Parv **Kapoor**

(+1) 213-577-9730 | parvk@cs.cmu.edu | parvkpr.github.io | parv-kapoor

Education

Carnegie Mellon University | School of Computer Science *Pittsburgh, U.S.A.*

Doctor of Philosophy in Software Engineering *Fall 2021 - Present*

CQPA: 4.08/4.00 Advisors: Eunsuk Kang and Sebastian Scherer

Manipal Institute of Technology *Manipal, India*

Bachelor of Technology in Computer Science Engineering *Fall 2016 - Fall 2020*

CGPA: 8.59/10 | Minor: Intelligent Systems

Selected Coursework: Human-Robot Interaction, AI for Social Good, Formal Methods, Machine Learning, Artificial Intelligence, Natural Language Processing, Social Network Analysis, Probability Theory, and Statistics.

Skills

Programming Python, C/C++, JAVA, OpenCL, MySQL, CUDA programming, PLSQL, Verilog, LaTeX

Tools ROS, OpenCV, Tensorflow, PyTorch, AirSim, CARLA, Pyglet, Tesseract, Matlab, ZED SDK, ADO.NET

Experience

Carnegie Mellon University *Pittsburgh, U.S.A.*

Graduate Research Assistant| PI: Eunsuk Kang Co-PI: Sebastian Scherer *Aug. 2021 - Ongoing*

- Developing safe and robust planning methods for autonomous aircraft control. We use a combination of specification based synthesis and control barrier functions to ensure reliable heterogeneous aerial robot behavior. This work is done in collaboration with AirLab.
- Formalising novel goal specification logic for safe reinforcement learning. Formally verified efficient policy learning is the major contribution of this work.
- Developing robustness analysis techniques for reinforcement learning agents in the face of environmental deviations.

VERIMAG, Université Grenoble Alpes *Grenoble, France (Remote)*

Research Engineer | PI: Thao Dang *Jan. 2021- Aug. 2021*

- Formalized the notions and concepts for uniform random stimulus generation based on timed automata. This work was done for quantitative validation of autonomous systems.
- Deployed them in the SUMO simulation environment for autonomous vehicle applications.

CPS-VIDA Lab, University of Southern California *Los Angeles, U.S.A.*

Research Assistant | PI: Jyotirmoy Vinay Deshmukh *Jan. 2020 - Jan. 2021*

- Implemented novel model-based and model-free Reinforcement Learning algorithms for optimizing over Signal Temporal Logic defined safety constraints.
- Developed multiple in-house environments to benchmark algorithms alongside CARLA, AirSim, and Gazebo simulators.
- A research paper based on our unprecedented optimization for STL Quantitative Semantics is currently under submission.

Visual Computing Researchers Lab, Cardiff University *Cardiff, U.K.*

Research Intern | PI: David Marshall *May 2019 - July 2019*

- Developed a bioinspired deep learning and computer vision virtual guide-dog project for safe trajectory prediction. The project aimed at obstacle avoidance to aid partially blind people.
- The implementation predicts subject trajectory and suggests optimal user action. Visual odometry, Optical flow, Human Perception, scene translation, and convolution neural nets were used to create a real-time solution. The project was programmed using Tensorflow for python and ZED stereo camera API.
- An abstract on our research findings was accepted at the Applied Vision Associations held in December 2019.

RapidQube Digital solutions Pvt. Ltd. *Mumbai, India*

Research Intern *May 2018 - July 2018*

- Implemented an obstacle avoidance project utilizing Computer Vision knowledge and a Convolutional neural network capable of logging data onto a blockchain network. The project was constructed using Tensorflow for python and NEM SDK.
- The project alerts drivers in case of anticipated accidents using depth perception networks, object tracking algorithms(YOLO) and OnBoard diagnostics device and logs driver information obtained using Optical Character Recognition(Tesseract) on Number plates, onto the NEM Blockchain network.

Publications and Preprints

Follow The Rules: Online Signal Temporal Logic Tree Search for Guided Imitation Learning in Stochastic Domains

J. Patrikar, J. Aloor, **P. Kapoor**, S. Scherer and J. Oh *2022*

- submitted to ICRA 2023

Challenges in Close-Proximity Safe and Seamless Operation of Manned and Unmanned Aircraft in Shared Airspace

J. Patrikar, J. Dantas, S. Ghosh, **P. Kapoor** et al *2022*

- In ICRA 2022 Workshop on Intelligent Aerial Robotics: From Autonomous Micro Aerial Vehicles to Sustainable Urban Air Mobility and Operations

Predicting Food Insecurity in Somalia using Machine Learning

P. Kapoor, M. Feffer, S. Dodt and F. Fang *2022*

- Working paper

Model-based Reinforcement Learning from Signal Temporal Logic Specifications

P. Kapoor, A. Balakrishnan, J. V. Deshmukh *2020*

- Under submission

Predicting Time to Contact Across the Visual Image

D. Marshall, S.K. Rushton, J. Redfern, **P. Kapoor**, R.J. Moran *2020*

- In PERCEPTION (Vol. 49, No. 6, pp. 714-714) SAGE PUBLICATIONS LTD.

Achievements & Volunteer work

2022	Selected for 11th Summer school on Formal Techniques organized by SRI International
2020	Member of the Organising Committee for the 20th International Conference on Runtime Verification held in Los Angeles.
2020	Remotely mentored UW-Madison students on applications of deep reinforcement learning for stock trading and analysis.
2019	1 out of 4 students selected out of 600 students for an all-expense paid 3 weeks Training program in Huawei Enterprises China premises.
2019	Won an internship offer at Cardiff university after competing with multiple candidates from 83 local committees worldwide
2019	Presented a Poster at Bristol Vision Colloquium at University of Exetor.