Ritabrata Chakraborty

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Education

Birla Institute of Technology and Science, Pilani (BITS Pilani) — Rajasthan, India
B.E. in Mechanical Engineering — Minor in Data Science, ***CGPA: 8.27/10 (Expected: 8.57/10)*** — *Oct '22 – May '26*

Technical Skills

Relevant Courses: Machine Learning, Deep Learning, Foundations of Data Science, Applied Statistical Methods, Linear Algebra, Computer Programming, Engineering Optimization, Differential Equations, Design of Machine Elements, Digital Twins
Programming Languages: Python, C++, C, Shell (Linux)
Robotics & Simulation: ROS (Gazebo, Rviz), MAVROS, Navigation Stack, MoveIt, AirSim, MATLAB, Simulink, QGIS
Machine Learning: PyTorch, TensorFlow, Scikit-Learn, OpenCV, Open3D, Matplotlib, Weights & Biases (W&B)
Hardware & Embedded Systems: NVIDIA Jetson (Nano, Orin), Raspberry Pi, Arduino, IMUs, Stereo Camera, 3D LiDAR
CAD & Mechanical Simulation: ANSYS Mechanical, SolidWorks, Fusion 360

Experience

ML Research Intern | Uber

Supervisor: Siddarth Malreddy, Tech Lead Manager, Uber — *July '25 – Present*

- Enhanced annotation quality in uLabel by integrating foundation models for image (RGB/IR) auto-labelling, cutting manual labelling time.
- Built deep learning pipelines for model-assisted pre-annotation, speeding up data curation in autonomy workflows.
- **Tech Stack:** PyTorch, Python, C++

Vision-Language Grounded Multi-Robot Coordination and Navigation

Supervisor: Dr. Avinash Gautam, Associate Professor, BITS Pilani — *May '25 – Present*

- Adapted VLMaps for multi-agent collaboration, enhancing spatial understanding in robot fleets.
- Coordinated decentralized navigation by integrating 3D visual-language maps with LLM-driven parsing.
- **Tech Stack:** ROS Noetic (with Gazebo), PyTorch, Python

Uncertainty-Guided Path Planning via Conditional Layout Prediction

Supervisor: Dr. Guillaume Sartoretti, Assistant Professor, MARMoT Lab, NUS — *Mar '25 – July '25*

- Co-developed CogniPlan, integrating a Wasserstein GAN-based conditional inpainting model and a graph attention network for uncertainty-aware navigation.
- Achieved 17.7% shorter exploration paths and 3.9% better navigation efficiency across 100+ maps.
- **Tech Stack:** ROS Noetic (with Rviz), PyTorch, Python

Synthetic Sensor Data Generation and Fault Classification for Bearing Systems

Supervisor: Dr. Pradeep Kundu, Assistant Professor, KU Leuven — *Oct '24 – July '25*

- Employed an Auxiliary Classifier Wasserstein GAN to synthesize time-series sensor data across multiple fault classes.
- Devising a Conditional Latent Denoising Diffusion GAN for generating CWT-based time-frequency images.
- Improving LiteFormer, an attention-free, transformer-inspired classifier for fault classification on augmented datasets.
- **Tech Stack:** PyTorch, Python

Monocular Vision-Based UAV Navigation for Orchard Monitoring

Supervisor: Dr. Kaushal Kishore, Senior Scientist, CSIR-CEERI — *Jan. '24 – Feb '25*

- Created a UAV-based orchard monitoring system using YOLOv11 (Box mAP50: 95.5%, Mask mAP50: 96.5%).
- Devised B-spline trajectory logic and implemented a custom yaw-roll controller, ensuring minimal drift under mild wind.
- **Tech Stack:** YOLOv11, ROS Noetic, AirSim, NVIDIA Jetson Orin NX

Design and Development of Smart Automated Field Hockey Ball Launcher

Supervisor: Dr. Mani Shankar Dasgupta, Senior Professor, BITS Pilani — *Apr. '24 – Dec '24*

- Engineered a programmable launcher achieving velocities up to 150 km/h; performed FEM validation and CAD modeling.
- Incorporated TCN-driven video feedback loop, allowing dynamic shot adaptation with 92% replication accuracy.
- **Tech Stack:** ANSYS-Mechanical, SolidWorks, MATLAB, Python

Image-Based Visual Servoing for Automated Radar Control and UAV Tracking

Supervisor: Dr. Rishi Verma, Bhabha Atomic Research Centre (BARC) — *Jun '24 – Jul '24*

- Automated radar alignment using YOLOv8 + DeepSORT, improving tracking recall to 91% and speed by 13%.
- Integrated PLC-based actuation system enabling continuous UAV lock-in.
- **Tech Stack:** YOLOv8, DeepSORT, Python

Projects

Autonomous Drone Navigation | MathWorks Global Student Drone Challenge 2025 *Mar '25 – Apr '25*

- Programmed vision-based control for Parrot Mambo using dynamic masking, ray-tracing, and closed-loop yaw control.
- Integrated speed variation and zone-based auto-landing to optimize track completion time.
- **Tech Stack:** MATLAB, Simulink

ExoMy Rover Navigation and UR3 Arm Motion Planning | ERC 2023 Remote *Apr '22 – Sep'23*

- Navigated ExoMy rover using ArUco detection, Ackermann steering, and spot turns for autonomous hazard avoidance.
- Configured UR3 arm with MoveIt and OMPL planner for collision-free object manipulation with 98% success.
- **Tech Stack:** ROS Noetic & ROS 2 Foxy (with Gazebo, Rviz), MoveIt, OpenCV

Publications & Presentations

Conference Publications

- Yizhuo Wang, Haodong He, Yuhong Cao, Jingsong Liang, **R. Chakraborty**, Guillaume Adrien Sartoretti, ***"CogniPlan: Uncertainty-Guided Path Planning with Conditional Generative Layout Prediction."*** Accepted at the **Conference on Robot Learning (CoRL)**, 2025.
- **R. Chakraborty**, T. Mian, P. Kundu, ***"An Efficient Approach for Synthetic Data Generation and Fault Diagnosis for Rotating Machinery."*** Presented at the **15th Prognostics and System Health Management Conference (PHM)**, 2025. Published in **IET Conference Proceedings**, 2025.
- K. Kishore, **R. Chakraborty**, ***"Path Planning of Low-Altitude UAV for Tree Canopy Tracking and Orchard Monitoring."*** Manuscript in preparation, 2025.

Poster Presentation

- **R. Chakraborty**, R. Verma, S. Mishra, ***"High-Velocity Impact Testing and Analysis of Layered Metal-Composite Shields Using Electromagnetic Railguns."*** Presented at the **Pulsed Power Science, Technology and Applications (PPSTA)**, 2024.

Leadership & Teaching

President & Secretary

Mechanical Engineering Association (MEA), BITS Pilani *Jun '24 – Present*

- Coordinated 10+ events and career sessions for 300+ students, facilitating technical exposure and alumni interaction.
- Managed production of 500+ merchandise items and led outreach initiatives that increased student participation by 40%.

President

Indian Society of Heating, Refrigerating, and Air Conditioning Engineers (ISHRAE), BITS Pilani *Oct '24 – Jul '25*

- Led a team of 25+ members to organize 4+ technical workshops with HVAC industry experts.
- Hosted 3 competitions and networking events, engaging over 200 students in HVAC awareness and innovation.

Project Manager

Tinkerer's Lab (TL), BITS Pilani *May '24 – Jul '25*

- Supervised 5 interdisciplinary robotics teams (30+ members) on projects including Micromouse and Hexapod.
- Oversaw lab resources, conducted weekly reviews, and mentored 50+ students in hands-on technical skills.

Teaching Assistant

ME F218: Advanced Mechanics of Solids, BITS Pilani *Jan '25 – May '25*

ME F216: Materials Science and Engineering, BITS Pilani *Sept '24 – Dec '24*

- Assisted in labs and tutorials for 100+ students, clarifying concepts and linking theory to practical applications.
- Evaluated assignments and supported faculty in delivering high-impact teaching sessions.

Awards & Achievements

3rd Place

Mathworks Global Drone Student Challenge 2025, MathWorks *Mar '25*

Finalist

AI for Space and Geospatial Innovation - ISRO Immersion Challenge, CIE-IIITH *Jul '24*

Top 15 Overall, Top 5 in College - Product Track

The American Express Campus Challenge 2024 *Jul '24*

Overall 5th Place & Best Remote Maintenance Award

European Rover Challenge (ERC) 2023 Remote Edition - World Finals, European Space Foundation *Sep '23*