A Glance at COVID-19 Combating Initiatives @ IITH

KID: 20200103

Research Area

I. Sanitizers:

1. Prof. Zafar Ali Khan (EE dept.) is working on UV-C based LED sanitizer.

II. Masks, Face shields & Protective wear:

2. Pure EV, under the leadership of Dr. Nishanth Dongari (MAE dept.), is working on to bring out a face shield in large quantity in collaboration with RCI Hyderabad.

3. Dr. Renu John (BME dept.), Dr. Suryakumar (MAE dept.) and their team are working on Design and production deployment of reusable face masks. These PPE face masks, which provide better protection than cloth masks are autoclavable and can be reused by changing the filter.

4. One of the incubates of CfHE, Dr. Sai Laxman under the mentorship of Dr. Renu John (BME dept.) has come up with a full design of PPE (protective gear, and face shield), "USafe - Sterilisable Face Shield & Protective Gown", designed, tested and prototyped.

5. Dr. Jyotsnendu Giri (BME dept.) and EaffoCare Innovation developing Antiviral coating for PPE and common surface.

6. Dr. Kousik Sarathy is working on UV box for disinfection of Masks.

7. The fellows of CfHE are working on an isolation hood for COVID-19 positive patients where healthcare providers can go near without fear and do procedures like intubations and inoculations.

III. Ventilators and other Hardware:

8. Aerobiosys, a startup of Centre for Health Care Entrepreneurship (CfHE) at IITH, has developed a low-cost portable ventilator, Jeevan Lite.

9. Dr. Prashant Kumar and his student Mangesh Ratolikar (MAE dept.) have developed a remotely operated mobile robot for hospitals and isolation wards for the purpose of interacting with patients or persons in quarantine, distributing food or medicines, and collecting trash. Dr. Harish Dixit (MAE dept.) is working on developing flow sensors for the ventilator system.

10. Dr. Prashant Kumar, Dr. Syed Khaderi and Dr. Viswanath (MAE dept.) are developing low cost, portable easily scalable mechanically actuated ventilator.

11. Dr. Nishanth Dongari (MAE dept.) is developing DC motors for ventilators.

12. Dr. Nishanth Dongari (MAE dept.) is developing Lithium batteries for thermal scanners and medical equipment.

13. Dr. Amit Acharyya & Dr. Ashudeb Dutta (EE dept.) and their team through their startup "Sensehealth" at iTIC IITH, has developed "Low-Cost One-stop ECG Solution functional as (a). Ambulatory (inside ambulance), (b). Hospital, (c). at home (during isolation period) and as (d). Holter in COVID-19 pandemic."

14. Dr. Renu John (BME dept.) is working through CfHE at IITH on efficient pulmonary rehabilitation system for post ventilator patients for efficient prognosis and a low-cost lab on a chip for detection of COVID-19 virus with fast turn over results.

IV. Drugs & Vaccines:

15. Dr. Ashudeb Dutta, Dr. Soumya Jana and Dr. Shiv Govind Singh (EE dept.) are developing a smart wearable patch for the prevention of quick spread COVID-19 pandemic.

16. Dr. Ranjith (MSME dept.) & Dr. Aravind Rengan (BME dept.) are developing Smart accessories for control and mitigation of infectious organisms.

17. Dr. Aravind Kumar Rengan's group (BME dept.) is working on the repurposing of anti-malarial nano-formulation targeting lung tissues to tackle virus-mediated inflammation/ fibrosis and acute respiratory distress.

18. Dr. Ashish Misra's Laboratory (BT dept.) is working on designing and developing DNA and mRNA based vaccine candidates for SARS-CoV-2.

19. Dr. Ashish Misra's Laboratory (BT dept.) is also working on repurposing FDA approved drugs to block SARS-CoV-2 infection in humans.

20. Dr. Rajkumara (BT dept.) is working on In silico engineering of putative epitope peptides from proteins of SARS-CoV-2 on nano-particles to develop vaccine candidates.

21. Dr. Mudrika Khandelwal (MSME dept.) and Ashish Misra (BT dept.) are developing Pulmonary delivery of antiviral herbal oils for adjuvant therapy

22. Dr. Thenmalarchelvi (BT dept.) is identifying potential drug targets in the structural proteins of SARS-Cov-2.

23. Dr. Jyotsnendu Giri (BME) is working on a peptide-based vaccine for SARS-Cov-2.

V. Sensors/Detection and Air purifiers:

24. Dr. Shiv Govind Singh (EE dept.) is developing rapid, ultrasensitive biomolecule sensor for detecting coronavirus in individuals.

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25. Nemocare and Heamac, two startups of CfHE, mentored by Dr. Renu John (BME dept.) are working on wearables for COVID-19 patient monitoring in isolation wards without having to go near to the patient unless there is an emergency. Nemocare Raksha is a wireless wearable for monitoring COVID-19 patients. This device is for COVID-19 patients in the ICU segment and home care segment. The device is ready to be manufactured on a large scale.
26. Dr. Ashudeb Dutta, Dr. Gajendranath Chowdhary and Dr. Soumya Jana (EE dept.) are developing an "A Handheld Contact-less Temperature Recording Device" for measuring the temperature for advanced fever screening in the COVID-19 pandemic.
27. Kvayat Medical, a start up from CfHE, under the mentorship of Dr. Renu John (BME dept.) has developed a product "Traqaro", which enables organised tracking and monitoring of COVID-19 patients with the help of a Bluetooth-based wearable.
28. Heamac Solutions, a start-up from CfHE, under the mentorship of Dr. Renu John (BME dept.) has developed A Tracker to diagnose & prevent COVID-19 spread with the help of a wrist band to detect symptoms of COVID-19 infection, screening & support.
29. Dr. Jyotsnendu Giri and Dr. Hari Krishnan (BME dept.) are working on rapid, affordable, portable SARS-Cov-2 screening kit.
30. Dr. Ch. Subrahmanyam (CHY dept.) and Dr. Shashidhar (CE dept.) are working on Air purifiers that can help residents, hospitals and malls to purify air contaminated with viruses.
31. Dr. Chandrasekhar (CHE dept.) and Dr. Anindya Roy (BT dept.) are developing a nano biosensor for rapid and early detection of SARS-CoV-2.
32. Dr. Lopamudra Giri and Dr. Suahanya (CHE Dept.) have started designing a 3D printed device that can be used for the detection of multiple proteins by using immunoassay for SARS-CoV-2 infection diagnosis and severity categorization.
33. Prof. Zafar Ali Khan (EE dept.) is working on Real-time detection of COVID-19.

VI. Apps and Software:

34. Dr. Harish Dixit (MAE dept.) is building a cough simulator to test the efficacy of masks and this work is being carried out based on discussions with colleagues at IIT Bombay, TIFR Mumbai and ICTS Bangalore.
35. Dr. Rajalakshmi (EE dept.) is working on IoT enabled remote monitoring of temperature and respiratory rate for COVID-19 infected patients.
36. Dr. Mohan Raghavan and Dr. Kousik Sarathy (BME dept.) have been working on Data analysis and modelling of COVID-19 disease spread.
37. Dr. Krishna Mohan (CSE dept) is leading a team to work on using visual surveillance to detect social distancing & people wearing masks.
38. Dr. Vineeth (AI dept.) and his team are working on AI to explain decisions on detecting Coivd-19 using chest X-ray
39. Dr. Kishalay Mitra (CHE dept.) is working on deep learning based cost-effective and rapid prognosis of COVID-19 to aid the state-of-the-art PCR & serology based diagnosis in India
40. Dr. Kishalay Mitra and Lopamudra Giri (CHE dept.) are working on development of computational and visualization software for evaluating GPCR targeting drugs with the aim of mitigating coronavirus infection level

VII. Other Areas:

41. Dr. Digvijay Pawar and Dr. Pritha Chatterjee (CE dept.) are modelling the Impact of COVID-19 outbreak on the daily commute and vehicular emissions during the transition phase.
42. Dr. Mahati and Dr. Haripriya (LA dept.) are working on exploring working mothers' experiences, regarding housework, childcare and professional work during the lockdown through regular interviews.
43. Dr. Satya Prakash Singh (Maths Dept.) is working on A cost-effective approach to the design and analysis of multiple experimental groups: a useful methodology for comparing potential treatments for COVID-19
44. Dr. Shuhita Bhattacharjee (LA) is working on "Urban Patterns of Gendered 'Productivity,' Emotional Abuse, and Anxiety during COVID-19."
45. Dr. Prabheesh (LA dept.) is working on the impact of COVID-19 on financial markets.
46. Mr. Shiva Ji (Design Dept.) is working on "Design for the New World: Post COVID-19: A Disruptive Change in Context".
47. Dr. Ambika (CE dept) is working on the Impact of COVID-19 on Environmental Sustainability
48. Dr. Sathya Peri and Dr. Vineeth have initiated work on Effective Framework for Managing supply and demand post-lockdown using Federated Learning

Publications on COVID-19 related topics

49. Dr. S. Narendra Nath, Seismic Noise Changes during COVID-19 pandemic: A case study of Shillong, India, Natural Hazards

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Inter-disciplinary and Rural Development Projects approved by IITH #fight against COVID-19

ID-RD Projects:

- Objective: Promote inter-disciplinary research and innovation along with specific focus on Rural Development
- Duration - 2 years
- Funding - up to 10 Lakhs
- Outcome - Product/prototype

ID-RD Projects 2020-2021:

105 faculty (half of the total faculty strength of the institute) participated in the call for ID projects, 23 faculty are involved in the selected projects. In case of RD projects, 29 faculty were involved in the proposed projects and 8 are involved in the selected projects.

- Project proposals received: 75 Inter-disciplinary + 18 Rural Development
- Projects selected: 15 Projects (10 Inter-disciplinary and 5 Rural Development) are selected for 2020-2021
  ~ Of these 2 projects are COVID-19 related as mentioned above
  ~ Project starts from 1st, June, 2020.

S.No.	Title of Project	PI Name	Co-PI	Deliverables
1	Study of Response Control and Mitigation of Bio Organisms/Molecules Under Small Voltage electrical signals on Ferroelectric Polymer and/or Polar Surfaces (COVID-19 related project)	Dr. Ranjith Ramadurai (Dept. of Materials Science and Metallurgical Engineering)	Dr. Aravind Kumar Rengan (Dept. of Biomedical Engineering)	A successfully tested face mask with the filter developed in this project should be demonstrated.
2	Anti-viral coatings of electrochemically reduced metal nanoparticles for respirators (COVID-19 related project)	Dr. Suhash Ranjan Dey (Dept. of Materials Science and Metallurgical Engineering)	Dr. N. K. Raghavendra (Dept. of Biotechnology)	A successfully tested face mask with the filter developed in this project should be demonstrated.

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Students' Proposal approved under BUILD #fight against COVID-19

BUILD program: Bold and Unique Ideas Leading to Development

- Objective - Promote creativity and innovation among students
- Duration - 6 months
- Funding - up to 1 Lakhs
- Outcome - Product/prototype (hardware or software or app)
- Open to all students of BTech/BDes/MTech/MDes/MSc/PhD

BUILD 2020 program:

- Total Project proposals received: 34
- 5 member Committee constituting of Director, Dean Students, 1 Faculty from 3 departments - CSE, EE, MAE evaluated the proposals under 3 categories
  ~ Hardware, Software and COVID-19

Total of 16 projects are selected for BUILD program 2020

~ Of these 8 projects are COVID-19 related IITH (5 0 % o f s e le c t ed projects)

~ Grateful that 5 COVID-19 related projects are supported by IITH ALUMNI

Project starts from 1st, August, 2020 to 31st, January, 2021

Projects selected and supported by IITH

S.No.	Title of Project	Team Members (Name, Roll Number including PI)	PI Name
1	Swatchh Air	Priyabrata Rautray (MD17RESCH11001), Nibedit Dey (HC17FCI11006)	Priyabrata Rautray (MD17RESCH11001)
2	Pairing of BT Devices to Measure Distance	Sushanta Banerjee (Jeorge), (EE19MTECH11034)	Sushanta Banerjee (Jeorge), (EE19MTECH11034)
3	Gamification Of Online Education (Physics)	Raghav Gupta (CS19MTECH11024)	Raghav Gupta (CS19MTECH11024)

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Projects selected and supported By IITH Alumni

S.No.	Title of Project	Team Members (Name, Roll Number including PI)	PI Name
1	Face Shield for Doctor and health workers	Priyabrata Rautray (MD17RESCH11001), Nibedit Dey (HC17FCI11006)	Priyabrata Rautray (MD17RESCH11001)
2	Self-sanitizing coatings for germ spreading surfaces.	Parth Bhala (ME17BTECH11036), Akshat Loya (ME17BTECH11003)	Parth Bhala (ME17BTECH11036)
3	Post-Pandemic Food Safety & Hygiene	Dharmgya (ME17BTECH11021), Aditya (ME17BTECH11048)	Dharmgya, (ME17BTECH11021)
4	Automatic Disinfectant Tunnel	Dhanalakshmi (ME16RESCH11003), Surendra Kumar Soni (ME13M15P000004) Soundar (PH13P0002)	Dhanalakshmi (ME16RESCH11003)
5	Mobile robot for food, medicines and other essential items delivery in isolation ward for COVID-19 patients	Mangesh (ME17RESCH11003)	Mangesh (ME17RESCH11003)