Advay Pakhale

+65 9145 8425 advay.pakhale@u.nus.edu Advay Pakhale advaypakhale

Education

National University of Singapore **Expected Graduation – May 2027**
Bachelor of Science (Hons) in Mathematics - Double Degree Programme (GPA: 4.85 / 5.0)
Bachelor of Computing (Hons) in Computer Science (GPA: 4.91 / 5.0)

- **Special Programme in Mathematics:** Advanced academic programme (15 students per year) for students demonstrating strong aptitude and passion for mathematics
- **Relevant Coursework:** Linear Algebra, Probability, Operating Systems, Parallel Computing, Computer Networks, Convex Optimisation, AI/ML, Mathematical Analysis, Financial Derivatives
- **NUS Overseas Colleges Vietnam:** Highly-selective entrepreneurship-focused internship programme

Raffles Institution, Singapore **Jan 2015 – Dec 2020**
Singapore-Cambridge General Certificate of Education Advanced Level (Rank Points: 90/90)

Technical Skills

Languages: Python, C, C++, Java
Machine Learning/AI: PyTorch, CUDA, transformers, spaCy, Pandas, NumPy, SciPy, scikit-learn, OpenCV, matplotlib, Plotly
Dev/MLOps: AWS (SageMaker, Lambda, EC2), Docker
Miscellaneous: SQL, Git, Unix, LaTeX, ROS, Mathematical simulations and modelling

Work Experience

PIXTA Vietnam **May 2024 – Aug 2024**
AI Engineer Intern *Hanoi, Vietnam*

- Achieved a 12x reduction in multimodal LLM inference latency through implementing a custom inference load-balancer and applying cutting-edge quantization methods
- Implemented end-to-end MLOps pipeline with AWS SageMaker and GitHub Actions, automating dockerization, deployment, testing, and monitoring, accelerating production timelines
- Developed a novel image de-duplication algorithm using image hashing and graphs to filter vector search results, resulting in higher quality of semantic search results
- Conducted and participated in weekly research seminars on latest AI research papers, presenting on advancements such as Kolmogorov-Arnold Networks

NUS Bumblebee Autonomous Systems | **Sep 2023 – Present**
Software Engineer

- Collaborating with a multi-disciplinary team of undergraduates to design and build world-class Autonomous Underwater Vehicle (AUV), Autonomous Surface Vessel (ASV) and an Unmanned Aerial Vehicle (UAV) for international competitions
- Architected and led development of complex autonomous behavior systems using behavior trees, enabling sophisticated decision-making capabilities for multi-vehicle operations
- Successfully rearchitected and migrated 50,000+ lines of legacy ROS 1 codebase to ROS 2, redesigning core system architecture to improve modularity and performance
- Worked with advanced ML models including YOLOv11 segmentation and Depth Anything, developing custom training and fine-tuning workflows for autonomous navigation applications

Singapore University of Technology and Design **May 2018 – June 2018**
Machine Learning Research Assistant *Singapore*

- Investigated the application of Homotopy Type Theory to higher-order machine reasoning, conducting experiments using the Facebook bAbI dataset
- Wrote formal proofs using proof assistants Coq and Agda, cultivating a robust foundation in mathematical thinking and precision in proof-writing

Projects and Competitions

Citadel Asia Trading Invitational 2024 | *Pandas, NumPy, matplotlib, Python* **Apr 2024 – Apr 2024**

- Developed and implemented a minimum variance hedging strategy using ETFs to manage risks associated with securities in those ETFs, effectively reducing portfolio volatility
- Utilized statistical and financial analysis to optimize the hedge, including the calculation of the Sharpe ratio, beta coefficients, and volatility indices
- Assessed financial performance and hedge effectiveness through detailed visualizations such as time-series plots of returns, volatility charts, and risk-return scatter plots

Citadel Asia Datathon 2024 | *Pandas, NumPy, SciPy, scikit-learn, matplotlib, Plotly, Python* **Mar 2024 – Mar 2024**

- Selected for the highly competitive Citadel Asia Datathon after rigorous resume screening and an online test, highlighting data analysis and problem-solving skills
- Collaborated in a team to analyze large datasets, employing Python and machine learning libraries such as Pandas, NumPy, and scikit-learn to uncover actionable insights and drive data-driven decision-making processes
- Designed and implemented predictive models to identify and tackle complex real-world problems

National AI Student Challenge 2024 | *LLMs, LangChain, Vector Databases, RAG* **Jan 2024 – May 2024**

- Developed an LLM-powered web application in Python, incorporating techniques such as Retrieval-Augmented Generation (RAG) and vector databases to automate feedback on student submissions for formative assessments based on teacher-provided marking scheme
- Leveraged Lang Chain for integrating state-of-the-art language models, enhancing the app's ability to parse and understand complex student responses, enabling precise measurement and tracking of student progress and understanding

Semi-finalist, Citi Foundation-SMU FinHack 2023 | *React, AI, NLP, Portfolio Optimisation* **Aug 2023 – Sep 2023**

- Catalysed innovative AI-powered solution aimed at empowering the public to easily and accurately assess the value of ESG investments
- Rapidly prototyped proof-of-concept application using React, integrating NLP techniques and advanced portfolio risk management algorithms
- Pitched our solution to a panel of experts, effectively communicating the project's vision, functionality, and potential impact

Research Publications

Automatic Grading of Online Formative Assessments | **Apr 2019 – Jul 2020**

***Best Paper Award**, 6th IRC Conference on Science, Engineering and Technology 2020*

- Developed novel automatic grading architectures using machine learning and natural language processing to expedite marking of formative assessments
- Utilised bidirectional long short-term memory networks with attention mechanism and cosine similarity-based model for quantitatively scoring answers and providing qualitative feedback, achieving up to 75% accuracy in the grading process
- Communicated research effectively to a panel of experts through academic presentation and publication, earning the recognition of the best paper amongst 70 entries