# Arjun Agrawal

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## Education

Oct 21 – Sept 22 **Imperial College London (ICL)** London, UK
**M.Res Medical Robotics and Image Guided Intervention**, Distinction
Research *Meta-learning, Few-shot learning, Deep learning*

Aug 17 – May 21 **National University of Singapore (NUS)** Singapore
**B.Eng Mechanical Engineering Honours**, Distinction (2.1)
Specialisation: Robotics & AI | 2nd Major in Innovation & Design
Research *Sensor Fusion, SLAM, Localisation Systems, Path Planners*

Programming Frameworks *C++, Python, PyTorch, ROS, OpenCV, Linux, PCL, LaTeX, Conda, Git, OpenAI Gym, MuJoCo, Scikit*

## Work & Research Experience

Dec 21 – Sep 22 **ICL The Hamlyn Centre**, *Researcher* London, UK
Supervisor: *Dr Stamatia (Matina) Giannarou* | GitHub: *Under Development*
- *Proposed optimisation methodologies for few-shot meta learning with applications in medical tumour segmentation.*
- *Identified limits of iMAML in cross-domain applications within medical imaging.*

May – Sept 21 **Siix-AGT | A*STAR**, *Robotics Software Engineer* Singapore
Supervisor: *Dr Albertus Adiwahono*
- *Secured certification in crucial street safety AV assessment (CETRAN) and spearheaded maiden voyage of a multi-agency security robot.*
- *Managed software and hardware integration of low-level sensor suite on robot. Developed sonar-based avoidance system essential to clearing CETRAN.*

Jan – May 21 **Temasek Laboratories NUS**, *Researcher* Singapore
Supervisor: *Dr Suttiphong Srigrarom* | GitHub: *UAVProjectileCatcher*
Publication: *"Trajectory Prediction Path Planning for an Object Intercepting UAV with a Mounted Depth Camera", ICCAS 21*
- *Researched the use of onboard depth image cameras instead of external motion capture to plan trajectories for Quadcopters and enable projectile interception.*
- *Designed and investigated path planning methodologies which were effective at predicting ball path and aiding interception in simulation.*

May 20 – May 21 **NUS Advanced Robotics Centre**, *Researcher* Singapore
Supervisor: *Prof. Marcelo Ang Jr* | GitHub: *Autonomous_Navigation_Stack_Rovers*
- *Led engineering team and collaborated with National Parks to develop a maintenance robot - addressed man-power deficiency and improved productivity by 150%.*
- *Evaluated SLAM algorithms in a dynamic outdoor environment.*
- *Developed a novel localisation pipeline to process 3D point cloud data for Monte Carlo Localisation. Tuned EKFs to yield a position variance of 0.15m and 0.09m in a GNSS denied with irregular terrain.*

- *Integrated DWA and TEB planners in C++ on robot. Wrote sensor drivers and carried out sensor integration.*

Aug 19 – May 21 **National University of Singapore**, *Teaching Assistant* Singapore

- *Led design engineering and microcontroller theory tutorials for 30 students.*

May – Aug 19 **Linde Gas**, *Intern Software Engineer* Singapore

- *Initiated IoT system to automate data collection in gas plants – pilot resulted in $23k annual savings.*
- *Developed computer vision software to aid the acquisition of Australian market – saving 40% in sales efforts.*

Jan – Dec 19 **Satellite Technology and Research Centre**, *Researcher* Singapore

Supervisor: *Dr Luo Sha*

- *Led 4 engineers to develop an IoT solution to monitor train track conditions - proposed system detected 67% of all accident-causing defects. Presented at Harbin Institute of Technology, Tech Forum to a panel of academics.*
- *Performed visual data analysis on edge devices to identify track buckling – benchmarked neural network architectures whilst operating on edge IoT devices.*
- *Adapted a low-power mesh network to relay data from sensors in low-connectivity areas.*

May – Aug 18 **NUS School of Design and Environment**, *Researcher* Singapore

Supervisor: *Assoc. Prof. Goh Yang Miang*

- *Designed a Convolutional Neural Network to localise workers and unsafe acts at a construction site - presented findings to Singapore Housing Development Board.*

May 15 – Aug 17 **Singapore Armed Forces**, *Infantry Sergeant* Singapore

- *Directed training of 23 soldiers. Planned and executed training modules in local and international camps. Leader of Company Marksman Team.*

## Projects

Dec – Sept 21 **Meta Learning Tools for Applied Medicine**

GitHub: *Under Development*

- *A collection of extensions and data-loaders for few-shot & meta-learning in PyTorch. It provides support for a range of open-source medical datasets, including BraTs, Medical Segmentation Decathlon, BUSIS, CAMUS.*

May – Sept 21 **Sensor Fusion Engineering Nanodegree**

GitHub: *SFND_Unscented_Kalman_Filter*

- *Built EKF and UKF in C++ to merge sensor data and track nonlinear movement.*
- *Processed LiDAR data with RANSAC to segment point clouds and Euclidean clustering with KD-Trees to distinguish vehicles.*
- *Investigated ideal pair of detectors and descriptors to estimate motion from RGB data. Fused RGB and LiDAR data for object classification.*
- *Analysed radar signatures to track objects. Calculated velocity and orientation by correcting radial velocity distortions and occlusions.*

May 20 – July 21 **Students for the Exploration and Development of Space**, *Team Lead*

- *Implemented navigation stack to traverse the unmapped environment of the Mars Desert Research Station.*
- *Led ROS and manipulator control workshops for students. Coordinated project schedule to meet compressed deadlines created by pandemic. Led talent recruitment.*

Aug – Dec 20 **Deep Reinforcement Learning for Robotics**

GitHub: *Reinforcement-Learning-for-Robotic-Manipulator*

- *Developed an OpenAI Gym environment of a manufacturing line and manipulator.*
- *Implemented a learning agent using PyTorch - trained actuator to pick, place, stack and sort. Agent used Double Deep Q-Network.*