

# Subhransu S. Bhattacharjee

School of Computing, The Australian National University, Australia

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**Bio:** PhD researcher advancing generative and vision-language models to represent spatio-temporal uncertainty for reliable robotic decision-making; interests also include time-series uncertainty analysis in noisy regimes, convex optimization & optimal transport.

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## Education

### Doctor of Philosophy

School of Computing, Australian National University, Australia

Resident Scholar

Apr 2023 – Expected Apr 2027

- **Thesis Topic:** Probabilistic 3D Spatio-Semantic autonomous reasoning under dynamic uncertainty with Generative Models
- **Supervisors:** Dr. Rahul Shome, Dr. Dylan Campbell, and Prof. Stephen Gould

### Bachelor of Engineering

School of Engineering, Australian National University, Australia

First Class Honours

Jul 2018 – Dec 2022

- **Major:** Mechatronic Systems Engineering (*Merit List* in the Honours cohort)
- **Minors:** Mathematics and Electronic Communication Systems
- **Certifications:** [Game Theory, Stanford](#); [Machine Learning Production](#); [Project Management, Google](#); [Financial Markets, Yale](#)
- **Thesis project:** [Whiplash Gradient Descent Dynamics](#) (Supervisor: Prof. Ian Petersen)

**Summer Schools:** Robotic Vision Summer School (2024); London School of Economics (2019): Practical Machine Learning

## Selected Publications & Preprints

**Subhransu S. Bhattacharjee, Dylan Campbell & Rahul Shome:** *Believing is Seeing: Unobserved Object Detection using Generative Models*. *IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)*, 2025. [paper](#) | [project page](#).  
*Pre-trained generative models can infer spatio-semantic distributions of occluded and out-of-frame objects across 2D, 2.5D, and 3D scenes by implicitly learning contextual scene relationships.*

**Subhransu S. Bhattacharjee, Hao Lu, Dylan Campbell & Rahul Shome:** *Into the Unknown: Using Generative Models to Sample Priors of Environment Uncertainty for Planning in Configuration Spaces*. *arXiv:2510.11014*, 2025 — under review at ICRA. [arXiv](#).

*Leveraging pre-trained generative model priors as uncertainty quantifiers enables motion planning algorithms to remain robust across distributions of partially observed plausible environment configurations.*

**Subhransu S. Bhattacharjee & Ian Petersen:** *Analysis of the Whiplash Gradient Descent Dynamics*. *Asian Journal of Control* (Special Issue), Wiley, 2023. DOI: [10.1002/asjc.3153](https://doi.org/10.1002/asjc.3153).

*A feedback-based inertial gradient method with adaptive damping achieves provable polynomial and exponential convergence rates that extend classical optimization theory to high-dimensional settings.*

## Achievements, Scholarships & Awards

- 2025** VC Travel Grant (A\$ 2500), Australian National University for traveling to CVPR 2025.
  - 2025** Invited attendee (fully funded £5000), *Citadel & Citadel Securities PhD Summit*, London.
  - 2025** Residential Mentor Scholarship, ANU for the year 2025
  - 2024** Optiver PhD Quant Lab Program (select participant) fully funded A\$ 2000.
  - 2023** ANU International University Research Scholarship (for 4 years).
  - 2023** Higher Degree by Research Merit Stipend (completely covers tuition).
  - 2022** Highly Recommended Paper in the *Asian Control Conference* and Best student reviewer award.
  - 2022** Highest in the course ENGN4627: Robotics.
  - 2021** High Commendation award for undergraduate student paper in *Australia & New Zealand Control Conference*.
  - 2021** ANU Chancellor's International Scholarship for academic merit.
  - 2020** ANU-VIT International Transfer Program scholarship: 8th highest standing GPA in cohort.
  - 2019** Chancellor's Special Achiever Award, VIT for scoring highest in Engineering Statistics and Differential Eqns course.
  - 2019** Google & HUL Hackathon — FMCG supply chain operational modeling using LSTMs: Finalist.
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## Internships

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### Optiver APAC, Sydney

Quantitative Research Intern (Machine Learning)

Nov 2024 – Feb 2025

Analyzed large-scale market and microstructure data; identified inefficiencies in the **Korean** market & Co-built a proprietary real-time ML decision system; achieved **94%** accuracy in historical backtests.

### Decimal Point Analytics, India

ML Research Intern — Financial NLP, Supervisor: Mr Paresh Sharma, MD

Dec 2020 – Jan 2021

Engineered and optimized a financial metadata store for a Transformer-based QA system for large scale document analysis, coordinated client reviews for product reassessment.

## Academic Research

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### Research School of Management, Australian National University

Graduate Research Assistant — FinTech & AI, PI: Dr Priya Muthukannan

### Commonwealth Bank of Australia

Sep 2023 – Sep 2024

- Analyzed open-banking regimes using a dynamic-capabilities lens to inform strategy.
- Delivered introductory data-analysis instruction for Business Information Systems.
- Built assessment frameworks for banks AI adoption and responses to technological shifts.

### School of Computing, Australian National University

Undergraduate Researcher — Foundational Deep Learning, Supervisor: Prof Richard Hartley, FAA

Mar 2022 – Jun 2022

- Studied invertibility of differentiable mappings with neural networks; achieved a **72%** hit rate (RMSE criterion) using dense positional encodings.
- Demonstrated limitations of normalizing flows for global invertibility, highlighting locality of neural function approximation.

### School of Engineering, Australian National University

Undergraduate Researcher — Control & Optimisation, Supervisor: Prof Ian Petersen, FAA

Dec 2021 – Mar 2022

- Designed Lyapunov-based approaches for predicting convergence rates in high-resolution ODE models; developed a complexity model for feedback systems without closed-form solutions.
- **Selected papers:**
  - *Analysis of Closed-Loop Inertial Gradient Dynamics* — [Asian Control Conference \(ASCC\) 2022](#).
  - *A Closed-Loop Gradient Descent Algorithm Applied to Rosenbrocks Function* — [ANZCC 2021](#).
- Open-source code: [1ssb/Whiplash](#).

## Teaching & Service

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- **Head Tutor, Building Cyber-Physical Systems** — School of Cybernetics, ANU (Mar 2025–Nov 2025): Co-designed and delivered project-based modules across microprocessors/robotics/ML; led NAO labs; coordinated assessments.
- **Tutor, Introduction to Machine Learning** — School of Computing, ANU (Jun 2025–Nov 2025): Taught ML mathematics and optimization; marked exams for **250** students; ran tutorials and assessed projects.
- **Tutor, Power Systems & Control Theory** — School of Engineering, ANU (Jul 2022–Sep 2023): Ran labs (ENGN8824, **12** MSc); led workshops (ENGN4628, **34**); delivered targeted tutoring (ENGN4625, **16**).

**Reviewer:** CVPR 2026; AAAI 2025; IROS 2025; ICRA 2025–2026; Asian Journal of Control (2023); American Control Conference (2022); Australia & New Zealand Control Conference (2021–2022).

**Volunteering:** Teacher at Friends of Tribal Society, 2017-18; Set4ANU Mentor 2023-24; Techlauncher Manager 2024

## Skills

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- **Languages:** Python; C/C++; CUDA; Embedded C; MATLAB; JavaScript; HTML/CSS;  $\text{\LaTeX}$
- **LLM/VLM APIs & Models:** OpenAI API (GPT-4o/4.1); Anthropic (Claude 3.5 *Sonnet*/Haiku); Google AI Studio (Gemini 1.5 Pro/Vision); Alibaba (Qwen2/Qwen2-VL); Meta (Llama 3/3.1); Mistral (Large; Pixtral); LLaVA 1.6; Florence-2; BLIP-2; CLIP; GroundingDINO; SAM/SAM2; Hugging Face Inference; Replicate; AWS Bedrock; Azure OpenAI
- **Vision & 3D & Generative:** Diffusion; segmentation/detection; 3D reconstruction; TorchVision; OpenCV; Open3D; PyTorch3D; trimesh
- **Performance/Systems:** Mixed precision (AMP); `torch.compile`; Inductor/TorchDynamo; custom CUDA kernels; Numba; CuPy; ONNX Runtime; TensorRT; Triton (GPU DSL); Nsight Systems/Compute; JAX
- **Data/Cloud/MLOps:** PySpark; SQL; Airflow; FastAPI; REST; Weights&Biases; Git/GitHub; CI/CD (Actions)
- **Containers & HPC:** Docker; Podman; Apptainer (Singularity); NVIDIA Container Toolkit; Conda/Mamba; Lmod; SLURM

**Selected Open Source Contributions:** [TorchKAN: Simplified KAN Model with Variations](#); [Depth Anything V1/V2](#); [Mangrove: A Dynamic Data Management System for Advanced AI Applications](#); [Webcamdinov2: Video Inferencing with Webcam using DINOv2](#); [Camera Ray Transformation Visualizer: A StreamLit App](#); [RGB-Depth Cropper NPMv2.5.0](#)

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