



**Centre for Career Development,
Indian Institute of Technology Guwahati**

Centre for Intelligent Cyber Physical Systems

Robotics & Artificial Intelligence

Message from Head of Centre

Centre for **Intelligent Cyber Physical Systems** at IIT Guwahati is established to promote activities focused on Technology Development, Human Resource Development, Technology Business Incubation, M Tech Program, Ph.D. Program. Centre is intended to focus on their targeted activities such as developing technologies and products, job creation, making collaborations, Skill development etc.

At present **41 Faculty Members** (18 ME, 8 EEE, 6 CSE, 5 DoD, 3 CE, 1 Chemistry) are involved in the centre.

Centre consist of **nine different laboratories** viz., Underwater Natural Resources lab, Product Development Laboratory, Reverse Engineering Laboratory, Fabrication Laboratory, Virtual & Augmented Reality Laboratory, E-Mobility Laboratory, Internet of Things Laboratory, Product Testing Laboratory and Sensor & Actuator Fabrication Laboratory, these facilities available at the centre have been a great support for the students working in different areas at IIT Guwahati as well for the students of various academic and research institutions of the north east.



Prof. Santosha K. Dwivedy

The Institute

Established in 1994, as an **'Institute of National Importance'**, IIT Guwahati has grown into being a preferred destination for people passionate about learning and innovation. IIT Guwahati has been **ranked among the Top 100 Young Universities in the world** by the Times Higher Education, one of the two Universities from BRICS nations. IIT Guwahati has several factors contributing to how in a short span of time it has established itself as one of the best institutes of its kind in the country. The programmes and courses that are offered at IIT Guwahati are perpetually evolving to adapt to the ever changing global requirements and along with the diversity of the fields of study, this has helped the institute become one of the nation's nerve centres for research and development, and technical education.

The faculty ensure that the students of the campus are ready to face the challenges of the professional world by providing them with a sound conceptual understanding of their respective disciplines. The institute also offers a plethora of opportunities to students for their holistic development, through the excellent facilities that it has for sports and general extracurricular activities.



Robotic & Artificial Intelligence

Robotics and Artificial Intelligence is a **Two-year M Tech programme** that is a first-of-its-kind **multi-departmental** initiative in collaboration with Technology Innovation Hub (TIH).

With a specialized focus on nurturing expertise in cutting-edge fields, our M.Tech program in Robotics and Artificial Intelligence (AI) within the **Centre for Intelligent CyberPhysical Systems (CICPS)** encompasses a holistic exploration of advanced technologies. Through a meticulously designed curriculum, students gain in-depth insights into the realms of **robotics, AI, machine learning, human-machine interaction, and cyberphysical systems**. Our program not only imparts theoretical foundations but also provides hands-on experience, enabling students to develop practical skills that are highly relevant in today's rapidly evolving technological landscape. With access to state-of-the-art labs and guidance from distinguished faculty, students are empowered to push the boundaries of innovation and contribute meaningfully to the field of robotics and AI



Student Profiles - M Tech



Image-Based 3D Object reconstruction

Abhishek Tripathi



Autonomous Crack Detection Robot

Atul Bhagat



Autofocusing and Phase Recovery in Holographic Images

Raj Hanmant Katkar



Underwater Dolphin Sound Simulation and Localisation

Aman Gupta



Underwater Image Enhancement using Deep Learning Architecture

Chivukula Sairam Satwik



Entity Recognition in Biomedical Text

Karnati Saipriya



Defect Prediction in 3D Printed Filament using Computer Vision and AI

Ashish Kumar



Egocentric Action Recognition

Hariansh Sehgal



Underwater Acoustic and Data Exploratory

Sanjeet Bara

"Computers are incredibly fast, accurate, and stupid. Human beings are incredibly slow, inaccurate, and brilliant. Together they are powerful beyond imagination." - Albert Einstein

Student Profiles - M Tech



Depth Estimation from Non-Stationary Images for Autonomous Vehicles

Suman Kumar



Object Tracking Using Drone

Ashish Giri Goswami



Anonymisation of Human Faces/Eyes and Vehicle License Plate Information

Pranjal Bhawsar



Visual Lip Reading

Vaibhav Ishwar Gavit



Automatic Image Captioning

Gyan Ratna



Underwater Dolphin Sound Simulator and Dolphin Localization

Raju Krishna Sharma



Improvement of OCR for Handwritten Medical Prescriptions

Aniket Gajanan Zope



UAV Based Environment Monitoring

P V Rohith Kumar



Improved Curriculum Learning using Isolation Forest for Data Distillation

Sushant Pargaonkar

"Artificial intelligence is the new electricity." - Andrew Ng

Matchless Mentors

WHAT SETS IIT GUWAHATI'S CENTRE FOR INTELLIGENT CYBER-PHYSICAL SYSTEMS (CICPS) IS ITS REMARKABLE AND DISTINGUISHED PEDAGOGICAL APPROACH. THIS CENTER EPITOMIZES A HARMONIOUS BLEND OF SCHOLARLY KNOWLEDGE DISSEMINATION AND IMMERSIVE CASE-BASED LEARNING METHODS. THIS DISTINCTIVE FUSION EMPOWERS STUDENTS NOT ONLY TO CULTIVATE A ROBUST ACADEMIC FOUNDATION BUT ALSO TO ACQUIRE THE ACUMEN REQUIRED TO NAVIGATE THE INTRICATE LANDSCAPE OF PRACTICAL IMPLEMENTATION.

AT THE HEART OF OUR EXCELLENCE LIES AN EXTRAORDINARY FACULTY COHORT, COMPRISING LUMINARIES WHO ARE NOT ONLY LEADERS IN THEIR RESPECTIVE FIELDS BUT ALSO PASSIONATE EDUCATORS DEDICATED TO NURTURING THE MINDS OF FUTURE TRAILBLAZERS. COMPLEMENTING THIS RICH ACADEMIC TAPESTRY, THE CENTER REGULARLY HOSTS DISTINGUISHED PERSONALITIES FROM DIVERSE INDUSTRIES, AFFORDING STUDENTS THE PRIVILEGE OF IMBIBING CONTEMPORARY BEST PRACTICES AND AVANT-GARDE INSIGHTS. THIS CONVERGENCE OF ERUDITION AND INDUSTRY WISDOM ENSURES THAT GRADUATES EMERGE NOT ONLY AS LEARNED INDIVIDUALS BUT ALSO AS AGILE INNOVATORS POISED TO SHAPE THE FUTURE OF INTELLIGENT CYBER-PHYSICAL SYSTEMS.

AI: Beyond Technology, into Tomorrow

Head of Centre

Prof. Santosha K. Dwivedy
Design and Robotics, Non-Linear Dynamics, Vibration

Faculty Associated with Center

Abhishek Shrivastava
*Design for users with varying tech readiness
Multimodal and assistive user interface design*

Amit Awekar
Data Mining, Machine Learning

Arijit Sur
Computer Vision, Image and Video Processing, Media Forensics: Image and Video Watermarking, Steganography, Steganalysis, Multimedia Streaming

Atul K. Soti
Computational Fluid Dynamics and Heat Transfer, Fluid-Structure Interaction, Renewable energy, High Performance Computing, Immersed-Boundary Method, Spectral-element Method

Biranchi Panda
Advanced manufacturing and design, 3D/4D printing, Modelling and Characterization, Energy and sustainable environmental technologies

Budhaditya Hazra
Stochastic Modelling, System Identification & Damage Detection, Statistical Signal Processing, Blind Source Separation, Fault Detection and Condition Based Maintenance of Rotating Machinery

Chandan Kumar
Smart Transformer Application in Power System DC and AC Microgrid Smart Transformer: Control and Applications Electric Vehicles and Battery Energy Storage System Power Quality, HVDC and FACTS Predictive Control of Power Converters

Deepak Sharma
Optimization and Soft Computing Techniques for Design and Manufacturing, GPU Computing For FEA

Karuna Kalita
Coupled Dynamics of Electro-Mechanical Systems, Vibration, Rotordynamics

S. Kanagaraj
Biomaterials, Carbon nanotubes based nanocomposites, Nanofluids, Materials characterization

Harshal B. Nemade
Electronic instrumentation, Systems design, Ultrasonic instrumentation, Non-destructive testing, Electronic product design, EMI/EMC issues, Acoustic sensors, Underwater acoustics, Surface acoustic wave devices, MEMS

Mahima Arrawatia
Energy Harvesting, RF Circuit Design, Microstrip Antennas

Manoj Majhi
Animation, Special Effects, Cartooning, Research Interest, Animation Movie history, Creation of Traditional Animation

Nagarjuna Nallam
Analogue and RF integrated circuits

Nelson Muthu
Meshfree Methods, Medical Device Innovation, Composites, Fracture Mechanics, Finite Element Method, NDT

Niranjan Sahoo
Instrumentation, Fluid and Thermal Engineering, Aerodynamics, Gas Dynamics, MEASUREMENTS AND EXPERIMENTS IN FLUID

P. S. Robi
Fracture Mechanics, Coating, Metal Casting, Metal Matrix composite, P/M Processing, Materials Processing

Pankaj Biswas
FEM, Computational weld mechanics, Line heating, Manufacturing and Design, Soft computing modeling of welding processes, Solid state welding

Prof. Parameswar K. Iyer
Organic Electronics, Sensors, Brain Science

PRADIP K. DAS
Speech Processing, Man-Machine Intelligence Systems, Drone Technology, Algorithms, Software Engineering, Smart Devices and Mobile Robotics

Pranab Kumar Mondal
Microfluidics, Electrokinetics, Flow Through Porous Media, Two Phase Transport, Microscale Transport of Heat

Praveen Kumar
Optimization of electrical motors and drives, State of the art algorithm development for Multi-objective optimization and Simulation, Design of electrical motors and actuators using Finite Element Methods

Prithwijiit Guha
Computer Vision, Pattern Recognition, Signal Processing, Robotics.

R. Ganesh Narayanan
Material Forming and Joining

Rashmi Dutta Baruah
(Evolving and Adaptive) Intelligent Systems, Computational Intelligence, Learning from Data streams, Deep Learning, Explainable AI and Model Interpretability

Rishikesh Dilip Kulkarni
Optical Metrology, Digital Optical Signal Processing, Digital Holography, Speckle Interferometry, Fringe Projection Profilometry

Rishikesh Bharti
Snow and Glacier Studies (Dynamics and Mass Balance), Micro-Climata Modeling, Tectonic Geomorphology, Landslide Susceptibility, Ocean-Atmospheric Interactions, Liquefaction Potential Evaluation, and Subsurface Investigation using Ground Penetration Radar (GPR) are my primary research areas.

Sajan Kapil
Manufacturing Automation, CNC, Rapid Manufacturing (3D Printing), Welding/Cladding Processes

Samarendra Dandapat
Artificial Intelligence and Machine Learning in Healthcare, Cardiovascular Signal Processing, Pathological Speech Processing, Retinal Image Processing, Deep Learning for Medical Diagnosis

Sandeep Reddy Basireddy
Applied Dynamics, Robotics and Control, Nonlinear Dynamics of Mechanical Systems

Sanjib Ganguly
Power distribution system planning and optimization, Distributed generation, Custom power devices, Evolutionary algorithms, Multi-objective optimization.

Satyajit Panda
Functionally graded materials and structures, Micromechanics of composite materials, Composite materials and structures, Active and/or passive control of structural vibration, Smart materials and structures, Non-Linear dynamics and control of structures, Finite Element Method

Shakuntala Acharya
Design Thinking & Creativity; Design for Education & Problem-based Learning; Sustainable Smart Cities

Shivashankar B. Nair
Artificial Intelligence, Intelligent and Nature-Inspired & Emotional Robots, Mobile Agent based systems, Artificial Immune Systems, Intelligent Internet of Things, Cyber-Physical Systems, Natural Language Processing, Genetic Algorithms, Fuzzy Systems & Neural Networks

Shrikrishna N. Joshi
Advanced manufacturing technologies

Shubhadeep Mandal
Complex Fluids, Electrohydrodynamics, Droplet Microfluidics, Microswimmers

Sonali Chouhan
Wireless Sensor Networks, Coding Theory, Wireless Communications.

SOUGATA KARMAKAR
Physical Ergonomics (Product and Workstation design), Cognitive Ergonomics (Information processing), Design and work environment, Design and Occupational Health, virtual Simulation (CAD and Digital Human Modeling), etc.

Subashisa Dutta
Hillslope Hydrology, Distributed Hydrological Modeling and impact of climate change, Flood Inundation Modeling, Geo-spatial technology, bank erosion, 2D river flow and sediment transport modeling, River bank protection and Stormwater drainage design

Sukhomay Pal
Welding Process Monitoring and Control, Welding of Similar & Dissimilar Materials, Tool Condition Monitoring, Application of Artificial Neural Network, Genetic Algorithms and Fuzzy Logic in Manufacturing

Sukumar Nandi
Computer Networks, Computer and Network Security, Data Mining, Machine Learning, VLSI, Computer Architecture, Computational Linguistic

Uday S. Dixit
Design and Manufacturing : FEM, Mechatronics, Neural Network and Fuzzy Set Application



Comprehensive Curriculum

THE CURRICULUM AT THE CENTER FOR INTELLIGENT CYBER PHYSICAL SYSTEMS (CICPS) IS MORE THAN JUST ACADEMIC EXCELLENCE; IT'S A GATEWAY TO UNPARALLELED CAREER PROSPECTS. OUR DEDICATION TO FOSTERING A DEEP UNDERSTANDING OF CUTTING-EDGE TECHNOLOGIES ENSURES THAT GRADUATES ARE NOT ONLY WELL-EQUIPPED FOR THE CHALLENGES OF TOMORROW BUT ARE ALSO IN HIGH DEMAND ACROSS INDUSTRIES. THROUGH A STRATEGIC BLEND OF THEORETICAL KNOWLEDGE, PRACTICAL SKILLS, AND HANDS-ON EXPERIENCE IN OUR ADVANCED LABORATORIES, OUR STUDENTS ARE PRIMED TO TAKE ON THE EVER-EVOLVING LANDSCAPE OF TECHNOLOGY WITH CONFIDENCE.

AT CICPS, WE UNDERSTAND THAT A SUCCESSFUL CAREER IS NOT JUST ABOUT A JOB; IT'S ABOUT EMPOWERMENT. OUR CURRICULUM IS METICULOUSLY DESIGNED TO BRIDGE THE GAP BETWEEN ACADEMIA AND INDUSTRY, PROVIDING STUDENTS WITH THE TOOLS THEY NEED TO SUCCEED IN THE REAL WORLD. WHETHER IT'S THE IMMERSIVE LEARNING EXPERIENCES IN OUR LABORATORIES OR THE EXPOSURE TO INDUSTRY TRENDS THROUGH COLLABORATIONS AND GUEST LECTURES, OUR CURRICULUM EMPOWERS STUDENTS TO TRANSFORM THEIR PASSION INTO PROFESSION.

"Strive not to be a success, but rather to be of value."
Albert Einstein

Course Structure

CORE COURSES

Semester-1

- RA-501 **Fundamentals of Robotics**
- RA-502 **Artificial Intelligence**
- RA-503 Robot Design Laboratory
- RA-504 Programming Laboratory
- XXX-xx Elective-1
- XXX-xx Elective-2

Semester-2

- RA-505 **Robot Sensing and Vision**
- RA-506 **Machine Learning**
- XXX-xx Elective-1
- XXX-xx Elective-2
- XXX-xx Elective-3

Semester-3

- RA-507 Technical Writing
- RA-508 **Project Phase - 1**

Semester-4

- RA-508 **Project Phase - 2**

ELECTIVE COURSES

- CS571 - Human Computer Interaction
- CS530 - Machine Learning using Cloud Computing
- CS551 - Wireless Networks
- CS563 - Neural Networks for NLP
- CS565 - Intelligent Systems And Interfaces
- CS566 - Speech Processing
- CS570 - Fundamentals Of Information Retrieval
- CS578 - Internet of Things
- CS590 - Deep Learning
- CS666 - Mobile Robotics

- DA526: Image Processing with Machine Learning
- DA671: Introduction to Reinforcement Learning

- ME531 - Mechanical Vibration
- ME542 - Numerical Analysis
- ME628 - Additive manufacturing technologies
- ME532 - Finite Element Methods in Engineering
- ME629 - Design of Mechatronic Products
- ME674 - Soft Computing in Engineering
- ME608 - CAD CAM ME615 Rotor Dynamics
- ME543 - Computational Fluid Dynamics
- ME645 - Mechatronics
- ME609 - Optimization Methods in Engineering
- ME644 - Modern Control

- EE523 - Introduction to Machine Learning
- EE535 - Advanced Topics in Machine Learning
- EE646 - Optical Measurement Techniques Applications
- EE550 - Linear Systems Theory
- EE551 - Estimation and Identification
- EE659 - Fuzzy Logic and Neural Networks
- EE626 - Pattern Recognition and Machine Learning
- EE660 - Modeling and Control of Power Electronic Converters
- EE656 - Robust Control
- EE657 - Intelligent Sensors and Actuator
- EE553 - Optimal Control
- EE554 - Nonlinear Systems and Control
- EE653 - Modeling and Simulation of Dynamic Systems
- EE694 - Introduction to Parallel Computing
- DD533 - Auditory and Voice Interaction Design
- DD509 - Interaction Design
- DD516 - Digital Human Modelling and Simulation in Product Design
- DD518 - Representation Techniques for Animation



OnGoing Projects

- Underwater Image Enhancement
- Dolphin monitoring using IOT network in the river Brahmaputra
- Design and Development of an autonomous rescue system for underwater divers
- Design and development of 3D printed earthquake resistant structural walls
- Material design and properties of 3D printable cementitious mixtures for underwater applications
- Design and developemet of intelligent extrusion device for concrete 3d printing
- Design and Development of Digital Inline Holograhy Setup for detection of Underwater Micro-organisms and Microparticles
- Development of prototype for underwater retrofitting of Structures
- Segmentation and Classification of Underwater Micro-organisms and Micro-particles in Digital Holographic Images
- Vision Based Control of Autonomous Underwater VehicleExploration of the aquatic ecosystem of the river Brahmaputra



Research Areas

- ACOUSTIC SIGNAL PROCESSING
- UNDERWATER **COMPUTER VISION**
- UNDERWATER COMMUNICATION
- DIGITAL HOLOGRAPHY & **IMAGE PROCESSING**
- **NATURAL LANGUAGE PROCESSING**
- MOTION AND PATH PLANNING FOR ADAS (ADVANCED DRIVER ASSISTANCE SYSTEMS) OF UNDERWATER VEHICLES
- DEPLOYMENT OF **DEEP LEARNING** MODELS ON ADVANCED HARDWARE
- **AI** ENABLED DESIGN OPTIMIZATION OF UNDERWATER STRUCTURES
- 3D CONCRETE PRINTING
- DRONE TECHNOLOGY AND E MOBILITY
- APPLICATIONS OF **ROBOTICS AND ARTIFICIAL INTELLIGENCE** FOR UNDERWATER EXPLORATION

Projects & Achievements



AR VR LAB

PRODUCT DESIGN
LAB

E-MOBILITY LAB

PRODUCT TESTING
LAB

IOT LAB

SENSOR & ACTUATOR
LAB

REVERSE
ENGINEERING LAB

UNDERWATER
NATURAL
RESOURCES LAB

FABLAB

Research Facilities & Labs

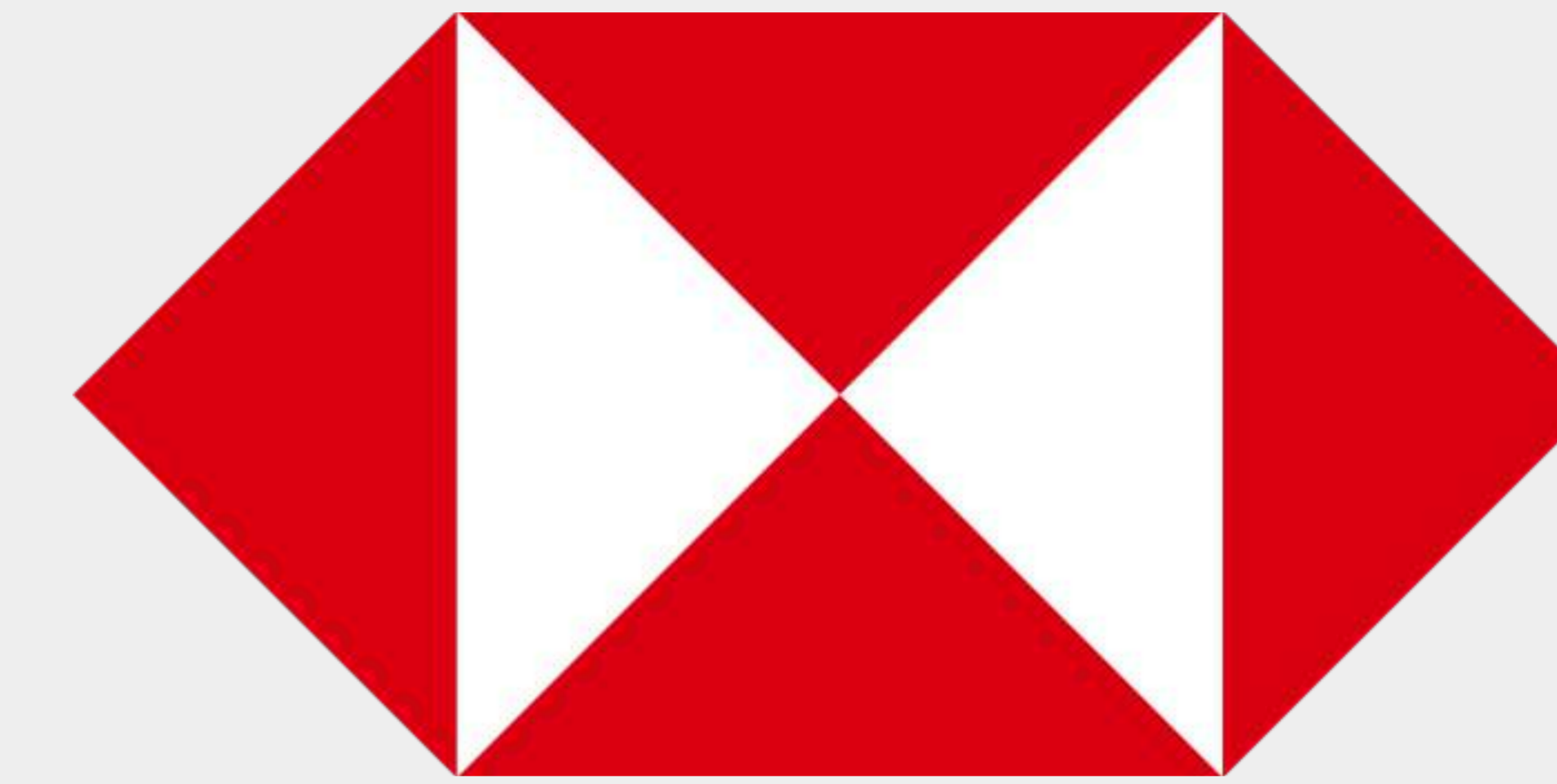
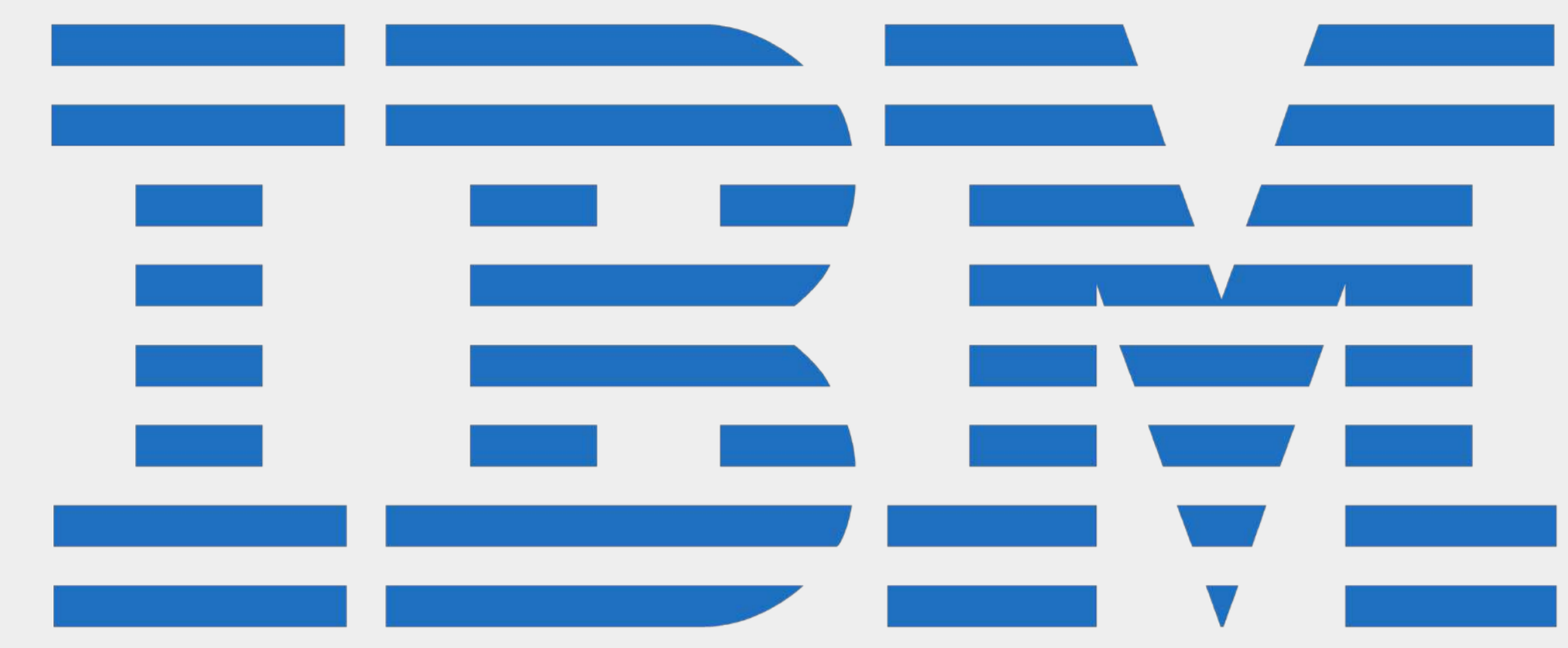
CENTRE CONSIST OF **NINE DIFFERENT LABORATORIES** VIZ., UNDERWATER NATURAL RESOURCES LAB, PRODUCT DEVELOPMENT LABORATORY, REVERSE ENGINEERING LABORATORY, FABRICATION LABORATORY, VIRTUAL & AUGMENTED REALITY LABORATORY, E-MOBILITY LABORATORY, INTERNET OF THINGS LABORATORY, PRODUCT TESTING LABORATORY AND SENSOR & ACTUATOR FABRICATION LABORATORY, THESE FACILITIES AVAILABLE AT THE CENTRE HAVE BEEN A GREAT SUPPORT FOR THE STUDENTS WORKING IN DIFFERENT AREAS AT IITG AS WELL FOR THE STUDENTS OF VARIOUS ACADEMIC AND RESEARCH INSTITUTIONS OF THE NORTH EAST.



100% Placement Record
for **MTech Robotics & AI**
for the session **2022-23**



Past Recruiters



HSBC



HCL

flexday



Contact Us



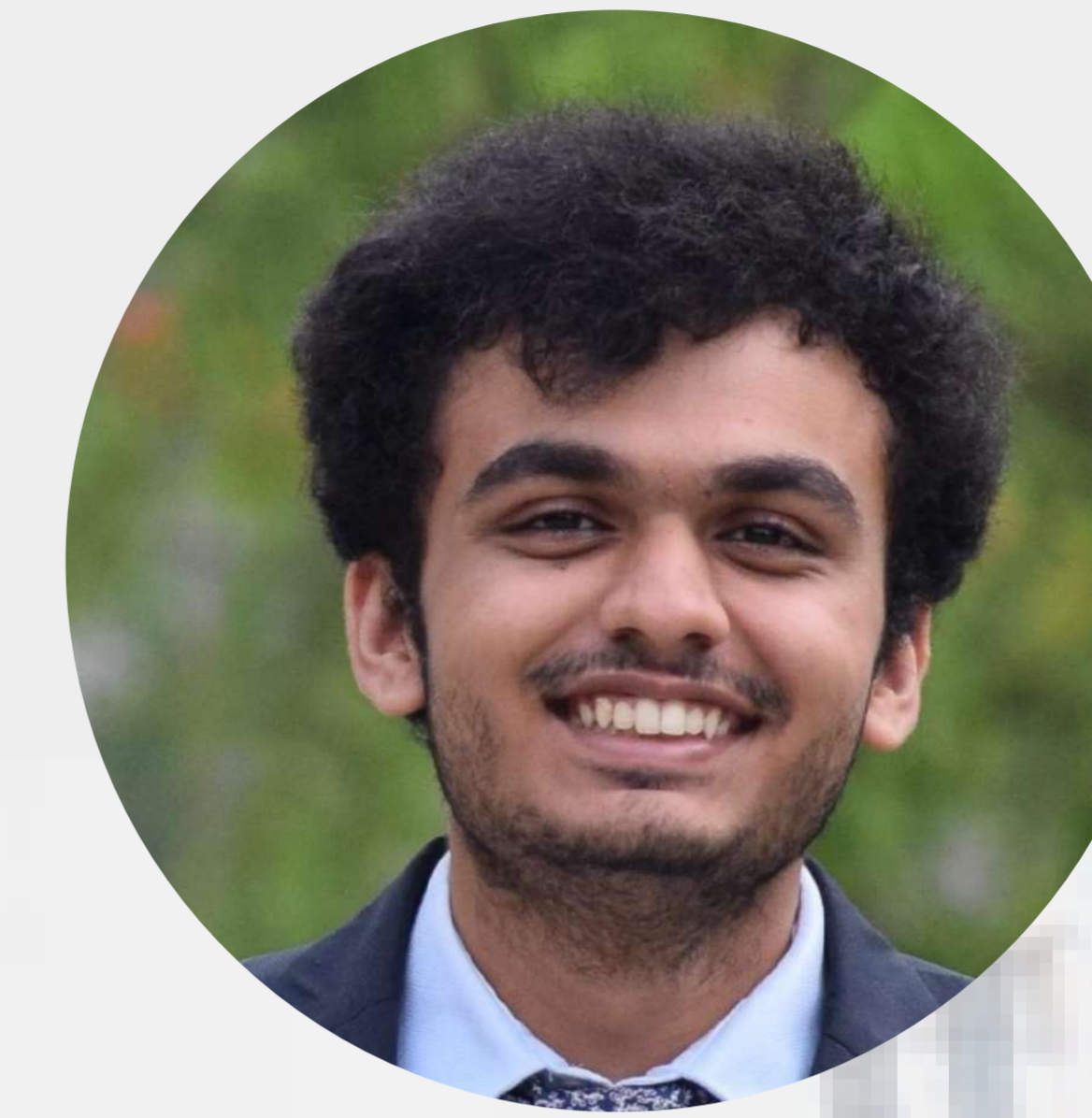
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