

Kritanu Chattopadhyay

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EDUCATION

Delhi Public School Newtown

Class X – 97.8%

Kolkata, West Bengal

Apr 2021

Haryana Vidya Mandir, Salt Lake

Class XII – 92.8%

Kolkata, West Bengal

Apr 2023

National Institute of Technology, Durgapur

B.Tech in Mechanical Engineering, CGPA: 7.82

Durgapur, West Bengal

Aug 2023 – Present

INTERESTS

Robotics: Intelligent and AI-driven robotic systems for medical and industrial applications, with focus on dynamic modelling, control, perception, and reliable autonomous behaviour.

AI for Science and Healthcare: Deep learning and vision–language models for biomedical imaging, clinical reasoning, and practical decision-support tools.

Large Language Models (LLMs): Improving instruction following, post-training, preference optimization, and reinforcement learning to build more accurate, efficient, and trustworthy language models.

Multilingual and Low-Resource NLP: Developing robust language technologies for low-resource and Indic languages, with interests in translation, cross-lingual transfer, and domain adaptation.

Machine Learning Foundations: Optimization, generalization, representation learning, and the mathematical principles that govern modern neural systems.

EXPERIENCE

Xu Lab, Carnegie Mellon University

Undergraduate Remote Research Intern

Oct 2025 – Present

Remote

- Undergraduate Remote Research Intern under the joint supervision of Prof. Min Xu (Carnegie Mellon University) and Prof. Xiaoyu Cao (Jiaotong University).
- **Retinal Image Analysis with Vision–Language Models:** Exploring zero-/few-shot retinal disease classification using self-supervised and CLIP-style vision–language models, benchmarked against CNN baselines on retinal datasets using accuracy and macro F1 as primary metrics.
- **Skills:** Vision–Language Models, Self-Supervised Learning, Zero-/Few-Shot Learning, PyTorch, Medical Imaging

AI-NLP-ML Lab, IIT Patna

July 2025 – Present

Undergraduate Research Intern, Department of Computer Science and Engineering

Remote

- Undergraduate Research Intern under the supervision of Prof. Sriparna Saha, guided by PhD Scholar Sofia Jamil.
- **Summarizing Adverse Drug Events in Cancer Treatment using LLMs and RL:** Designing an LLM+RL pipeline to condense noisy patient-reported adverse drug events into concise, clinically actionable summaries, evaluated using ROUGE/BLEU and expert feedback.
- **Skills:** Natural Language Processing, Large Language Models, Reinforcement Learning, HuggingFace, PyTorch

Mechatronics Laboratory, IIT Delhi

Feb 2025 – Present

Undergraduate Research Intern, Department of Mechanical Engineering

Remote

- Undergraduate Research Intern under Prof. Subir K. Saha.
- **Backend Development of RoboAnalyzer:** Developing and enhancing backend modules of the **RoboAnalyzer** robotics analysis and visualization software using **Visual C#**. Implemented new features to improve numerical stability, simulation accuracy, and computational efficiency.
- Debugging, refactoring, and optimizing existing kinematic and dynamic computation pipelines to ensure scalability and reliability across diverse robotics use cases.
- Collaborating with research mentors to align backend improvements with ongoing robotics research and educational applications.
- **Skills:** Visual C#, Backend Development, Robotics Software, Numerical Optimization, Code Refactoring

CMATER Lab, Jadavpur University, Kolkata

Dec 2025 – Aug 2025

Undergraduate Research Intern, Department of Computer Science and Engineering

Remote

- Undergraduate Research Intern under the supervision of *Prof. Debotosh Bhattacharjee*.
- **SPAD Value Estimation from Rice Leaf Images:** Designed an ensemble of CNN, DNN, XGBoost, and Random Forest with a linear meta-learner to estimate chlorophyll (SPAD) values from rice leaf images, achieving $R^2 = 0.7820$ on held-out data and accepted at **COMSYS 2025** (Warsaw, Poland).
- **Skills:** Computer Vision, Ensemble Learning, Deep Learning, XGBoost, Random Forest, TensorFlow/Keras, OpenCV
- **Cassava Leaf Disease Classifier:** Built a multi-backbone ensemble (ViT, ResNet-50, AlexNet, ConvNeXt, Swin-T) for 5-class cassava disease classification on 21,367 images, reaching **87.03%** validation accuracy and **0.7733** macro F1-score (2–8% above individual backbones).
- **Skills:** Computer Vision, Deep Learning, Transfer Learning, Vision Transformer, ConvNeXt, ResNet, Ensemble Learning, PyTorch
- **Banana Leaf Disease Classifier:** Implemented a full **PyTorch** pipeline on a 4-class banana leaf dataset (Cordana, Sigatoka, Pestalotiopsis, Healthy); a top-3 ensemble (ConvNeXt, VGG16, MobileNetV3) achieved **98.95%** accuracy and **0.9895** F1-score with ROC-AUC ≈ 0.9998 .
- **Skills:** Deep Learning, PyTorch, CNNs (ConvNeXt, VGG, MobileNetV3, ResNet, DenseNet, EfficientNet), Model Evaluation (F1, MCC, ROC-AUC), Grad-CAM

Autonomous Systems Laboratory, IIT Madras

May 2025 – July 2025

Undergraduate Project Intern, Department of Engineering Design

Chennai, India

- Undergraduate Project Intern under *Prof. Bijo Sebastian, Prof. Sandipan Bandyopadhyay, and Prof. G. Saravana Kumar*.
- **Dynamic Stability of Self-Propelled Boom Sprayer:** Built and validated dynamic simulations in **Altair MotionSolve** for a 1.6-ton self-propelled boom sprayer, identifying critical regimes (speed ≈ 41 km/h, slope $\approx 30^\circ$ – 33°) and recommending CG adjustments to improve rollover stability.
- **Skills:** Dynamic Simulation, Altair MotionSolve, Vehicle Dynamics, CAD Simplification, Virtual Prototyping

Robotics and Automation Laboratory, IIT Patna

Dec 2025 – Jan 2025

Undergraduate Research Intern, Department of Mechanical Engineering

Bihta, Bihar, India

- Undergraduate Research Intern under the supervision of *Prof. Karali Patra*, guided by PhD Scholar Surya Prakash Singh.
- **Toolpath Generation for Texturing on Free-Form Surfaces:** Derived rotation and translation matrices between points on free-form surfaces and implemented STL-based point selection; validated MATLAB/Python algorithms on hemisphere and cube geometries for accurate CNC texturing.
- **Skills:** Computational Geometry, MATLAB, Python, Rotation & Translation Matrices, 3D Meshing, CNC Toolpath Simulation

National Institute of Technology Durgapur

Jan 2025 – Present

Undergraduate Research Intern

Durgapur, West Bengal, India

- Undergraduate Research Intern under multiple professors across the Departments of Mechanical and Electrical Engineering.
- **Biped Robot Jumping Mechanism (with Prof. Nirmal Baran Hui):** Designed walking and jumping control strategies for a biped robot in **MATLAB/Simulink**, focusing on dynamic balance and ground reaction forces with collaborator Debanuj Roy.
- **Skills:** MATLAB, Simulink, Biped Robotics, Dynamic Simulation
- **UAV Tracking Controller Design (with Prof. Aritro Dey):** Developing a tracking sliding-mode controller for UAV dynamics in **MATLAB/Simulink**, assessing robustness via trajectory tracking simulations under external disturbances.
- **Skills:** MATLAB, Simulink, UAV Dynamics, Nonlinear Control, Sliding Mode Control
- **Robust Meta-Learner Ensembles for Retinal Disease Classification (with Prof. Soumya Chatterjee):** Benchmarked CNNs including **ResNet-50 (98%)**, **DenseNet-121 (97%)**, **EfficientNet-B0 (97%)**, **VGG-16 (96%)**, **MobileNet-V2 (98%)**, and **ConvNeXt-Tiny (98%)** in **PyTorch**; a ridge-regularized LogisticRegressionCV meta-learner stacking ConvNeXt-Tiny, MobileNet-V2, and ResNet-50 reached **99.65%** accuracy and **0.996** weighted F1 (AUC ≈ 0.995).
- **Skills:** Deep Learning, Ensemble Learning, PyTorch, CNNs (ResNet, DenseNet, EfficientNet, ConvNeXt, MobileNet, VGG), Computer Vision, Medical Imaging

SKILLS

Soft Skills: Communication, Community Outreach, Content Writing, Technical Documentation, Team Collaboration.

Programming Languages: MATLAB, Python, C, Visual C#, SQL (mySQL), L^AT_EX.

Robotics Skills: ROS2, Gazebo, RViz, Kinematic & Dynamic Modelling, Robotics Simulation, Motion Planning Basics, Numerical Optimization for Robotics.

Hardware: Arduino, ESP32.

Mathematics: Linear Algebra, Probability & Statistics, Calculus, Optimization.

Frameworks: PyTorch, TensorFlow, Scikit-Learn, Mediapipe.

Developer Tools: VS Code, Visual Studio.

Libraries: Pandas, NumPy, Matplotlib, Seaborn, OpenCV, OpenTK, HelixToolkit3D, Streamlit.

Languages: English (Fluent), Bengali (Native), Hindi (Fluent), German (Beginner).

Simulation Softwares: Ansys WorkBench, Simulink, Altair MotionSolve, Altair HyperMesh, Altair HyperGraph.

CAD Tools: SolidWorks, Autodesk Fusion 360, CATIA V5R19.

ACHIEVEMENTS

- Paper accepted for presentation at **COMSYS 2025 (Warsaw, Poland)** on SPAD estimation using ensemble learning, under the supervision of Prof. Debottosh Bhattacharjee, Jadavpur University.
- **Qualified for the Internal Smart India Hackathon (SIH)** with a project shortlisted at the institute level.
- Semi-finalist in the **Flipkart GRiD 6.0 – Robotics Track**.
- Secured **7th rank in Prodylitics 2024**, organised by IIM Indore.
- Placed in the **top 3 percentile** among 1.20 million candidates in the **JEE Mains** examination.

EXTRA-CURRICULAR

- **Senior Coordinator, Society of Automotive Engineers (SAE) Collegiate Club** (May 2025 – Present)
Work across **Robotics**, **Machine Learning**, and **Automobile** domains; introduced the weekly F1 magazine “**Through the Formula Lens**”, helped organize the flagship technical fest **Aarohan** as a member of Team Aavishkar, and co-organized a **TEDx NIT Durgapur, 2025** as a part of the Organizing Committee, collaborating with Literary Circle.
- **Senior Coordinator, Mechanical Engineers’ Student Association (MESA)** (Mar 2025 – Present)
Helped conceptualize and organize **CADathon**, a CAD design hackathon that promoted 3D modelling and design thinking among undergraduate students.
- **Senior Member, Team NDORS (BAJA SAE NIT Durgapur)** (Jun 2025 – Present)
Contribute to the **Computer-Aided Engineering (CAE)** and **Steering System** divisions, focusing on structural analysis, vehicle dynamics, and steering geometry for the BAJA off-road vehicle.
- **Fundraising Intern, NayePankh Foundation** (Aug 2024)
Raised **INR 5001** to support education for underprivileged children through outreach, donor engagement, and social media campaigns.
- **Campus Ambassador, Rendezvous, IIT Delhi** (Aug 2024 – Sep 2024)
Promoted the cultural festival and its sponsors on campus and online, driving registrations and visibility among students.
- **Content Writer, Earth5R** (Aug 2024 – Dec 2024)
Authored articles on **climate change**, **sustainability**, and **environmental awareness** to engage readers and support Earth5R’s outreach initiatives.