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
- Thesis Topic: Towards 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 3rd 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**: LaTeX, HTML, Nano, MATLAB, Shell Script

o **Softwares & Frameworks**: GitHub, STM32Cube, Vivado, Simulink, LTSpice, SCADA, DigiSim, SLURM, Blender, ROS2, SAS, Jupyter

Experiences

Graduate Research Assistant: Fintech & AI **Research School of Management, ANU**
Employer: Dr. Priya Muthukannan, Principal Investigator *September 2023 - Present*

o Conducting Qualitative Analysis on Open Banking Regime using Dynamic Capabilities Lens

o Taught Introduction to Data Analysis in Business Information Systems

o 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*

o ENGN8824: Advanced Control Systems (Masters) at ANU, 2023: Tutored the laboratory class of 12 students.

o ENGN4628: Network Optimization and Control at ANU, 2023: Tutored Problem-Solving sessions in a class of 34 students.

o 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*

o 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.

o Demonstrated that normalizing flow networks struggle with global invertibility, serving as strong evidence for Neural Networks as local approximators for smooth functions.

o 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*

o Established a novel algorithm which was deterministic and exponentially faster than classical Nesterov-like methods for convex functions.

o 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*

o 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.

o 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*

o 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.

o Facilitated and chaired client meetings for product reassessment and quality assurance, liaising with diverse stakeholders to collect feedback and enact performance enhancements.

o 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 *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.

Services

▪ 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.

References

○ Rahul Shome
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○ Dylan Campbell
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○ Stephen Gould
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