Sarthak Mishra

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Education

- **Universidad Polytecnica de Madrid, Madrid, Spain** *2023 - 2026 (Expected)*
  Center for Automation and Robotics (CAR), a joint center for research by UPM and CSIC.
  *Current **Ph.D. Student***
- **Indian Institute of Science Education and Research Bhopal** *2018 - 2023*
  Integrated Bachelors of Science - Masters of Science CPI: 8.32/10
  *Major in **Physics**, Minor in **Data Science and Engineering***
- **Senior Secondary Education** *2015 - 2017*
  Class 12th (CBSE board) Percentage: 93%
  Major subjects: Physics, Chemistry, Maths, Biology

Research Experience

- **Seawings Project** *Nov 2023 - present*
  Computer Vision and Aerial Robotics (CVAR) lab Universidad Politecnica de Madrid, Spain
  – Wing-in-ground effect vehicles (WIG vehicles) to improve the strategic preparedness and defence-related operations in the sea/air interface.
  Development of advanced military surveillance drones as wing-in-ground effect vehicles (WIG vehicles) for sea/air operations, introducing Unmanned WIG Vehicles (UWV) to carry out maritime surveillance missions. Leading the research to design learning based control strategies to enhance the capability of the vehicle by seamlessly integrating ground, naval, and aerial assets.

- **Airship Project** *Nov 2023 - present*
  Computer Vision and Aerial Robotics (CVAR) lab Universidad Politecnica de Madrid, Spain
  – Autonomous Flying Ships For Inter-island And Inland Waters Transport.
  Research and development of autonomous UWV technology for aviation business models with fully electric, energy-efficient, and versatile unmanned aircraft systems. Study classical control theories and AI-based techniques to employ complex transitional maneuvers by the AIRSHIP WIG Vehicle.

- **Master's Thesis Research** *Aug 2022 - Apr 2023*
  Underwater Systems and Technology Laboratory (LSTS) in collaboration with Moon Lab University of Porto, Portugal
  – Model Predictive Control (MPC) based approach to trajectory optimization of Autonomous Underwater Vehicles (AUV).
  This study presents a mathematical model-based MPC approach for real-time optimal trajectory optimization of a six-degree-of-freedom underwater vehicle. The approach minimizes tracking error of the desired trajectory while ensuring operational constraints are met, demonstrating effectiveness in the presence of disturbances and uncertainties. [Final Report]

- **Long Term Research Project** *Jan 2022 - Apr 2023*
  Moon Lab in collaboration with LSTS Porto IISER Bhopal
  – Speed Modelling for Path Planning of a Wave-Propelled USV using metocean forecasts.
  This study validates and improves a speed-over-ground (SOG) model and estimator for a wave-propelled Unmanned Surface Vehicle (USV) using an independent dataset collected in the Irish-Atlantic Ocean. The estimator employs a non-linear Gaussian Process Regression (GPR) model trained with SOG measurements from a GNSS unit and metocean data from Copernicus Marine Services.

Technical Skills

- **Programming/scripting languages**: Python*, C/C++, LaTeX, HTML, CSS, Javascript, PHP, MySQL.
- **Libraries/Frameworks/Simulators**: ROS/ROS2, Gazebo, UUV Simulator*, Pandas*, Numpy, Matplotlib*, Keras, Tensorflow, Pytorch, Git, MATLAB, Wolfram Mathematica, Qutip.
- **Operating Systems**: Windows, Linux*.
- **Soft Skills**: English, Hindi, Odia, Sanskrit, Spanish. **Proficient*

Conferences, Summer Schools, Symposiums and Workshops

- **Computational Neuroscience Summer school**, Selected among 20 participants worldwide to attend this funded in-person summer school focused on physics and machine-learning based approaches to neuroscience organised by Jagiellonian University, Krakow, Poland. *July 2023*
- **IITB CSE Research Symposium**, Selected to participate in fully-funded symposium in the cutting-edge research in the field of **AI/ML**, computer systems, and theoretical CS. *Mar 2023*
- **OCEANS 2023 Limerick conference**, Selected to present our conference paper titled- "**Speed Modelling for Path Planning of a Wave-Propelled USV:** An independent validation in the Atlantic Ocean by Sarthak Mishra, Renato Mendes, Joao Sousa, Alberto Dallolio and P.B. Sujit". Regrettably, it was necessary to withdraw due to a significant discrepancy in the final round of result validation. *June 2023*
- **Soft skills and Career Development workshop**, a 2.5 day intensive workshop on behavioral skills and personality development organised by ICDPC, IISER Bhopal. *Mar 2023*
- **WSDM 2023**, Recieved the **ACM SIGWEB Fair Access Student Participation Award** for participation in the **16th ACM International Conference on Web Search and Data Mining** organised by National University of Singapore. *Feb 2023*
- **17th Academic Research and Careers for Students Symposium**, co-located with **ACM India Annual Event** organised by ACM India at OIST Bhopal. *Feb 2023*

Key courses taken

- **Credited courses**: Linear Algebra, Multi variable Calculus, Probability & Statistics, Mathematical Methods, Computational Physics, Numerical Methods and Programming, Physics through Computational Thinking, **Deep Learning**, **Data science and Machine Learning**, **Artificial Intelligence**, Advanced Programming in Python, AI and it's scientific application.
- **e-Certificate courses**: Satellite Photogrammetry and its Application (Indian Institute of Remote Sensing, IIRS Dehradun), Basics of Machine Learning (IISERB), Computer Vision Basics using MATLAB (Coursera), MATLAB onramp (Mathworks).

Positions of Responsibility

- **Teaching Assistant**, for the course **Data Science in Practices**, Dept. of Data Science and Engineering. Examination conduction, assignment preparation, answer sheet evaluation for a class of 120 students. *Aug - Nov 2022*
- **Volunteer at NGO**, Swadhin Educational and Charitable Trust, Sambalpur, Odisha. Organised multiple food and clothes distribution campaign for daily wage workers, Sanitizers and masks distribution for needy ones during COVID-19. *2019 - 2021*
- **Organiser**, Conference for **National Assembly of Researchers in Physics** (NARIPHY), IISER Bhopal. *Aug 2022*