Amogh Singh

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AmoghSingh25

Education

- **MPhil in Advanced Computer Science** *Oct 2024 - Jul 2025*
  University of Cambridge Cambridge, United Kingdom
  - Thesis on 'Modelling Down Syndrome: A Causal, Multi-Modal Approach', supervised by Prof. Pietro Liò
  - Passed with Distinction, securing a total of 82.4%
  - Awarded the Pemanda Monappa Scholarship by the Cambridge Trust, a fully funded scholarship
- **B.Tech in Computer Science and Engineering with Spl. in AI and Robotics** *Sept 2020 - May 2024*
  Vellore Institute of Technology, Chennai Chennai, India
  - CGPA: 9.38 / 10.0
  - Secured 2nd Rank in the University

Experience

- **Nanyang Technological University** *Sept 2023 - Sept 2024*
  Research Intern Remote
  - Worked as a research intern with Dr. Yuvaraj Rajamanickam
  - Implemented deep-learning techniques on video data for real-world applications
- **UPAAYA** *Apr 2022 - Oct 2022*
  Research and Development Intern Remote
  - Bagged the internship for having won the Ideathon competition held in 2021
  - Implemented an end-to-end system for predicting onset of pests on rice crops
  - Developed a cross-platform app using React Native
  - Designed a Deep Learning model for analyzing video datasets of crops
  - Implemented AI inferencing in the cloud using AWS Sagemaker

Projects

- **Language Evolution in Multi-Agent Systems**
  Tools: TensorFlow, PyTorch
  - Study the evolution of language between agents when placed in a cooperative environment
  - Demonstrated that agents can develop a language of their own to communicate information
  - Analysis revealed characteristics of human languages including generalizability, redundancy, evolution and overcoming communication breakdowns
- **Model Expansion using weight copying**
  Tools: TensorFlow, PyTorch
  - Implemented knowledge distillation and weight copying methods from literature and compared the performances
  - Theorized a new weight copying method, Envelope Expansion, based on Grad-CAM analysis with a lower SNR ratio
  - Results show Envelope Expansion is the best performing in terms of validation loss and accuracy gain
- **Optimising Coastal Defense Strategies: A Simulation-Based Study**
  Tools: Python
  - Part of a team working on optimizing barrier placements for reducing coastal erosion
  - Designed and created two simulators for coastal erosion for 2D and 3D using energy- and particle-based approaches respectively
  - The simulators were used by the team on real-world Norfolk buoy data and barrier placements were optimized using Bayesian Optimization

- Achieved a 93% decrease in erosion compared to non-optimized barriers

- **Amygdala-Modeled Neural Network System for Rapid Obstacle Avoidance in Drones**
  Tools: AirSim, TensorFlow
  - Modeled the working of the Amygdala in the human brain for improved performance in obstacle detection and avoidance in drones
  - Mimicked the working of the Amygdala by using a Self Organizing Map combined with a Feed Forward Neural Network which would take in image input and output an overall fear factor along with the fear factor associated with each direction of movement
  - Achieved remarkable reduction in processing time of upto 89% compared to other methods utilizing VGG and Faster R-CNN

- **Autonomous navigation of UAVs in GPS-Denied Environments using Reinforcement Learning**
  Tools: AirSim, StableBaselines3, TensorFlow
  - Aim to improve the performance of drones in environments without GPS based on inputs from RGBD cameras in the front and back
  - Used AirSim as simulation environment to evaluate the performance of implemented systems
  - Implemented Reinforcement learning for allowing drone to navigate in three different indoor environments with varying levels of difficulties in terms of obstacles and goals
  - Proposed a system uses two DQN networks for input from front and back cameras with a combinatory neural network to combine the inputs and output a single Q value.
  - Improvements also included using an unbiased replay buffer and an adaptive learning rate

PATENTS AND PUBLICATIONS

J=JOURNAL, P=PATENT, S=IN SUBMISSION

[J.1] Ananthakrishnan Balasundaram, Ayesha Shaik, B. Rohan Alroy, **Amogh Singh**, S. J. Shivaprakash (2024). **Genetic Algorithm Optimized Stacking Approach to Skin Disease Detection**. *IEEE Access*, Vol. 12, pp. 88950-88962. DOI: 10.1109/ACCESS.2024.3412791

[S.1] **Amogh Singh**, Christy Jackson Joshua, Abraham Sudharson Ponraj (2024). **SwarmRoute: Collaborative Optimization for Efficient Logistics Routing with Road Metric Optimization**. Manuscript submitted in *International Conference on Machine Learning and Data Engineering*.

[S.2] Sandhya P, Anik Bhaumik, R Srivats, Kalyanasundaram V, **Amogh Singh** (2024). **Partum prediction of cephalopelvic disproportion based on maternal anthropometry classification of shape of pelvic bone and head circumference of the foe**. In *3rd international conference on advances in data-driven computing and intelligent systems* September 20-21, 2024, BITS Pilani, Goa.

[P.1] Sandhya P, **Amogh Singh**. (2024). **A Handheld Device to Verify Authenticity of a Fabric and a Method Thereof**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441045377.

[P.2] Sandhya P, **Amogh Singh**. (2024). **A Platform to Park Vehicle Above a Surface**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441041075.

[P.3] Sandhya P, **Amogh Singh**. (2024). **A Device to Dispense Perfume Over the Body of a User**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441028675.

[P.4] Sandhya P, **Amogh Singh**. (2024). **System and Method Facilitating Safety to Users from Ball Collisions During Games**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441052205.

[P.5] Sandhya P, **Amogh Singh**. (2024). **A System, a Device, and a Method To Prevent Dispensing of Damaged Banknotes**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441083587.

[P.6] Sandhya P, **Amogh Singh**. (2024). **Footwear Device for Assisting a User in Wearing Footwear**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441033638.

[P.7] Sandhya P, **Amogh Singh**, R Srivats. (2024). **An Aid to Examination Procedure**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441089239.

[P.8] Sandhya P, R. Veeraragavan, **Amogh Singh**, Kalyanasundaram V, R Srivats, Rajkumar Murugesan, Rajvenkatesan P R L. (2024). **A System and Method for Protecting Secret Documents on Permissioned Block Chain**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441072588.

[P.9] Sandhya P, Ganesan R, Rama Parvathy L, R Srivats, Kalyanasundaram V, **Amogh Singh**, Sanjana Ravishankar. (2024). **Blockchain-based System and Method for Managing Tenders and Monitoring of Quality in Public Works**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441069105.

[P.10] Sandhya P, Ganesan R, Rama Parvathy L, **Amogh Singh**, R Srivats, Kalyanasundaram V, Harsha Jackson, Chanakya Bharadwaj, Harsha Vardhine G, Kaushik S, Harsh Raj, Steve Anthony Sequeira. (2024). **System and Method Facilitating to Track Authenticity of Organic Produce in Supply Chain**. The Office of the Controller General of Patents, Designs and Trade Marks (CGPDTM), Patent No. 202441081169.

Honors and Awards

- **Highly Commended M.Phil Project** *2025*
  University of Cambridge, United Kingdom
  ◦ Awarded by examiners for my M.Phil Project on 'Modelling Down Syndrome: A Causal, Multi-Modal Approach'
- **Rank Holder** *2024*
  Vellore Institute of Technology, Chennai, India
  ◦ Awarded for graduating with a second rank in the university
- **Meritorious Student Award** *2022, 2023 & 2024*
  Vellore Institute of Technology, Chennai, India
  ◦ Awarded for academic excellence for three consecutive years, 2022, 2023 and 2024
- **Upaaya Ideathon 2021** *2021*
  Vellore Institute of Technology, Chennai and Upaaya
  ◦ Won 1st prize for best project on end-to-end system for pest detection and prediction
  ◦ Received ₹25,000 cash prize and an opportunity to work on the project as a paid intern at Upaaya
- **Innovation award for Assistive Bot** *2021*
  International Rover Design Challenge, Mars Society South Asia
  ◦ Part of team Technocrats Robotics which won the Innovation award for the design of its Assistive Bot, Arjuna

Certifications

- **Cloud Engineering Track, Data Science and Machine Learning Track in 30 days of Google Cloud program 2021**
- **Software Engineering Virtual Experience from JPMorgan Chase & Co.**
- **Engineering Virtual Program from Goldman Sachs**
- **STEM Connect Virtual Experience Program from Deloitte**
- **Foundational Enterprise Grade AI by IBM Academic Initiative**
- **Foundational Cloud for the Enterprise by IBM Academic Initiative**
- **Foundational Enterprise Data Science by IBM Academic Initiative**
- **Introduction to Packet Tracer course by Cisco Networking Academy**