

# Subhransu S. Bhattacharjee | Résumé

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## Education

### Doctor of Philosophy in Artificial Intelligence

Ongoing

*Intelligent Systems Cluster, School of Computing, ANU, Australia*

*April 2023-Present*

- Supervisors: Rahul Shome, Dylan Campbell & Stephen Gould
- Specialisations: Vision Language Models, Non-Convex Optimization, Diffusion Models & 3D Computer Vision
- Attended: Robotic Vision Summer School, 2024; Optiver PhD Quant Lab Program, 2024
- Thesis Topic: *Probabilistic Spatial-Semantic Reasoning in 3D using Generative Models*

**Courses Audited:** *Task & Motion Planning in Robotics, Convex Optimization, Differential Geometry & Probability Theory*

### Bachelor of Engineering (Honours)

First Class Honours

*College of Engineering, Computing & Cybernetics, ANU, Canberra*

*July 2018 - Dec 2022*

- Major in Mechatronic Systems Engineering (CGPA: 6.48/7.0, Graduated 3<sup>rd</sup> in Honors' cohort)
- Minors in Mathematics & Electronic Communication Systems

**Courses Audited:** *Non-linear Control Theory, Network Optimization & Control, Information Theory, Mathematical Analysis*

- Summer School at the **London School of Economics**, 2019: Practical machine Learning: Grade-A
- Online Certification in Game Theory, **Stanford University**
- Thesis Project: Whiplash Gradient Descent Dynamics (Supervisor: Professor Ian Petersen). Find it [here](#).
- Transferred to ANU from VIT, India, with CGPA: 9.34 (top 10% in ECE branch) & IELTS: 8.5 band.

## Scholarships & Awards

1. **2023:** ANU International University Research Scholarship with HDR Merit Stipend
2. **2022:** ANU Course Highest in Robotics
3. **2022:** Highly Recommended in the Asian Control Conference
4. **2021:** High Commendation Award in the Australia and New Zealand Control Conference
5. **2020:** CECS Undergraduate International Scholarship and Partner Institute scholarship – 50% tuition scholarship.
6. **2019:** VIT Chancellor's Achiever Award for highest marks in Digital Signal Processing
7. **2019:** VIT Chancellors' Special Achiever Award for Best Project in VIT Expo
8. **2019:** Best Project Award, HUL & Google, AI for Agriculture Hackathon – Markov Chain Modelling of Supply Chain Uncertainty for FMCG products in India.

## Publications

**Subhransu Bhattacharjee\* & Ian Petersen:** Analysis of the Whiplash Gradient Descent Dynamics, DOI: 10.1002/asjc.3153, Asian Journal of Control, Special Edition, 2023

**Subhransu Bhattacharjee\* & Ian Petersen:** Analysis of closed-loop inertial gradient dynamics, DOI:10.23919/ASCC56756.2022.9828104, Asian Control Conference, 2022

**Subhransu Bhattacharjee\* & Ian Petersen:** A closed loop gradient descent algorithm applied to Rosenbrock's function, DOI:10.1109/ANZCC53563.2021.9628258, Australia and New Zealand Control Conference, 2021

## Skills

- **Programming Languages:** C/C++, Python, R, Embedded C, Verilog, SQL
- **Libraries:** PyTorch, Tensorflow, Pandas, BeautifulSoup, Seaborn, Numpy, Scipy, Scikit-learn, CUDA
- **Scripting & Documentation Languages:**  $\text{\LaTeX}$ , HTML, Nano, MATLAB, Shell Script
- **Softwares & Frameworks:** GitHub, STM32Cube, Vivado, Simulink, LTSpice, SCADA, DigiSim, SLURM, Blender, ROS2, SAS, Jupyter

## Experiences

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### Graduate Research Assistant: Fintech & AI

Research School of Management, ANU

Employer: Dr. Priya Muthukannan, Principal Investigator

September 2023 - Present

- Conducting Qualitative Analysis on Open Banking Regime using Dynamic Capabilities Lens
- Taught Introduction to Data Analysis in Business Information Systems
- Developed novel frameworks to study effects of AI and banking sector response to technological shifts

### Casual Sessional Academic: Engineering

School of Engineering, ANU

Employers: Dr. Ian Petersen, FAA & Dr. Iman Shames, Professors

July 2022 - September 2023

- ENGN8824: Advanced Control Systems (Masters) at ANU, 2023: Tutored the laboratory class of 12 students.
- ENGN4628: Network Optimization and Control at ANU, 2023: Tutored Problem-Solving sessions in a class of 34 students.
- ENGN4625: Power Systems and Electronics at ANU, 2022: Tutored problem-solving sessions for 16 students.

### Undergraduate Researcher: Foundational Deep Learning

School of Computing, ANU

Supervisor: Dr. Richard Hartley, FAA, Distinguished Professor Emeritus

March 2022 - June 2022

- Employed Neural Networks to assess the invertibility of differentiable functions in closed sample ranges for non-linear processes. Achieved a RMSE hit rate of 72% with computationally intensive positional encoding and transfer decoding.
- Demonstrated that normalizing flow networks struggle with global invertibility, serving as strong evidence for Neural Networks as local approximators for smooth functions.
- Formulated an FPGA TIMER algorithm to measure the total computational effort required for minimum convergence, dictated by the floating-point accuracy of the oracle.

### Undergraduate Researcher: Control & Optimisation

School of Engineering, ANU

Supervisor: Dr. Ian Petersen, FAA, Professor

December 2021 - March, 2022

- Established a novel algorithm which was deterministic and exponentially faster than classical Nesterov-like methods for convex functions.
- Utilized control theory to formulate universal Lyapunov-based methods for predicting convergence rates in high-resolution ODE approaches.

### Head Automation Intern: Power Systems Automation

Calcutta Electric Supply Corporation, India

Employer: Mr. Arindam Sanyal, Deputy Director (Automation)

March - August, 2021

- Orchestrated a 17-member team, comprising 5 junior interns and 12 field workers, to engineer and implement a self-healing mechanism in the Ring Main Unit-based Power System at Chitpur hospital substation amid India's second COVID-19 wave.
- Managed a real-time installation of high-voltage DC circuit breakers, linking the substation to multiple power grids.

### ML Research Intern: Financial NLP

Decimal Point Analytics, India

Employer: Mr. Paresh Sharma, MD

December 2020 - March 2021

- Engineered and optimized a financial metadata database tailored for RoBERTa-based question-answering systems. Utilized cutting-edge NLP methodologies to augment both system accuracy and operational efficiency.
- Facilitated and chaired client meetings for product reassessment and quality assurance, liaising with diverse stakeholders to collect feedback and enact performance enhancements.
- Successfully renegotiated contract durations during discussions with the banking tribunal, with a focus on stock option roll-over mechanisms in policy management deliberations.

### Research Intern

Laxmi Vilas Bank, India

Employer: Mr. Parthasarathi Mukherjee, Ex- CEO, Laxmi Vilas Bank, India

September - November, 2020

Developed a Markonikov portfolio optimization method using a Competitive Neural Network from multiple time series data.

### Summer Research Intern: Passive Radar Signal Processing

DRDO, India

Supervised by V. Venkateshwara Rao, Ex-Director, ARDE

May-August, 2020

- Formulated a Kalman filter-centric technique for swift selection of the best-matched filter for incoming radar signals, utilizing its ambiguity function. This methodology facilitated the fine-tuning of subsequent radar bursts to reduce signal uncertainty.
- Implemented an FPGA-based multi-processor interface for the analysis of long-range, noise-affected radar signals.

### VIT Undergraduate Researcher: Optical Excitation Study in Graphene Sheets

VIT, Vellore

Supervisors: Prof. Gargi Chakraborty, Dr. Sumathi S, Prof. Shweta B. Thomas

August-December, 2019

- Developed a model to estimate parametric states for the optical response of viscoelastic graphene sheets under stress, challenging the reproducibility of the Bubnov-Galerkin treatment.
  - Verified the bifurcations and empirically validated the model for larger gains.
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## Services

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- Wiley: Asian Journal of Control, 2023: Paper Review on Game-theoretic Control.
- Asian Control Conference, 2022: Paper review on Feedback Linearisation for UAV controllers.
- IEEE Xplore — ANZCC, 2021: Paper Review on Non-Smooth Feedback Controllers.

## Certifications

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- [Machine Learning Production, DeepLearning.AI](#)
- [SCADA: Process Control Engineering, Udemy](#)
- [Game Theory, Stanford University](#)
- [Foundations of Project Management, Google](#)
- [Introduction to Git and GitHub, Google](#)
- [Financial Markets, Yale University](#)

## References

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| ○ <a href="#">Rahul Shome</a><br>Lecturer<br>School of Computing<br>Australian National University<br>Email: <a href="mailto:rahul.shome@anu.edu.au">rahul.shome@anu.edu.au</a> | ○ <a href="#">Dylan Campbell</a><br>Lecturer<br>School of Computing<br>Australian National University<br>Email: <a href="mailto:dylan.campbell@anu.edu.au">dylan.campbell@anu.edu.au</a> | ○ <a href="#">Stephen Gould</a><br>Professor<br>School of Computing<br>Australian National University<br>Email: <a href="mailto:stephen.gould@anu.edu.au">stephen.gould@anu.edu.au</a> |
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