

# Athindran Ramesh Kumar

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Webpage: <https://athindran.github.io/>

## OUTLINE

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Domain expertise in controls, machine learning, and robotics. Ph.D research work on safety certification using optimization, learning, and control. TA for several courses on machine learning and data science.

## EDUCATION

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### Princeton University

NJ, USA

*MA + PhD, Electrical and Computer Engineering*

*Sep.2018 - Sep 2023*

Advisor: Prof. Peter J. Ramadge

GPA : 3.93/4.0

- Key Courses: Machine learning and Pattern Recognition, Modern Control, Safe Robotics, Theoretical Machine Learning, Optimization for Machine Learning, Reinforcement Learning.
- M.A. degree in Electrical Engineering awarded.
- Ph.D. completed - to be awarded Sep 2026.

### University of Illinois at Urbana-Champaign

Illinois, USA

*MS (fully funded by Dept.), Electrical and Computer Engineering*

*Aug. 2013 - Aug 2015*

Advisor: Prof. Grace Gao

GPA : 3.95/4.0

### Indian Institute of Technology, Madras

Chennai, India

*B.Tech, Electrical Engineering*

*Aug. 2009 - July 2013*

Advisor: Prof. Radhakrishna Ganti

GPA : 9.27/10.0

## PROFESSIONAL EXPERIENCE

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### • Aurora Innovation

Pittsburgh, PA

*Software Engineer II - Behavior Planning and Control*

*October 2023 - present*

- Contributed to state-of-the-art ML models for motion planning and scene understanding
- Experience working on safety-critical robotics software that implements control algorithms on a self-driving truck while ensuring fail-safe testing

### • Aurora Innovation

Pittsburgh, PA

*Software Intern - Controls*

*May - Aug 2022*

- Analysis and deployment of improvements to longitudinal control of autonomous trucks

### • Nokia Bell Labs

Murray Hill, NJ

*Research Intern*

*Jun - Aug 2021*

- Reinforcement learning algorithms for a multi-link robotic arm in simulation
- Sample-efficient reinforcement learning with expert demonstrations
- Adapting efficiently to re-configurable robotic arms using sequence neural networks

### • Center of Excellence in Wireless Technology

Chennai, India

*Research Engineer*

*Apr 2016 - June 2018*

- Path loss modeling with GIS satellite imagery from geo-platform of ISRO
- Developed frequency planning methods in a communication system that have been patented by the organization

### • IIT Madras

Chennai, India

*Project Associate*

*Nov 2015 - Mar 2016, Jul 2017 - Jul 2018*

- Worked on a proposal seeking funding for the 5G mmWave cellular project at IIT Madras
- Efficient deep learning for object detection in videos using inference-time schemes for acceleration

### • Google Inc.

Mountain View, CA

*Software Intern - Street View*

*May - Aug 2014*

- Implemented ambiguity resolution algorithms in Python on GPS carrier phase data obtained from receivers installed on Street View cars to achieve sub-meter accurate positioning

## SELECT PUBLICATIONS

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### Journals

- A.R. Kumar, K. -C. Hsu, P. J. Ramadge and J. F. Fisac, “Fast, Smooth, and Safe: Implicit Control Barrier Functions through Reach-Avoid Differential Dynamic Programming,” in IEEE Control Systems Letters, doi: 10.1109/LCSYS.2023.3292132.
- Heng, Liang, A.R. Kumar, and Grace Gao. “Private proximity detection using partial GPS information.” IEEE Transactions on Aerospace and Electronic Systems 52.6 (2016): 2873-2885.

### Conference and Workshops

- S. Liu\*, A.R. Kumar\*, Jaime F. Fisac, Ryan P. Adams, Peter J. Ramadge. “ProBF: Probabilistic Safety Certificates with Barrier Functions.” Presented at SafeRL workshop at NeurIPS 2021.
- A.R. Kumar and Peter J. Ramadge. “Learning to Control Using a Convex Combination of Controllers.” 2021 American Control Conference (ACC). IEEE, 2021.
- A.R. Kumar and Peter J. Ramadge, 2021, March. DiffLoop: “Tuning PID controllers by differentiating through the feedback loop.” In 2021 55th Annual Conference on Information Sciences and Systems (CISS) (pp. 1-6). IEEE.
- T. H. Fan, A. R. Kumar and P. J. Ramadge. Safety Control for Prime Focus Spectrograph. In 2022 56th Annual Conference on Information Sciences and Systems (CISS) (pp. 269-274). IEEE.
- A.R. Kumar, Balaraman Ravindran, and Anand Raghunathan. “Pack and detect: Fast object detection in videos using region-of-interest packing.” Proceedings of the ACM India Joint International Conference on Data Science and Management of Data. 2019.
- A.R. Kumar, Liang Heng, and Grace X. Gao. “GPS privacy: Enabling proximity-based services while keeping GPS location private.” Proceedings of the 27th International Technical Meeting of the Satellite Division of the Institute of Navigation (ION GNSS+ 2013),(Tampa, FL). 2014.

### Patents

- Athindran R, Navinnath P, Klutto Milleth, Bhaskar Ramamurthi, “Frequency Assignment for SINR and Throughput Management in Battlefield Communication”, India Patent granted 27th June 2024.

## SELECT ACADEMIC ACHIEVEMENTS

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- Awarded full-tuition waiver and stipend for MS degree program at University of Illinois, Urbana-Champaign
- Received first-year fellowship at Princeton University for PhD program
- Outstanding merit in Mathematics from Srinivas Ramanujan academy of Maths talent awarded in 2008
- Ranked 294 out of 1,000,000 students in AIEEE and 1561 out of 800,000 students in JEE

## ACADEMIC SERVICE

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### Teaching Experience

- Three-time TA for ECE 435-535 (Machine learning course with strong math foundations)
- Assistantship in Teaching for 11 semesters

### Reviewing Service

- Conferences: ICLR (2021, 2023, 2024), NeurIPS (2022-2024), ICML (2023-2025), CISS 2022, IJCAI 2024, IJCAI 2026, CDC 2026
- Journals: IEEE Transactions on Control Systems Technology, IEEE Robotics and Automation Letters
- Top reviewer for NeurIPS 2023
- Recognition of reviewing contribution within the PPI - Bronze Tier for IJCAI 2026

## SELECT PROJECTS

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### –Optimization and Learning methods for Safety-Critical Control–

Princeton University, NJ

*Guide: Prof. Peter Ramadge*

*Jul 2019 - Aug 2023*

- Safety certification for autonomous control systems
- Learning residual dynamics using probabilistic models

### –Efficient Deep Learning for Videos–

IIT Madras, Chennai

*Guide: Prof. B. Ravindran and Prof. Anand Raghunathan (Purdue University)*

*Jul 2017 - Jul 2018*

- Novel inference time method to accelerate object detection in videos
- Published ACM India Joint International Conference on Data Science and Management of Data 2019

## PROGRAMMING SKILLS

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- Python      - PyTorch      - JAX      - C++      - Matlab