrive.

3) THYNC

Psychiatry is one of the most difficult areas of medicine, and it is still developing. Therefore, the treatment of a number of diseases in which the

nervous system is excessively excited or conversely, depressed, remains extremely difficult. The way out of the situation could come from Thync – a hardware start up that offers to manage and improve the mood. Thync consists of two wireless devices. The first one is Calm, which helps to relieve stress. The second one is Energy, with which a person can "recharge." The principle is based on sending weak impulses to the brain that affect mood. According to the developers, it takes only 5 minutes to change your mood.

IOT IS ABSOLUTELY BENEFICIAL!... ALMOST

Providers and patients alike have concerns with telemedicine due to the mass amount of sensitive information in the healthcare world. Because of telemedicine, physicians are able to communicate with their patients via video chat, text message, and phone call, but not all communication mediums are safe. Not all kind of treatments and solutions can be provided through virtually. For instance, chronic conditions require the doctor to have a profound understanding of the affliction. Another issue that is pretty too obvious is technical difficulties. Yes, technology has improvised to an invaluable asset but with its slack in connectivity, it could slow everything down.

Conclusion:

The future of IoT in healthcare is promising in the view of the recent events. The unfolding crisis in the industry caused by the pandemic once again proved the importance of implementing technologies like IoT, big data and AI to enhance efficiency and improve safety in healthcare. Implementing IoT solutions right now is no longer about staying ahead of the competition, it's about making sure we can handle the crisis.

THINK PIECE

BIOENGINEERED CLOTHINGS

- **Raghupathy J II Year BME**

The science-fiction exemplary, Dune, highlighted the "still-suit" a full-body suit intended to keep the wearer cool and reuse the body's loss to guarantee the individual stayed temperature-controlled, hydrated, and, hence, alive, even in the most sultry planetary atmospheres. This wild dream of what can occur at the convergence of design and innovation is referred to in bioengineering as "wearable innovation."

Joseph Wang, a teacher of Nanotechnology and the overseer of the Center for Wearable Sensors at the University of California San Diego, is driving a group to create innovation that makes us one stride more like a still-suit.

In a venture known as Adaptive Textiles Technology with Active Cooling and Heating (ATTACH), Wang's group will likely make an individual warming/cooling framework that reacts to changes in surrounding temperature, to changes in the person's internal heat level, and to orders for on-request warming and cooling. This wonder of bioengineering requires a great cluster of advancements cooperating to make the ideal yield of individualized temperature control. To keep the wearer at an agreeable 93 degrees Fahrenheit, the ATTACH framework includes two material frameworks: aloof and dynamic.

The inactive material framework, comprising of unique polymers and dampness responsive folds, empowers the texture to grow when it's hot or agreement when it's a virus. The latent materials framework can react—without power—to little temperature varieties relying upon the temperature of the room, the wearer's internal heat level, or how much the wearer is perspiring.

THINK PIECE

For bigger temperature varieties, Wang's group is building up a synergistic dynamic materials framework to expand the warming and cooling limit of the texture. At the point when the latent framework gets over-burden or has arrived at a limit, a thermoelectric framework controlled by battery- powered batteries and biofuel cells collecting power from human perspiration cooperates with the detached framework to manage the temperature of the wearer.

On the off chance that this synergistic arrangement of materials, sweat-controlled biofuel cells, and nanotechnology weren't at that point sufficiently dazzling, Wang's group additionally plans to have everything created through 3D printing to minimize expenses. At the point when ATTACH, in the end, makes its path to the market, there is additionally an arrangement for the dress to feel good, adaptable, and lightweight.

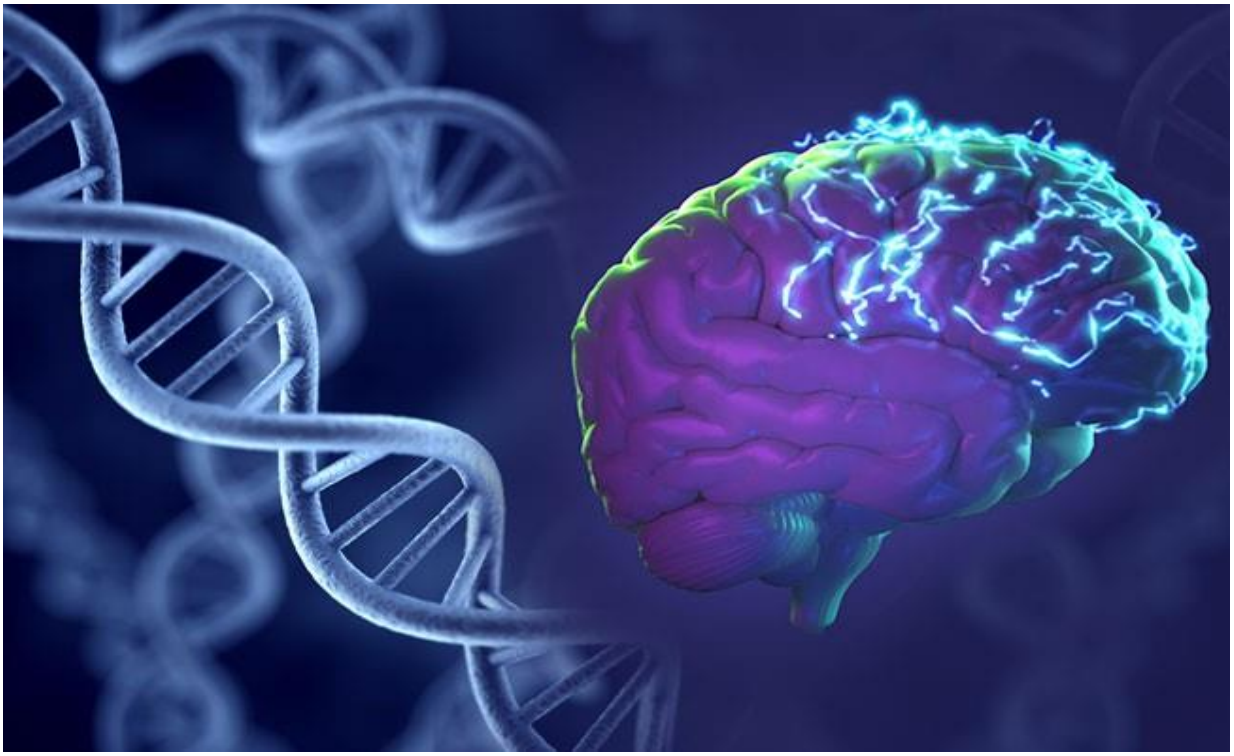
Wang is confident that the texture will help lessen the expense of warming structures. By empowering wearers to keep temperature directed on an individual level, structures utilizing HVAC frameworks for warming and cooling might have the option to decrease costs by up to 15 percent. Past cost-investment funds, future uses could likewise incorporate help for those with temperature-related joint and other foundational torment.

THINK PIECE

THINK PIECE

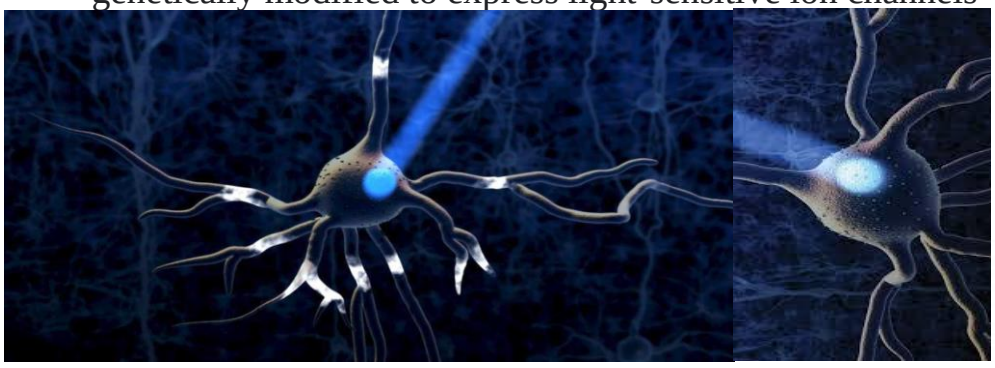
BRAIN FRIENDED GENES

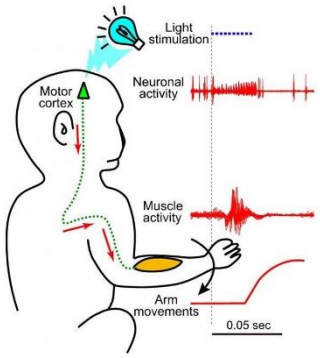
- V. AISHWARYA II Year BME



OPTOGENETICS

Biological technique that involves the use of light to control neurons that have been genetically modified to express light-sensitive ion channels



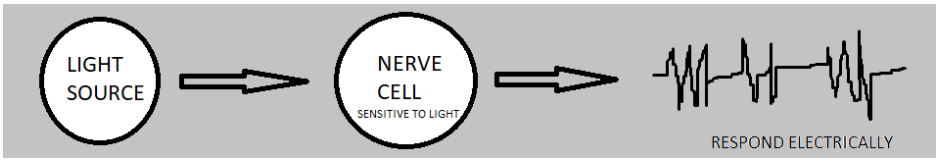


We all know that the brain is the controlling unit of our body,but have you ever wondered about controlling the neuronal activities by just using ‘light’,is it really possible?

THINK PIECE

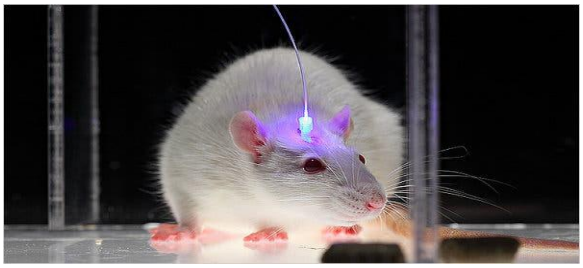
Yes it is possible, by the neurobiological technique called OPTOGENETICS. This technique uses a combination of light and genetic engineering (changing the genetic information of a living thing by inserting or deleting information in the genetic code) to control the cells of the brain.

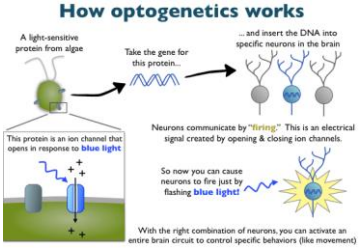
The general idea of this technology is to develop molecular tools, to be able to stain the cells. In this case to stain the cell or to implant probes into nerve cells that are sensitive to light. So when we shine light of a particular wavelength onto this particular cell that we are manipulated to become sensitive to light, then that cell will respond electrically.



We actually know only one type of nerve cells, in the brain that are sensitive to light and that is our retina. So when we see light it means that the photons from the world hit a particular cell type, and the photoreceptors in the retina swallow the photons and generate electrical activity in response. But this means that there are genes that can generate specific molecules that are sensitive to light, and can transform light into electrical activity. What if even we can make our other brain cells respond to light?

So this is the magic. A group of scientists *(Karel Svoboda's group at the Janelia Farm Research Campus in the US)* found that it is possible to make brain cells light sensitive by embedding a gene(protein) into the cells.

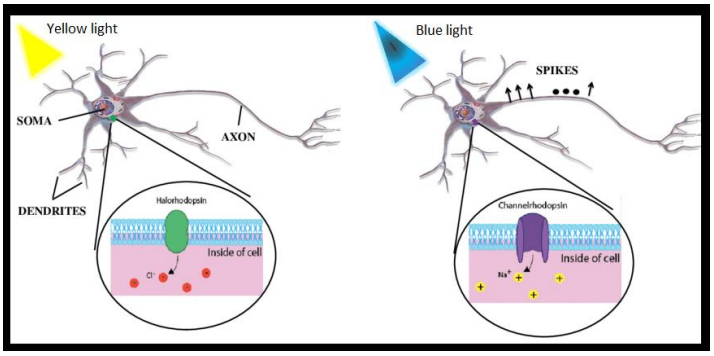


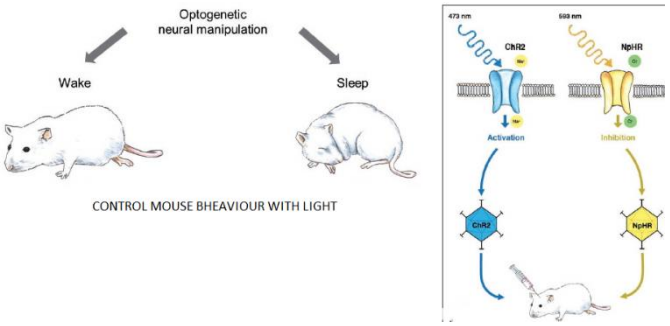


THINK PIECE

In optogenetic studies, scientists take the genetic code of the neurons they want to study and add a new piece of code to it. The new code allows these neurons to make special proteins, called opsins(a protein which forms part of the visual pigment rhodopsin and is released by the action of light).Opsin Proteins that respond to a specific type of light (for example, ChR2 only responds to blue light). These proteins are used to control neural activity, which respond to light. Opsins occur naturally and were first discovered in algae, which use these proteins to help them move toward light. But how does the opsin get into the neuron? This requires some specialized laboratory techniques. For example,Let's look at a mouse. To get the opsin into the neurons of a mouse, the genetic code for the opsin must be carefully inserted into the genetic code for the neurons in the mouse. If this is done correctly, now every neuron in the mouse should have the opsin. We can insert the code into a specific type of neuron, or into a specific location in the brain. We can choose exactly which neurons we want to control. In neuroscience, the most popular opsin is called channelrhodopsin-2 (ChR2)an opsin that responds specifically to blue light. When ChR2 is inserted into neurons, blue light can be used to turn those neurons on. This opsin comes from the green algae Chlamydomonas reinhardtii. ChR2 is activated by blue light, meaning that it produces electric spikes when blue light shines on it and it doesn't respond to other types of light. The neurons with ChR2 will only be on for as long as the blue light is shining on them. This gives us precise control over the timing of the neuron's activity. Normally, neurons are not affected by blue light , so only the neurons that have ChR2 will be affected by blue light.Similarly,deactivation of the nerve cell can also be performed using specific proteins obtained from Natronomonas pharaonis.This protein channel responds only to yellow light.Spikes are not produced when this gene modification is made

in the nerve cells,ie,when yellow light is shined on the brain,those group of modified cells respond and deactivate the cells by not producing any electrical spike. (*Karel Svoboda's group at the Janelia Farm Research Campus in the US have been able to create what they call 'illusory touch' in the brain of awake, behaving mice*.)





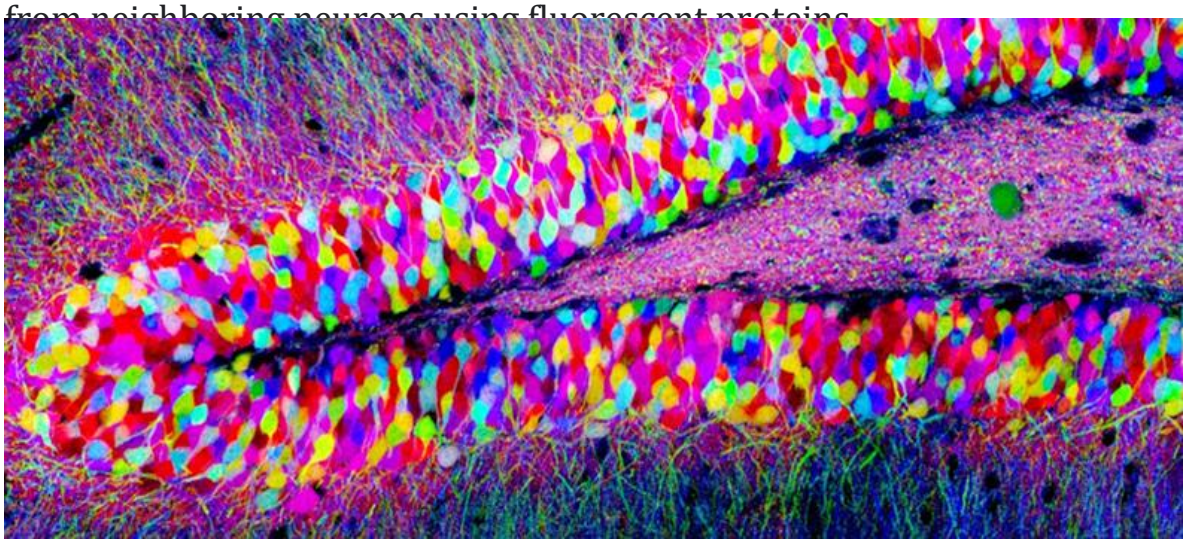
Applications Of Optogenetics: Optogenetic methods have been applied to a broad range of questions in behaviour and physiology, providing insight into movement, navigation, learning, memory, metabolism, hunger, thirst, respiration, sleep, blood pressure, reward, motivation, fear, and sensory processing. Clinically inspired discoveries have also been made, helping to shed light on cellular activities associated with conditions such as epilepsy, Parkinson disease, Huntington disease, stroke, chronic pain, obsessive-compulsive disorder, drug addiction, depression, social dysfunction, and anxiety. For example, optogenetics made it possible to determine which cells and connections across the brain were important in defining and assembling the different features of anxiety, including respiratory-rate changes and risk avoidance, into a distinct behavioral state.A collaborative group led by Botond Roska at the Friedrich Miescher Institute for Biomedical Research in Switzerland has looked into retinitis pigmentosa, a form of blindness caused by degeneration of the retina at the back of the eye. Using two animal models, they

have been able to restore vision by inserting a light-sensitive channel into the retina. This therapy worked well enough to allow the previously blind mice to be able to carry out visually guided behaviours.Further use of therapeutic optogenetics has been mooted for the treatment of Parkinson's disease. In Parkinson's, a region of the brain called the basal ganglia degenerates, leading to an inability of the patient to coordinate movement. Increasing the activity of this region has been shown to have therapeutic benefit and the lab of Anatol Kreitzer at the University of California, US have shown potential in an optogenetic approach. They were able to mould the activity of the basal ganglia in such a way to create Parkinsonian-like symptoms in mice and also to reduce Parkinsonian-like symptoms in a mouse model.

The challenge now is to develop the technology further so that we have more accurate and controllable tools so that we can start using them in humans!

BRAINBOW TECHNOLOGY

It is a process by which individual neurons in the brain can be distinguished from neighboring neurons using fluorescent proteins.



THINK PIECE

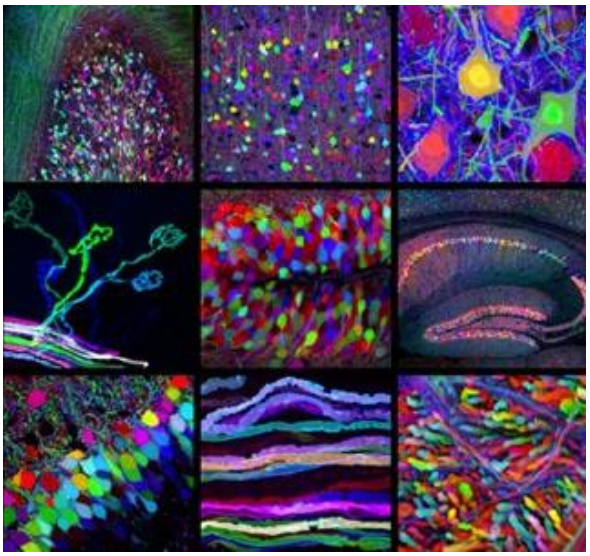
As you know, when we look at the brain we call it the grey matter / White matter.

So it is very difficult to see and distinguish between those brain cells.It looks like a meshy grey jungle of trees! A few years ago, a team of researchers from Harvard - Washington University in St. Louis developed a genetical technique, where they can intervene with the genes.For instance,they worked with a mouse; Particular genes are locally inserted into pieces of DNA and into the genome of this animal.When this piece of DNA is expressed some cell types in the brain, becomes colorful.Suddenly the brain is glowing with fluorescent colors like a rainbow,hence the name brainbow. We can do this today in the brain of a mouse, or other animals but of course we don't do it to humans because we have to intervene in the embryo of humans.Hence we try it on animals and get to see a colorful brain.

What can we do with this brainbow? So here are some prospects or some examples, for what you can do with this new technology. So far we were all interested in knowing about the structure and basis for learning , ie, what happens to the brain

when it is learning?For instance, You might not have heard about the brainbow before, but now you know something about the brainbow. What happens in your brain when you learn? What is changing in your brain when you learn?

Hence this brainbow technology helps us to know what exactly happens in the brain in real time(online) when it is learning, and see what are the anatomical changes happening in it.Like for instance when the mouse in the maze is finding his way from one place to the cheese and the second time he does it better. And the third time he does it way more better; so what is changing in his brain when he learns? We can use this technology to look at the brain in real time, during learning. And we can see some anatomical changes related to learning. That's a breakthrough. In a black jungle or in a grey jungle, it would be very difficult but in a colorful jungle, it will be much easier to say that the green thing is moving or making contact or going there. So, this is very useful as a technique to study online learning (real-time) in the brain.



Another use of this brainbow technology is to tag different cell types using different dyes.A basic question is how many cell types anatomically do we have in the brain?

THINK PIECE

Is it 100? Is it 1,000? Is every cell different from another cell? If so how many types are there? So we can use these genetic tools to stain populations of different cell types and say that there are so many red cells of one type and so many blue cells of another type. So we will be using this Brainbow tagging technology to categorize the same type in terms of anatomy. Hence we know about each nerve cell way better than before! So now you can see how technology enables us to ask old questions but in a new way!

COVID MAKES SMART PHONE SMARTER

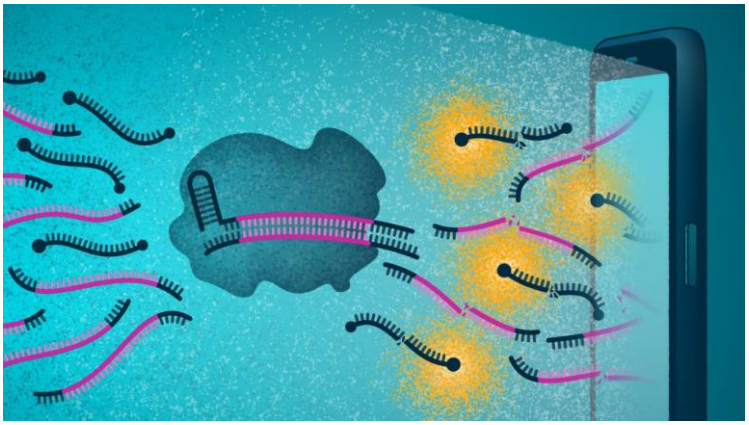
- **Thejaswini II Year BME**

In years to come, the 2020 Budget will be known as the **"get it done corona virus".** Only 150 million people have been tested till now which comprises only 11% of the total population. Testing is a major snag of this covid-19 pandemic because of the PCR technique. PCR technique is used to detect DNA virus but corona contains a non-segmented, positive-sense RNA genome. For this reason RNA has to be converted to DNA and then the DNA should be amplified enough to be detectable. Thus this technique needs trained users, lab equipments and takes more days to generate result. To overcome this issue researchers at Gladstone Institutes developed a new CRISPR(Clustered Regularly Interspaced Short Palindromic Repeats)-based test for COVID-19 which converts a Smartphone camera into a microscope to provide quick and accurate results in 30minutes. Thus it allows us to test rapidly with minimal resources.

THINK PIECE

Swab your nostrils and insert the swab into the device that is connected to a smart phone. Emission of fluorescent signal occurs if the sample contains RNA from SARS-CoV-2.The Smartphone camera which is converted to a microscope detects the fluorescence and reports positive for the virus. This test not only generates positive and negative result, it also measures the concentration of the virus i.e. Brighter the fluorescence more the concentration of virus. The mechanism behind this is CRISPR, a natural mechanism seen in bacteriophages to protect themselves from viruses. When a viral DNA is detected, the bacterium makes two strands of RNA, one of it contains a sequence that matches the invading virus. These two RNA's combine with a protein inside the bacterium called Cas9. Cas9 is a nuclease, a type of enzyme which can cut DNA. When the sequence matches between the bacterial RNA and the viral DNA, Cas9 cuts the target DNA disabling the virus.

In this assay, They use Cas13 instead of Cas9 which recognizes and cleaves RNA instead of DNA. If the sample contains RNA from SARS-CoV-2, Cas13 will be activated and will cut the reporter molecule, causing the emission of a fluorescent signal within 15-30 minutes. Recent models of SARS-CoV-2 needs frequent testing with a fast turnaround time, this test is



unique as it uses a one-step reaction to directly test the viral RNA, as opposed to the two-step process in traditional PCR tests. With increased testing, we can avoid lockdowns and protect the most people from being infected. As Mobile phones are also mass-produced and cost-effective, demonstrating that specialized lab instruments aren't necessary for this test. This type of smartphone based diagnostic test could play a crucial role in controlling the current and future pandemics.

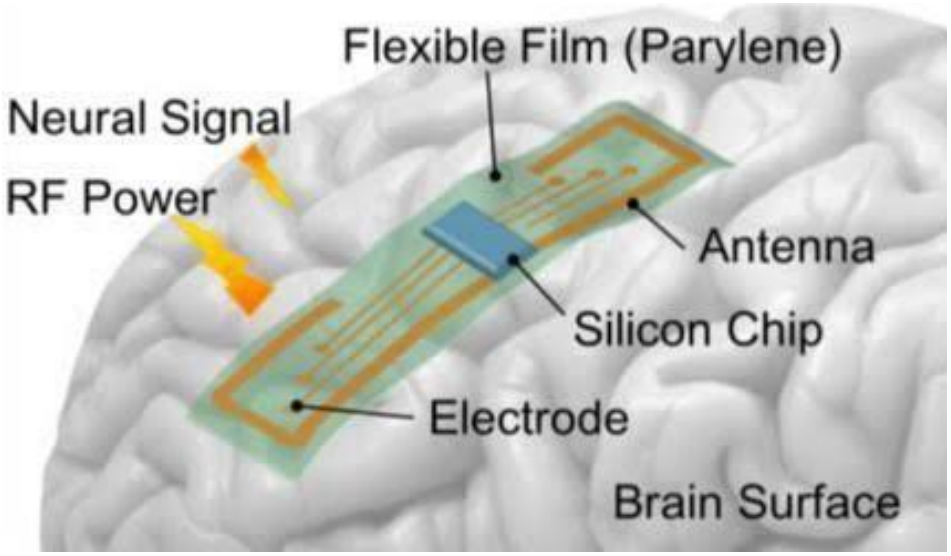
BIORESORBABLE WIRELESS BRAIN SENSOR

- **RAAMANARAYANAN A II YEAR BME**

In recent times, a team of physicians and scientists have joined hands to create an electronic biosensor which can be incorporated inside a brain to measure or determine the pH, temperature, blood flow rates and pressure of the brain. Moreover, it dissolves when no longer needed without the need of any surgical procedure. It is widely applicable in neuroscience field as brain trauma care and cerebral injuries causing death of about 10,000 patients every year. These kinds of injuries often cause the brain to swell, which constricts the flow of blood and oxygen, and can lead to permanent damage. So surgeons need reliable ways of monitoring the pressure inside their patients' head. In contrast to the earlier available sensors which were usually large, heavy and solid, so had to be removed through surgical procedures once the patient has recovered, these

THINK PIECE

bioresorbable wireless brain sensors are light, handy and could be easily inserted inside the brain to monitor intracranial pressure and temperature. Once the implantable device is not needed, it is absorbed by the body, eliminating the need of surgically removing the device. The sensors are remotely accessible through wireless connectivity. Advanced wireless brain sensors work on brain-computer interfaces to assist people with severe paralysis. It is a model which can be implanted that is fully rechargeable and transmit real-time neuron signals.



THINK PIECE

Brain sensors work on the brain-computer interface, a computer-based system that acquires, analyses and translates them into commands which are relayed to an output device like a speeling program, motorized wheelchair, robotic arms that carry out the desired function.

Neurosurgeons produced this clinically usable pressure sensor consisting of a polylactic-co-glycolic acid membrane suspended in a frame of silicon and magnesium. The electrical resistance of silicon sensor accordingly changes with the pressure of the surrounding fluid that causes membrane to fold or bend. The whole sensor device is further wrapped in watertight polymer which absorbs over a period of time, setting the lifetime of the sensor. Moreover, this technology can be used to monitor the activity in any organ system throughout the body and dissolve or degrade when critical period is over.

Percutaneous wiring system adsorbed with biodegradable polymer connect the sensors to the wireless transmission system on the top of the skull. Measurement of intracranial pressure and temperature was recorded using these biodegradable sensors which is done wirelessly and are connected with externally mounted potentio-stat transmitters for data transmission through percutaneous wiring. Narrower than the tip of a needle, it can be left in brain to monitor internal brain's activity before completely dissolving. They just get absorbed into the body. The storage and privacy of patient's data has allowed doctors to resolve or prevent more significant problems of the patient based on the case history.

THINK PIECE

***Written by* Charles McNair *and* Henry Lake**

Ignacio Montoya woke in his Los Angeles apartment before dawn. The world lay still.

Montoya was a man in motion.

He threw on his clothes. He walked his eager Labrador, Mimi. He grabbed a bowl of oatmeal, then hurried to offices at UCLA. There, with top medical experts, he's participating in one of the most advanced paralysis recovery therapies ever attempted.

It's *his* therapy. Montoya uses the experimental protocols and physical treatments on *himself*.

"For once you have tasted flight you will walk the earth with your eyes turned skywards, for there you have been, and there you will long to return."

— Leonardo da Vinci

It's been seven years since a motorcycle wreck paralyzed three-fourths of his body. Now, every morning, Montoya opens his eyes determined to walk again.

After that, he's determined to fly.

Before his 2012 accident, Montoya qualified to be a pilot in the U.S. Air Force, his eyes set on the F-16 fighter jet. Two broken vertebrae (and much else broken) forced him to hit the eject button on his flying career for the moment. It also delayed his graduation from Georgia State.

THINK PIECE

Just one year after the accident, Montoya finished his degree. He went on to earn a master's degree from Georgia Tech in biomedical innovation and development, then became executive director of a nonprofit with a mission to transform the standard of care for spinal cord and nerve injuries globally.

Now, he is the subject of one of the most extensive paralysis recovery experiments in medical history.

"This is my personal mission," Montoya says, "to get the human body to move, feel and function again after paralysis from a spinal cord injury. And I'm using my own body, experience and knowledge so that I and others may walk, run and jump tomorrow."

Montoya's academic and personal achievements, and flight credentials, also make him a candidate to become the first human being with a spinal cord injury to fly into space.

To recognize and celebrate his reinvention and determination, the Georgia State Alumni Association awarded Montoya a place on its prestigious 40 Under 40 alumni list for 2020.

"I'm grateful for the recognition," he says. "And grateful my Georgia State education has opened many doors."

Also, in an extraordinary dual celebration of achievement, Georgia Tech recognized Montoya as one of its own university 40 Under 40 honorees for 2020.

CREATE YOUR OWN AMERICAN DREAM

Imagine the odds against him.

When Montoya was 4, his beloved mother died of cancer.

"She was my everything," he says.

When Montoya was 6, his family emigrated from Cuba to the United States. The youngster left behind all he'd known — school, friends, customs, extended family. He

THINK PIECE

started life over in a complicated, competitive new country. He was the only family member who spoke English.

Then at age 22, he lost the use of both legs and one arm.

Montoya's accident hospitalized him for six months. After pulling through, he remembered his Air Force training: Observe. Orient. Decide. Act. He began researching what had happened to him and how he might recover.

"I painfully looked over the opportunities that existed — or actually *didn't* exist — for myself and for millions of people with the severity and complexity of this type of injury," he says. "I decided to create opportunities even if they didn't exist."

Montoya's resolve comes, in part, from a principle his father taught him when the family emigrated.

Create your own American dream, don't expect to chase it.

THE DISRUPTION

On Dec. 4, 2012, one day after his 22nd birthday, Montoya gave a speech at an induction and award ceremony of the Arnold Air Society, a professional organization for Air Force ROTC cadets. (Seeking a career as a pilot, Montoya simultaneously attended Georgia State and the Air Force ROTC program at Georgia Tech.)

"I left the event still in uniform," he says. "I put on my motorcycle helmet and waved goodbye. Thirty minutes later, I was lying in the middle of a street, no pulse and no breath. I literally died for 15 minutes and came back to life in an emergency room."

Montoya remembers nothing of the accident. Mercifully.

Witnesses saw Montoya, cruising on his pride-and-joy Yamaha R1 (Raven Edition), entering an intersection near his Duluth, Ga., neighborhood. A minivan cut in front of him. Montoya broadsided it at 45 mph.

THINK PIECE

Collapsed lungs. Sixteen rib fractures. Broken vertebrae, with paralysis from the chest down and in the right arm. Internal bleeding requiring 17 transfusions. Nerve loss to the right diaphragm, affecting breathing.

As it happened, the vehicle behind Montoya carried, he says, an "angel from God" — Kathryn Thorpe, a registered nurse from Children's Healthcare of Atlanta. When she came to Montoya's rescue, she found no heartbeat. In medical terms, Montoya was dead. But Thorpe didn't lose faith. Somehow, she kept Montoya's lungs filled with air until an ambulance arrived to connect him to an oxygen supply.

"I experienced cardiac arrest another six times in the intensive care unit," Montoya says. "For 31 days, I remained in a roto-hospital bed, turned from one side to the other, chest tubes on each side draining blood from my lungs. Every day for a month, doctors told my family they didn't know if I'd make it."

He made it.

His body stabilized after 30 days. His mind stayed asleep, in a coma, for 60 more.

Late in February, he woke.

"This is my personal mission, to get the human body to move, feel and function again after paralysis from a spinal cord injury. And I'm using my own body, experience and knowledge so that I and others may walk, run and jump tomorrow."

THINK PIECE

FLIGHT FROM CUBA

Six months in a hospital give a man time to remember.

Montoya recalled Camaguey, Cuba, where he was born Dec. 3, 1990. The Cuban government called the time the "special period"— a severe economic crisis. The Soviet Union had withdrawn support. Everyday Cubans fought to survive.

"Because I was only a baby, to me, things seemed normal," Montoya recalls. "I didn't know any better. I had a plate of food on the table. I had my family and the unconditional love of my mother, Carmen Maria."

Montoya's dad made ends meet. He drove bicycle taxis, tended bar, made electrical repairs, cooked. When electrical power failed, sometimes for days, Montoya's dad kept the lights on with lines connected to huge train batteries hidden in the backyard.

Montoya learned to be resourceful, too.

"If things broke, you'd always have to find a way to put them back together. There was no Walmart or Home Depot," he says. "I learned how to value and care for things at a young age."

Authoritarian life under the Castro regime grew unbearable. The Montoya family, he says, began to "re-evaluate our priorities, values, principles and self-dignity."

Montoya's father had considered fleeing the island, as many Cubans did, on a boat or raft — "anything that floated," Montoya says. The elder Montoya submitted applications to a visa lottery provided by the U.S. Interest Section in Havana. Only 1 percent of entrants would win.

The next year, "miraculously," Montoya says, the family received a precious visa to the U.S. But the miracle would be bittersweet — Montoya's mom was no longer with him.

"In late 1993, she was suddenly diagnosed with leukemia," Montoya says.

She died less than nine months after her diagnosis.

THINK PIECE

During his mother's illness, Montoya grew closer to his sister and grandmother. He was three months shy of his seventh birthday, and he did not want to leave the only home he'd ever known. Cuba held his mom's memories, his uncles and aunts, everyone and everything in his experience.

His uncle, Rafael Montoya, saw qualities in the youngster that would help him survive.

"Ignacio was strong and smart," he says. "Even then, he showed a willpower that few people will ever have. He was never the type to surrender."

On Oct. 6, 1997, at 6:30 p.m., Ignacio Montoya boarded a jet at Frank País International Airport in Holguín, Cuba. He stood by his father and waved goodbye to the first part of his life.

"I remember people telling me when my mom died that she'd gone up to the sky, to heaven," Montoya says. "And I was going inside a huge aircraft, a thing that I'd never even seen, much less flown in, and I was going up to the sky as well.

"And I was experiencing how everyone in that airplane burst into tears and started yelling 'Freedom at last!' as we landed in Miami. I saw my father cry for the first time in my life as he looked out the plane window."

It was a life-changing realization, one that has shaped him into who he is today.

"That day, I began to love and have a tremendous need for aviation — because in my mind that would be how I could help others, including my own family," he says. "Flying is how I would see them again, and one day possibly even rescue them."

"Ignacio is a genius, with an insane work ethic. He's brought the determination of an aspiring Olympic athlete to this field of health care. He's a miracle in the making."

— Ross Mason, founder, The Healthcare Institute for NeuroRecovery and Innovations

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THINK PIECE

FINDING THE WAY

A reporter from Telemundo interviews Montoya on his graduation day.

After graduating from Georgia State in 2014, Montoya traveled widely, visiting rehab hospitals, clinics, conferences and symposiums. He met top scientists, researchers, clinicians, therapists, engineers and innovators.

“We have incredible explorers in this field of uncertainty,” Montoya says. “They’re not afraid to ask, ‘what if?’ and step outside every box to try to make nerves regenerate, reconnect, rewire. But there’s little collaboration between fields. As a biomedical engineer, a soon-to-be neuroscientist and an explorer of new treatments for spinal injuries, that’s where I come in.”

Montoya began participating in 2016 in a trial to test a robotic right arm. This technology has provided new hope for treatment of peripheral nerve injuries and changed the standard of care for patients living with damage to the brachial plexus, the network of nerves sending signals to and from the shoulder, arm and hand.

Montoya graduated in December 2018 at the top of his Georgia Tech class. The Georgia House of Representatives passed House Resolution 301 honoring his achievements. In the battle to be fully recognized for his military service, it took seven years for Montoya to be listed as a veteran by the National Personnel Records Center at the National Archives — another hard-won achievement. Still, Montoya's fight to be fully recognized by the VA goes on.

Montoya took a role as executive director of a nonprofit called HINRI Labs — The Healthcare Institute for NeuroRecovery and Innovations. At HINRI, he would offer himself for emerging technology, techniques and protocols to help the recovery of patients with spinal cord injuries.

Ross Mason founded HINRI. He believes Montoya's unique work will transform the spinal injury field sooner rather than later.

"Ignacio is a genius, with an insane work ethic," Mason says. "He's brought the determination of an aspiring Olympic athlete to this field of health care. He's a miracle in the making."

In 2019, Montoya attended a Chicago symposium featuring Dr. Reggie Edgerton, UCLA's vice chair of integrative biology and physiology. Edgerton has been a leading scientist in neurobiology and spinal cord injury for five decades. After his presentation, Montoya approached.

The two men spent the next six hours talking.

Montoya told Edgerton he'd just been given a deadline by the Air Force to re-enter his officer commission. He had until December 2020 to stand on his own if he wanted to return to the Air Force and pursue his fighter-pilot dreams.

Montoya explained that he'd just walked a record-setting 650 miles — nearly 25 marathons — in the first-ever home lokomat, an exoskeleton orthosis suspended over a weight-support system attached to a treadmill. He added that HINRI had just raised $9.3 million to fast-track a cure for paralysis, and that it was his job as executive director to find, test, optimize and accelerate potential therapies — on himself.

The meeting eventually led to Montoya's groundbreaking 12-month test program in Los Angeles. He drove from Atlanta to California in his adapted SUV and started in January 2020.

"We have never studied an individual with the combinations of injuries received by Ignacio," says Edgerton. "We're anxious to utilize the physiological and technical capabilities we and others have developed to determine if it's possible to achieve a new level of multiple sensory-motor and autonomic functions for him, with our primary target being independent standing."

"This is the longest clinical trial ever of this type," Montoya says. "It's the first time in history that electrical stimulation is being used to attempt to reverse paralysis in all systems of the body after a spinal cord injury, and it's the first time that the body as a whole is being analyzed and targeted as one single organism.

"We're using electrical stimulation to amplify remaining connections and help create new ones to get me moving voluntarily and standing by December 2020," he says. "We then want to fast-track and scale these findings in our lab in Atlanta to 400 participants."

PRIMATE NO. 13?

While Montoya wants to walk in the world again, he's also shooting for the stars.

"I have applied to be an astronaut candidate through NASA," he says. "My experience as a fighter pilot select through the Air Force and my master's in biomedical engineering qualify me.

"I went from riding an R1 motorcycle and dreaming of flying an F-16," Montoya says, "to riding an F5 Permobil Vertical Standing Power Wheelchair, and now, hopefully soon, a rocket."

Edgerton has worked with space agencies to send 12 primates into space for experiments, testing different conditions for effects on the spinal cord.

"I'd like to be primate number 13," Montoya smiles. "It's always been a dream to go into space."

Edgerton feels Montoya is capable.

"Zero gravity is probably more easily manageable for a paraplegic well adapted to the absence of weight-bearing," Edgerton says. "Ignacio certainly is not bound by the lack of motivation and determination. With his bioengineering training, he could be a wise choice."

Edgerton is not the only believer in Montoya's dream. NASA has notified Montoya he is on its highly qualified applicant list. Montoya hopes as soon as 2021 or 2022 to go to space.

"Ironically," he says, "it may work out that this spinal cord injury has put me in a special position to accomplish that goal."

But Montoya's more immediate goal and deadline are approaching this December.

TO WALK AGAIN

As Montoya's trial began early this year, therapists each morning applied electrical stimulation to his lower, mid and upper back in a daily, multi-hour session. Small electrodes sent continuous currents, and Montoya's body contracted and quivered during intense exercises that engaged different muscle groups.

"I sweated my life out," he says.

After hours of this therapy, he would then drive himself to a paralysis recovery gym for training all afternoon.

When the coronavirus pandemic swept in, things changed. On March 6, UCLA suspended the clinical trial until further notice. On March 12, the paralysis recovery gym locked down, too.

Montoya improvised.

"I moved all of my physical therapy equipment and locomotor training devices to my apartment and basically turned it into a decent-sized gym," Montoya says. "I coordinated schedules with my physical trainers and, thank God, we've kept our routine.

"Every single day for three hours straight I use my left arm, my only fully functional extremity, to move and activate the other three limbs. This way, I've been able to maintain what I've recovered in the clinical trial."

There's the million-dollar question: What has Montoya recovered?

Keep in mind that the word recovery is rarely mentioned with "complete" spinal cord injury. Montoya's physical therapist, Cindy Lopez, updates his progress:

"Ignacio is and has been constantly improving," she says. "His muscles are engaging more with each exercise. His quads are engaging and contracting on command. His independent trunk posture and stability have also significantly improved. From what he recovered in just the first two months, I can say that his paralysis is no longer considered 'complete.' It's now 'incomplete' and hopefully soon completely reversible."

On Aug. 11, he began moving his toes for the first time in seven years. He can now kick his legs while exercising, using both sets of obliques, hamstrings and quads.

“If someone just runs a finger down my thigh or the bottom of my foot, my whole body and nervous system respond,” he says. “I get chills, goosebumps, my toes wiggle, my ankle moves and my legs react. I’ve actually kicked a few people really hard, including my poor girlfriend Hilda.”

Hours each day, he walks on a treadmill with two therapists moving his legs and another supporting his waist.

“I do this while I stare at a mirror, tricking my mind, imagining I am generating the movements, not the therapists,” Montoya says. “I’m using visualization and all my senses to help me create new neural connections and respective coordinated and controlled muscle activation.”

The same month he began to regain movement in his toes, Montoya drove six hours to San Francisco to take 1,204 steps in a filmed test of a revolutionary locomotion exoskeleton. The trial was such a success Montoya is now using the video footage to crowdfund for the $500,000 he’ll need to buy an exoskeleton of his own.

He has a personal deadline to walk again by Dec. 4, 2020 — the eighth anniversary of his accident. The day he woke from his coma, he set this goal.

Now, he’s on track to meet it.

Source: ***https://news.gsu.edu/magazine/ignacio-montoya***

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