# Kaleb Ben Naveed

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## EDUCATION

- **The Hong Kong Polytechnic University** Hong Kong

  *Bachelor of Engineering in Electronic & Information Engineering* *Sep 2018 – May 2022 (Expected)*

  CGPA: 3.59/4.0

  **Relevant Courses**: Deep Learning and Neural Networks, Perceptual Robotics, Computer Vision and Pattern Recognition, Probability and Statistics, Digital Signal Processing, Multimodal Learning, Computer Programming, Linear Algebra

- **Robotics Specialization, University of Pennsylvania** Online Course Series, Coursera

  *Average Grade: 99/100* *May 2018 – December 2021*

  **Relevant Courses**: Aerial Robotics, Computational Motion Planning, Mobility, Perception, Estimation and Learning, Capstone Project [Certificates]

## PUBLICATIONS

[1] **Kaleb Ben Naveed**, Zhiqian Qiao, and John M. Dolan, "Trajectory Planning for Autonomous Vehicles Using Hierarchical Reinforcement Learning," in Proceedings of IEEE Intelligent Transportation Systems Conference (ITSC '21), pp. 601 - 606, September 2021

[2] **Kaleb Ben Naveed**, Brady G. Moon, and Sebastian Scherer, "Informative and Fast Exploration Planning Using UAV for Reconnaissance Operations," in RISS Working Papers Journal (RISS '21), pp. 219 – 225, August 2021

## TECHNICAL SKILLS

- **Languages:** Python, C++, MATLAB, C, R, LaTeX
- **Software:** ROS, Gazebo, AirSim, Unreal engine UE4, MATLAB & Simulink, Open AI gym, CARLA, SUMO, CUDA
- **Frameworks:** TensorFlow 1.x & 2.x, Keras, PyTorch, NumPy, Matplotlib, SciPy, OpenCV, Pandas
- **Electronics:** AVR microcontroller, Arduino, Soldering

## RESEARCH EXPERIENCE

- **Connected Autonomous Vehicles lab, The Hong Kong Polytechnic University** Hong Kong

  *Research Assistant* *Nov 2020 - Present*

  *Supervisor: Dr. Edward Chung*

  - Leading research on decision-theoretic planning using multi-agent reinforcement learning
  - Developing algorithm for multi-agent on-ramp merging scenario for autonomous vehicles using PyTorch in SUMO

- **AirLab, Carnegie Mellon University** Pittsburgh, PA

  *Robotics Institute Summer Scholar (RISS)* *May 2021 – Aug 2021*

  *Supervisor: Dr. Sebastian Scherer*

  [Paper][Poster][Video]

  - Proposed and developed Prioritized-FUEL (**F**ast **U**AV **ExpL**oration), a hierarchical approach for informative path planning
  - Proposed method showed **2 times faster Data Acquisition** with same exploration time compared to existent approach
  - Helped in Development of simulation environment using ROS, AirSim, Unreal Engine and Gazebo.

- **Argo AI, Carnegie Mellon University** Pittsburgh, PA

  *Robotics Institute Summer Scholar (RISS)* *April 2020 - Nov 2020*

  *Supervisor: Dr. John M. Dolan*

  [Paper][Poster][Video][Code]

  - Proposed and developed Robust-HRL [1], a Hierarchical Reinforcement Learning (HRL) based framework for decision making trajectory planning for Autonomous Vehicles.
  - Robust -HRL showed **at least 7 % higher success rate** than the existent state of the art RL and heuristic based approaches.

- **Engineering Laboratory, The University of Cambridge** Cambridge, England

  *Summer Exchange Student at Pembroke College (PKP)* *July 2019 - Aug 2019*

  *Supervisor: Dr. Gábor Csányi*

  [Video]

  - Developed a Maze Solver line follower Robot which was successful to solve maze using sensors and pre-stored conditions.

    ◦ Added the ability to create the map of the path taken by robot, identify dead-ends and to do error correction.

## SELECTED PROJECTS

- **Final Year Project, The Hong Kong Polytechnic University**          *Aug 2021 – Present*
  - ◦ Using machine learning techniques for radio map based UAV path planning with Disconnectivity constraint.
- **Capstone Project, Specialization in Robotics (MOOC), Coursera**         *Dec 2021*
  - ◦ Used MATLAB to simulate the mobile inverted pendulum using PID controller and Extended Kalman Filter.
- **Autonomous Mini Robot Car as part of Integrated Project [Video]**     *Sept 2020 – April 2021*
  - ◦ Developed robot car from scratch. The stages included PCB design and programming microcontroller and planning routine.
  - ◦ Was ranked in the highest category (top 10%) in class for having best performance metrics on all missions.
- **Technical AI Engineer, Aerovision Technologies, Hong Kong Science Park**    *Dec 2020 – Jan 2021*
  - ◦ Improved accuracy by 25 % of the small-sized object detection framework using YOLO v4 for intrusion detection.
- **Student Assistant, PolyU School of Design**          *May 2019 – March 2020*
  - ◦ Facilitated experiments and processed data for the project "Sizing and Comfort Study for Ear-related Product Design"

## STEM OUTREACH & LEADERSHIP

- **Member and Contributor, CMU Robotics Outreach Working Group**      Pittsburgh, PA
  *Robotics Institute, Carnegie Mellon University*          *Sept 2021 - Present*
  - ◦ Designing and launching a website for students and teachers to learn about robotics. Website will include free learning resources about robotics, list of resources for different robotics opportunities, etc.
- **Founder and Leader of Reinforcement Learning Reading Group (RLRG)**     Hong Kong
  *Faculty of Engineering, The Hong Kong Polytechnic University*      *April 2021 - Present*
  - ◦ Founded RLRG to create a platform for students and faculty to learn and discuss RL and also to form possible collaborations. RLRG is first ever research reading group on campus
- **Assistant Lecturer for Cambridge GCE A levels**         Lahore, Pakistan
  *Science Department, Keynesian Institute of Management and Sciences*    *Sept 2017 - Feb 2018*
  - ◦ Responsible for teaching GCE A Level physics, chemistry laboratory experiments and programming problem sets.
  - ◦ Regularly helped students struggling with time management, and exam attempting techniques.

## TALKS & PRESENTATIONS

**Conference Paper Presentation**, *IEEE Intelligent Transportation Systems Conference, Indianapolis*    *Sept 2021*

**RISS 2021 Research Poster Presentation**, *Robotics Institute Summer Scholars Program, CMU*    *Aug 2021*

**Talk on Reinforcement Learning**, *Teach Your Mates, Faculty of Engineering, HKPU*    *April 2021*

**RISS 2020 Research Poster Presentation**, *Robotics Institute Summer Scholars Program, CMU*    *Aug 2020*

**Robotics Project Demonstration**, *Pembroke College, University of Cambridge, UK*    *Aug 2019*

## HONOR & AWARDS

- **Undergraduate Research and Innovation Scheme (URIS):** Awarded 5000 for my research project in connected autonomous vehicles lab. Awarded to almost 100 undergraduate students throughout university in June 2021
- **Undergraduate Summer Research Abroad Sponsorship (USRA):** Awarded 5000 USD to participate in Robotics Institute Summer Scholars Program at Robotics Institute, Carnegie Mellon University in May 2021
- **Honored Global Student Ambassador:** Awarded highest level ambassadorship for organizing intercultural events
- **Oxbridge Program Subsidy:** Awarded 6500 USD to participate in exchange semester at University of Cambridge
- **Deans Honor List 2018/19:** Included in Deans honor list for exceptional academic achievement.
- **Entry Scholarship by The Hong Kong Polytechnic University**: Full scholarship for 4-years BEng (Hons) in Electronic & Information Engineering. The scholarship covers full tuition fee, accommodation, and personal expenses.

## OTHER COURSES & EDUCATION

- **CS 285 Deep Reinforcement Learning**, *University of California, Berkeley, Online*    *Aug 2021 – Present*
- **Probabilistic Graphical Model Specialization,** *Stanford University, Coursera*    *May 2021 - Present*
- **Summer Exchange Semester**, *Pembroke College, University of Cambridge* [Transcript]    *July 2019 – Aug 2019*