Major Research Initiatives @ IIT Ropar

● Collaborative Research between IIT Ropar and PGIMER Chandigarh.

● Ongoing collaborative project with Machine Learning Laboratory, International Institute of Information Technology Hyderabad.

● Ongoing collaborative project with PGIMER Application of Microwave Ablation Technique in Destruction of Large Size Tumors: Numerical and Experimental Studies.

● Collaborative Research between IIT with PGIMER Chandigarh.

● Ongoing collaborative project with IIT Kharagpur and IIT Kanpur 'Coarse Grained CFD-DEM-PBM simulations of industrial granulating beds'

● Ongoing collaborative project with IIT Mandi and NIT Hamirpur Collaborative Research between Foreign Commonwealth & Development Office, UK (FCDO).

● Collaborative Research between NIOT Chennai, Uppsala University Sweden and INCOIS.

● Ongoing collaborative project with RCB Faridabad, CCMB Telangana Hyderabad, THSTI-Faridabad and IISER Mohali 'Establishment of Centre for Advanced Research for Rapid Development of Host-directed broad Antivirals'

● Ongoing collaborative project with Malviya National Institute of Technology, Jaipur, Rajasthan 'Development of ultra-high hardness steel through grain refinement for automotive and defence industries: A novel approach'.

● **Drone for Post-Disaster Help:** IIT Ropar researchers have come up with post-disaster management communication during emergency situations with the concept of device to device (D2D) communication with drones.

● **Alternative to Alcohol-Based Disinfectant:** IIT Ropar professors develop an alternative to alcohol-based disinfectant, Electrolyzed water can be used as "a powerful natural tool" to combat COVID-19.

● **Acoustic Repellent System:** IIT Ropar researchers have come up with a concept of acoustic repellent system (ARS) for crop protection against animal attacks in agricultural elds.

● **Driver Drowsiness Detection Algorithm:** Brilliant researchers of IIT Ropar have developed an algorithm for driver drowsiness detection. They have used computer vision algorithms to extract facial features such as eye closure & yawning, followed by machine learning techniques to effectively detect driver's alertness.

- **Sarcasm Detector:** Researchers of IIT Ropar have developed a code to detect sarcasm in news headlines. The "Sarcasm Detector" works using neural networks to understand how a computer learns the pattern of sarcasm.

- **AmbiTAG:** IIT Ropar developed AmbiTAG" India's first indigenous temperature data logger for vaccines, blood and body organs, and perishable products. IIT Ropar will give away the AmbiTag device at production cost for COVID vaccine transportation.

- **Containment Box:** IIT Ropar and DMC Ludhiana designed containment boxes for protecting frontline healthcare workers fighting the COVID-19 Pandemic.

- **Eco-friendly Mobile Cremation System:** IIT Ropar develops a portable tech-traditional eco-friendly mobile cremation system that uses first of its kind technology that involves smokeless cremation despite using wood.

- **Power-free CPAP device JIVAN VAYU:** IIT Ropar develops Nation's first Power-free CPAP device 'JIVAN VAYU' to save lives in villages and low resource areas and during transit of patients from ambulance to hospitals.

- **Oxygen Rationing Device – AMLEX:** IIT Ropar develops first-of-its-kind Oxygen rationing device – AMLEX. It supplies a required volume of oxygen to the patient during inhalation and trips when the patient exhales CO_2.

- **Fake Buster:** A team of IIT Ropar and Monash University researchers have developed a detector Fake Buster to identify imposters attending virtual conferences without anyone's knowledge.

- **Electronic Massager for Calf Muscles:** The researchers of IIT Ropar have developed an electronic massager for calf muscles that can reduce the risk of fainting among the blood donors during or after the blood donation.

- **A Machine Learning Model that Accurately Predicts In-Hospital Outcomes:** IIT Ropar in association with Harvard University, MIT USA, MGH Global Health, Dayanand Medical College Ludhiana developed a Machine Learning model that accurately predicts InHospital outcomes at the admission to a cardiac unit.

- **Biomimetic Implant Device:** IIT Ropar researchers developed a Biomimetic Implant Device for Osteogenesis Imperfecta. Congratulations to Dr. Jitendra Prasad and his team won the grant for this patent.

- **Mercury Free Blood Pressure Monitor:** IIT Ropar has developed an alternative to the mercury blood pressure monitor that works just like the mercury type but is free of mercury.

- **AN ELECTRONIC MASSAGER FOR REDUCING THE RISK OF FAINTING:** IIT Ropar researchers have developed an electronic massager for calf muscles that

can reduce the risk of fainting among the blood donors during or after the blood donation.

- **ECO-FRIENDLY TECHNOLOGY TO SAVE WATER:** IIT Ropar has developed this eco-friendly technology under start-up named NanoKriti pvt. limited which committed towards cleaning the environment and is expanding in developing new applications ranging from water treatment to health care. To remedy the use of large quantities of water in the textile sector, the IIT Ropar researcher Dr. Neelkanth Nirmalkar developed an innovative green technology - air nano-bubble that can reduce the water quantity. The technology can reduce the use of water up to 90 %. Roughly 200- 250 L of water is required to process 1 kg of Cotton fabric. The laboratory reports suggest the air nano-bubble dispersed in water can reduce the water consumption, chemical dosage by 90- 95% which ultimately saves 90% of the energy consumption as well.

- **START-UP OF UBREATHE:** IIT Ropar start-up Ubreathe has been chosen as one of the top 3 companies working in the air quality sector through the ICAC – Indian Clean Air Challenge, designed by the Ministry of Housing and Urban Affairs. Ubreathe is looking at semi-open infrastructures such as Metro-stations, to provide sustainable solutions for fighting air related issues in the country.

- **A MOBILE-BASED APP FOR EPILEPTO SYSTEMS:** In order to provide a major relief to epilepsy patients, IIT Ropar has developed a mobile-based app, Epilepto Systems, through which an automatic call can be initiated just before a seizure. The app has been developed by Dr. Ashish Sahani, Assistant Professor, Department of Biomedical Engineering and his student Rahul Shukla. The team also comprises Krishnu R S and Hemant Kumar Chattar of IIT Ropar, Dr. Gagandeep Singh, Brinder Singh Paul, Ranjit Kaur and Arun Khokhar from Dayanand Medical College & Hospital, Ludhiana. The emergency call and messaging service informs about the patient's location to caretaker contacts with just a click on the alert button. It is important to note that epilesy is one of the most common neural disorders affecting nearly 50 million people across the globe.

- **NECK SENSOR FOR BETTER HEALTHCARE OF CATTLES:** In association with a Pune based start-up Areete Business solutions, IIT Ropar has developed a neck sensor with collar arrangement for cattle, providing timely alerts on various health and heat condition of the cattle. The 'cattle health and heat monitoring solution' measures various cattle parameters, including rumination, body temperature, activity level, heat cycle, lameness and GPS location. The cattle collar has been tested on more than 100 cattle giving exceptional accuracy above 90% in various farms across Maharashtra. The sensor in the collar sends all data to a cloud server and it is processed using AI-based analytics models with custom algorithms. Dr. Neeraj Goel, who headed the team for developing the software,

shared that the sensor-based device helps in identifying the main challenges in cattle management for farmers. Along with detection, it will also alert and notify farmers to take necessary steps to upkeep their cattle.

- **NANO ROUTE TO TREAT POLLUTED WATER:** IIT Ropar researchers have developed a first-of-its-kind nano bubble (NB) generator that may prove helpful in treating the polluted water coming out of the industries or at sewerage treatment plants (STP), and it would also save 50% running cost in comparison to the technology presently being used at STPs. Besides wastewater treatment, the NB generator can prove beneficial in farming and fishery. It can be used in drip irrigation and agriculture, aquaculture and fishery, pond and river restoration, gas and oil sectors, sterilization, medical sectors, surfactant free cleaning and chemical- free disinfection.

- **AN APP FOR ANGANWARI WORKERS:** Dr. Puneet Goyal, Associate Professor, Department of Computer Science and Engineering, coordinator of the app development project team in collaboration with the district administration has developed the app named – 'SAMPAN' – which is a software for real-time IIT Ropar has developed a rst-of-its kind user-friendly app for recording and maintaining digital records of the nutritional status of children and women. It will help in improving the health and nutrition status of children belonging to poor families, who attend government run crèches known as anganwaris in the country. monitoring of nutrition services at its anganwari centres (AWCs) and a reporting system to provide public access to data collected at the centres, in a bid to combat malnutrition."

- **GRANT OF US PATENT:** The team of researchers, Prof. Harpreet Singh, Dr. Prabir Sarkar, Dr. Malkeet Singh and Prof. Christopher Berndt got Grant of US PATENT on the invention of "Scrap Recycling-Based Additive Manufacturing Technology." The developed technology and process utilize the waste/scrap particles generated during machine processing to create useful products. The invention will play a critical role in achieving Sustainable Development Goals (SDG).

- **IIT ROPAR RESEARCHERS PREDICTED SURFACE DISPLACEMENT** IIT Ropar researchers predicted surface displacement at Joshimath in 2021. A team of researchers led by Dr. Reet Kamal Tiwari, Assistant Professor in the Department of Civil Engineering had carried out the glacial displacement mapping for the 2021 Joshimath flood scenario as early as March 2021.During the study, Dr. Tiwari and his then PhD student Dr. Akshar Tripathi, who is now working as Assistant Professor in the Department of Civil & Environmental Engineering at IIT Patna, had predicted a large-scale surface displacement to occur in a span of two years for Joshimath town. They had used Persistent Scatterer SAR Interferometry (PSInSAR) technique using Sentinel-1 satellite data for the study.

The predictions ranged between 7.5 cm to 10 cm displacement for buildings in Joshimath city, enough to cause large scale cracks in buildings, a scenario which has now become clearly evident in the last few days. The study was presented in a conference held in Lucknow on April 16, 2021, for which Tripathi was awarded the 'Best Paper Award'.

- **DEVELOPED A WAY TO SEE BACTERIA FOR LONG:** More than 10% of patients having bacterial infections die in India every year. Scientists at IIT Ropar have developed a modified protein fragment that can boost the detection of a specific bacterial species for two to three hours longer than the usual time in the infected area. It grabs the bacterial membrane tightly and helps protein fragments stay on the bacterial surface longer.