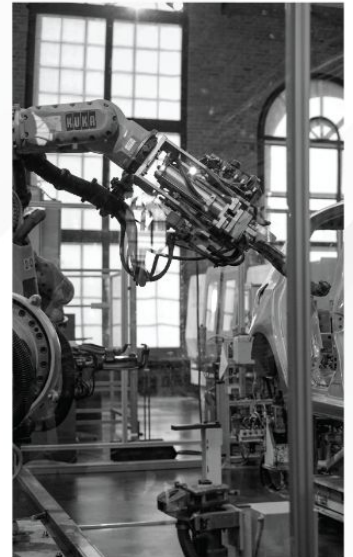


MEDICAL



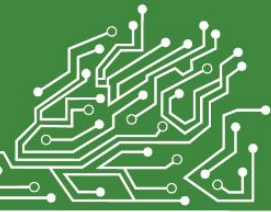
INDUSTRY



AGRICULTURE

DEFENCE





Message from Director, IIT Delhi

I am happy to see the 2nd edition of Cobotics News published by I-Hub Foundation for Cobotics (IHFC) at Indian Institute of Technology (IIT) Delhi!

IIT Delhi has passed through a very difficult phase during the 2nd wave of COVID pandemic when we lost many of our renowned ex-colleagues. We also lost one of our Hub Governing Body (HGB) members. IHFC expresses deep condolences to all their families. It is, however, good to note the several initiatives taken by the energetic team of IHFC in the past few months. As per the mandate given by Department of Science and Technology (DST), IHFCs have been acting as micro-ministries coordinating activities at the national level in their chosen areas of study. DST, through a national level scheme, has created 25 Technology Innovation Hubs in the country. I am confident, the synergy between the projects submitted to the IHFC, by stitching them together to form common objectives and expert groups will lead to a new framework of working together in the country. I convey all stakeholders (i.e., the IHFC team, Grand Project Coordinators, Principal Investigators of the projects, Start-ups and associated Industries) my best wishes for fruitful outcomes in the form of hardware or software. I am also eagerly looking forward to the contributions from medical and technological fraternities for the launch of medical simulation activity of IHFC, which is expected to be a first of its kind activity in the country. In the meantime, I hope to see all TIHs joining hands and collaborate to develop the much needed technologies for the country in the nation's pursuit to become *Atmanirbhar* in these high technology areas.



Prof. V. Ramgopal Rao

Director
IIT Delhi

Message from Project Director, IHFC

In the middle of COVID pandemic when we lost one of our HGB members (Mr. Rajeev Karwal of Milagrow Robotics), only consoling news is that we are completing our first year of existence at IHFC successfully. Our company IHFC was incorporated on June 13, 2021. I am happy to see this 2nd issue of our Cobotics News for which I want to congratulate our newsletter team for their timely initiative and effort to bring it on time. In last six months, we mainly focused on forming eight Grand Projects (GP) based on the 50+ submitted projects to IHFC from our collaborators around the World, and planning to set up a Medical Robotics and Simulation Center at our Sonepat Campus. Regarding the GPs, I want to thank our GP Coordinators drawn from four institutes, namely, IIT Delhi, Kanpur, Madras, and IIIT Allahabad for their hard work in last 3-4 months to bring the Principal Investigators (PIs) of various projects in a common forum. It is expected that these areas of Rehabilitation Robotics, Medical Simulators, Healthcare Robotics, Drone Applications, Human-Robot Interaction (HRI)-Intelligent, HRI-Control, Industry 4.0, and Intelligent Systems and Secured Communications will represent expert groups in the country to take any kind of challenges to cater to the requirements of industries and government departments. The simulation center is expected to boost the advanced training equipment and facility for the medical practitioners. We successfully conducted nine monthly seminars by exposing the audience to various aspects of Cobotics and allied areas. Finally, we are happy to start generating our revenues from the consultancy and CEP (Continuing Education Programme) sponsored by industries. Let us keep up the tempo for greater contributions to the society for which we will seek support and collaboration of all TIH and other stakeholders! Jai Hind!



Prof. Subir Kumar Saha

Professor, Dept. of Mechanical
Engineering, IIT Delhi

Message from CEO, IHFC

We like most businesses, amid recovering from COVID-19 pandemic cannot ignore the fact that IHFC's growth has also been stunted. We experienced, or rather are experiencing, a shortfall in hiring the best-qualified talent across the board, delayed partnerships, challenges in managing our projects remotely amidst office space restrictions. So IHFC decided that it will, in turn, use this as an opportunity to grow in ways which would not be possible without the new normal of working styles induced by the pandemic. We remotely met all our project teams (50+ teams in 6 weeks), creating 8 Grand Projects, bringing together faculty and researchers from 30+ institutes/organisations working as a team, and which instil in every team member a sense of pride and ownership. How many people can say with confidence that they are doing something great and epic for the future, creating and incubating businesses and being backed by the Govt. of India? Well, we for sure can. Some of our grand projects are very easy to understand and people resonate with the titles in one moment, but the others are probably even bigger. If we examine the core issue with humanity today, it is not education or information rather an appropriate transfer of knowledge and learning system. Fortunately for us, the Department of Science and Technology, through NM-ICPS showed faith in us to enable that and thereby create a future where humans and robots collaborate seamlessly. Being hosted at IIT-Delhi gives us access to some of the sharpest minds as resources and supports our growth without a personal agenda in mind. If you examine our CoboTalks (our seminar series) participants, you will notice every single person has a very lucrative career yet chalks out their valuable time willingly because they see the impact that our work will have over time. When we get doctors and highly paid surgeons, who are always overworked, volunteering their time to meet with us for our best-in-class international simulation training center planned for medical professionals/students, we realize that our work is going in the right direction. Wish best of health to you and your family!



Mr. Ashutosh Dutt Sharma

Chief Executive Officer (CEO)
IHFC, IIT Delhi

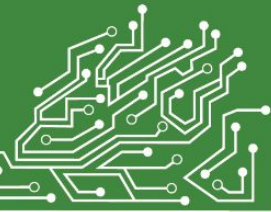
Expert Talk - Rehabilitation based on Brain Computer Interface (BCI)

There exists world-wide interest in BCI as the new tool for developing cognitive electronic appliances for a number of applications including those in the domain of prosthetics, interface for robotic systems and consumer behavioural modeling. There exists a strong research challenge for developing robust signal analysis and interpretation devices for brain signals, including EEG, which needs to be adaptive for individual applications. Applications of BCI are many. For example, in a typical BCI Controlled Upper Body Neuro-Prosthetics and touch Sensation, information is extracted from EEG signals, and successfully used to control a robotic device for instance as a substitute of a moving human limb. The computer generated signal is fed back into the patient's own limb to activate muscles through a functional electrical stimulation. People suffering from partial paralysis or Alzheimer's and Parkinson's disease can be supported with such BCI technologies by controlling a robotic arm or an Electric Powered Wheelchair (EPW) using their brain signals as controls. Stroke survivors/injured defence personnel can also partially recover their lost motor function through such rehabilitation approach. One can also consider Brain controlled Robotic Wheel Chair for disabled persons having restricted limb movements caused by some diseases such as Parkinson's disease and quadriplegics. The movement of the wheelchair can also be controlled in various directions using the EEG signal. It can also be stopped at any time and its speed can also be controlled.



Dr. Atanendu Sekhar Mandal

Senior Research Scientist, IHFC
Ex-Scientist CSIR-CEERI Pilani




CoboTalks: A Monthly Seminar Series

1 14th Oct 2020



Prof. Rohan Paul
CSE, IIT Delhi
Title: Journey of IHFC formation



Prof. Ashwini Vaidya
HSS, IIT Delhi
Title: Computational Linguistics

2 11th Nov 2020




Dr. Atanendu Sekhar Mandal
IHFC, IIT Delhi
Title: Cognitive Computing




Prof. Sumitava Mukherjee
HSS, IIT Delhi
Title: Cognitive insights in human judgment

3 9th Dec 2020




Prof. Sunil Jha
ME, IIT Delhi
Title: Robotics in smart factory




Prof. Samar Husain
HSS, IIT Delhi
Title: Natural Language Modeling

4 20th Jan 2021




Prof. Arpan Chattopadhyay
EE, IIT Delhi
Title: Some recent results on security of Cyber-Physical Systems




Dr. Sunil Kumar
Post-Doc, IIT Delhi
Title: Polymer Based DEA for Robotics

5 17th Feb 2021




Prof. Ou Ma
University of Cincinnati, Ohio
Title: Decentralised control for a group of robots to perform collaborative tasks




Pushpendra Singh
CSE, IIT Delhi
Title: iHub-Anubhuti: TiH in Cognitive Computing & Sensing

6 10th Mar 2021



Prof. Bharadwaj Amrutur
ECE, IISc Bangalore
Title: Technology Innovation Hub at IISc Bangalore




Dr. Anirban Nag
Post-Doc, IIT Delhi
Title: Geometry in parallel manipulators

7 14th Apr 2021




Prof. Sunita Chauhan
Monash University
Title: On Medical Robotics

8 12th May 2021



Prof. Richard Voyles
Purdue University
Title: Semi-Autonomous Robotic Surgery



Dr. Nayan Kumar
Post-Doc, IIT Delhi
Title: Modeling and Analysis of Grid Connected Stand-Alone PV Systems

9 9th June 2021



Dr. Xavier Cyril
Ex-Sr. Director at L3 Harris, Canada
Title: Simulation Assisted Product Lifecycle

1st Anniversary of IHFC

I-Hub Foundation for Cobotics (IHFC) was incorporated as a non-profit (Section-8) company at IIT Delhi on June 13, 2020, with the funding of Rs. 170 crores (USD 20 million) over a period of 5 years from the Department of Science Technology (DST), Government of India under its National Mission on Interdisciplinary Cyber Physical Systems (NM-ICPS). Recently, IHFC has turned one and celebrated its first anniversary on June 18, 2021. We were glad to have the honorable Secretary of DST, Prof. Ashutosh Sharma, as a chief guest of the event. We also got the presence of Prof. V. Ramgopal Rao, Director, IIT Delhi; Mr. Ashutosh Dutt Sharma, CEO at IHFC; Prof. S. K. Saha, Project Director at IHFC; Dr. Gautam Shroff, Dr. Aloknath De, Prof. Santanu Choudhury, Dr. KR Murali Mohan as Hub Governing Board (HGB) members, and many other distinguished professors, researchers and students from all over India and abroad. During this event, Mr. Ashutosh Dutt Sharma shared last year's progress updates about IHFC and its activities like monthly seminar series, consulting, startup building, skill development programs, etc. HGB members also provided their views about IHFC and the future it will create for society. Prof. Ashutosh Sharma gave a detailed view of the guiding principles to put forward a successful path not only for the IHFC but also to the overall purpose of the NM-ICPS. During this esteemed occasion, the IHFC team also disclosed the 8 multi-institute grand projects towards technology development in the area of Cobotics, of which a few have been already initiated. The project coordinators of each grand project presented the overview of their respective grand projects and a glimpse of the ongoing & future work. It was a very proud moment for the IHFC to celebrate its first anniversary and share some of the achievements and plans to propel its objectives. Please visit this link <https://youtu.be/VxeAFAnOqiA> to view the recorded video of this event.

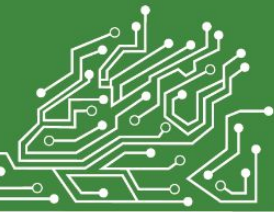
IHFC TURNS ONE



Left to Right: Prof. V. Ramgopal Rao, Prof. S. K. Saha, Mr. Ashutosh Dutt Sharma



Dr. Venkat Bokka, Dr. A.S. Mandal, Mr. Kamla Prasad, Prof. S. K. Saha, Prof. V. Ramgopal Rao, Mr. Ashutosh Dutt Sharma, Mr. Utkarsh Bajpai, Mr. Sharbhanu Dutta



Research and Development Initiatives

IHFC has envisioned creating and implementing **eight multi-institute grand projects** towards research and technology development in the area of Cobotics.

1. Human-Robot Interaction Intelligence

Objective: Development of novel robot-learning techniques for effective human-robot interaction.

Project Coordinator: Prof. G.C. Nandi, IIIT Allahabad

Collaborating Institutes: IIT Delhi, CSIR-CMERI Durgapur, IIIT Allahabad

2. Healthcare Robotics

Objective: Development of collaborative robotics solutions for the healthcare sector.

Project Coordinator: Prof. Laxmidhar Behera, IIT Kanpur

Collaborating Institutes: IIT Kanpur, IIT Jodhpur, Tata Consultancy Services.

3. Rehabilitation Robotics

Objective: Design and Development of robotic exoskeletons and exo-suits for human rehabilitation and augmentation.

Project Coordinator: Prof. Ashish Dutta, IIT Kanpur

Collaborating Institutes: IIT Delhi, CSIR-CMERI Durgapur, IIT Guwahati, IIT Gandhinagar, IIT Kanpur, IIT Roorkee, Mahindra Ecole, Tezpur University.

4. Industry 4.0

Objective: Development of collaborative robot solutions for the future of Indian industry.

Project Coordinator: Prof. Sunil Jha, IIT Delhi

Collaborating Institutes: IIT Delhi, NIT Durgapur.

5. Human-Robot Interaction Control

Objective: Development of novel robot-control architectures for effective human-robot interaction.

Project Coordinator: Prof. I. N. Kar, IIT Delhi

Collaborating Institutes: IIT Delhi, IIIT Delhi, SIT Japan.

6. Medical Simulation

Objective: Development of state-of-the-art medical simulators for training and education.

Project Coordinator: Prof. Asokan Thondiyath, IIT Madras

Collaborating Institutes: IIT Delhi, IIT Madras, Monash University, Merkel Haptics, NAVTAT Solutions.

7. Drone Applications

Objective: UAV research and application-based product development for the betterment of society.

Project Coordinator: Prof. Laxmidhar Behera, IIT Kanpur

Collaborating Institutes: IIT Delhi, CSIR-CEERI Pilani, IIT Mandi, IIIT Hyderabad, Delhi Technological University, MGR University and IIT Kanpur.

8. Intelligent Sensing and Secured Communications

Objective: Development of sensors and secure communication methods for intelligent cobots.

Project Coordinator: Prof. Amol Choudhary, IIT Delhi

Collaborating Institutes: IIT Delhi.

Skill Development: Global Online Course on Fundamentals of Cobotics

IHFC has launched an online course, namely Global Online Course on Fundamentals of Cobotics, to introduce Cobotics to engineering and science graduates, teachers, and industry professionals. The course also includes the industry sessions by **Mathworks** and an **international expert** with 30+ years of experience. This course will help lay the foundation for building blocks and necessary tools to conduct research and development in cobotics. **The registration deadline is July 25, 2021.** Please visit www.ihfc.co.in/sdp.html for further information.

Promoting Entrepreneurship: Grand Challenge

IHFC, in collaboration with Foundation for Innovation and Technology Transfer (FITT), IIT Delhi, is organizing the Grand Challenge in the area of **Medical Devices and Healthcare**. This initiative is supported by the Ministry of Electronics and Information Technology and the Department of Science & Technology (Ministry of Science and Technology) Government of India. This Grand Challenge is being organized for the early-stage startups as well as a group of students/researchers with innovative ideas or prototype in the following directions:

- 1) High impact products based on frugal innovations that address healthcare challenges, including (but not limited to) Cobotics/Robotics in Medical and Health care (Surgical devices, rehabilitation, care, etc.), Medical simulators, Patient support and care (Portable ventilators, Pulse oximeters, Oxygen concentrators, etc.) Personal Protective Equipment, Diagnostics, Informatics (Health care information systems, Movement tracking & tracing, Crowd management, etc.)
- 2) Any solution that addresses/mitigates various challenges faced by country/society due to the severe impact of COVID-19.
- 3) Product/solution (near-ready/ready for deployment) or manufacturing scaleup/repurposing of existing products and services that can be quickly deployed.

Investment Mechanisms:

- Entrepreneur in Residence Fellowship - Rs 4 Lakhs (Proof of concept ideas)
- Grant Fellowship - Rs. 7 Lakhs (Prototype-based ideas or Pre-commercial based concepts)
- Seed Level Investment - Rs. 10 Lakhs (Market Ready ideas)
- Scale-Up Investment - up to Rs 1 Cr (scaling up a revenue stage startup)

The last date to apply is July 15, 2021. For more details, please visit www.ihfc.co.in/gc.html

Research & Entrepreneurship Development Program

IHFC is pleased to provide an internship opportunity to young and outstanding Indian engineering graduates and students who are interested in problem resolution through collaborative robotics research and development. IHFC seeks to provide financial assistance, mentorship, and guidance to individuals who want to go beyond the usual internship route and make a meaningful contribution to their society's development. **The deadline to register is July 31, 2021.** The program will **start from 1st week of September.** Please visit www.ihfc.co.in/Activites.html for further information.

**Mobile
Robots****Industrial
Robots****Flying
Robots****Parallel
Robots****I-Hub Foundation for Cobotics****EDITORIAL TEAM**

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