Venkata Ramana Makkapati

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https://vrmakkapati.github.io

Research Interests

Decision and control under uncertainties, Optimization, Multi-agent systems, and Machine learning with applications in *Aerospace systems & Robotics*

Experience

- **Engineer, Advanced Research** *Jul 2021 – present*
  Honda Aircraft Company, Greensboro, NC

- **Graduate Research Assistant** *Aug 2016 – May 2021*
  Georgia Institute of Technology, Atlanta, GA
  - Sensitivity-based analysis to mitigate for control design of hypersonic vehicles
  - Safe, resilient and efficient operation of autonomous aerial and ground vehicles
  - Optimal strategies for uncertain differential games with applications

- **Research Intern** *May 2019 – Aug 2019*
  Foresight AI Inc, San Jose, CA
  - POMDPs and RL based motion planning and driving decisions algorithms & software

- **Summer Intern** *May 2013 – Jul 2013*
  Mahindra & Mahindra, Chennai, India
  - Approximation methods for the modal analysis of an exhaust system

- **Summer Intern** *May 2012 – Jul 2012*
  CSIR - National Aerospace Laboratories, Bangalore, India
  - Evaluation of free-to-roll test technique to study unsteady motions of an aircraft

Education

- **Ph.D.,** *Aerospace Engineering* *2021*
  Georgia Institute of Technology
  Advisor: Prof. Panagiotis Tsiotras
  Thesis: *Games of pursuit-evasion with multiple agents and subject to uncertainties*

- **M.S.,** *Computational Science and Engineering* *2021*
  Georgia Institute of Technology

Focus: *Machine Learning*

- **M.Tech.,** *Aerospace Engineering* *2016*
  Indian Institute of Technology Kanpur
  Advisor: Prof. Mangal Kothari
  Thesis: *Pursuit-evasion games of high speed evaders*

- **B.Tech.,** *Aerospace Engineering* *2014*
  Indian Institute of Technology Madras
  Minor: *Industrial Engineering*

CERTIFICATIONS

- **Private Pilot (Airplane Single Engine Land)** *Nov 2020*
  Federal Aviation Administration (FAA)

- **Leading Flight Cadet** *2011*
  4-TN Air Squadron, National Cadet Corps (NCC)
  - B Certificate in the NCC examination

PUBLICATIONS

Peer-reviewed

JOURNAL ARTICLES

1. Safe optimal control under uncertainties
   V. R. Makkapati, H. Sarabu, V. Comandur, P. Tsiotras, and S. Hutchinson
   IEEE Robotics and Automation Letters (RA-L), 2020

2. Optimal evading strategies and task allocation in multi-player pursuit-evasion problems
   V. R. Makkapati and P. Tsiotras
   Dynamic Games and Applications (DGAA), 2019

3. Nested saturation based guidance law for unmanned aerial vehicles
   J. Patrikar, **V. R. Makkapati**, A. Pattanaik, H. Parwana, and M. Kothari
   ASME Journal of Dynamic Systems, Measurement, and Control, 2019

4. Optimal evading strategies for two-pursuer/one-evader problems
   V. R. Makkapati, W. Sun, and P. Tsiotras
   Journal of Guidance, Control, and Dynamics (JGCD), 2018

5. A comprehensive differential game theoretic solution to a game of two cars
   R. Bera, **V. R. Makkapati**, and M. Kothari
   Journal of Optimization Theory and Applications (JOTA), 2017

6. Pursuit-evasion games of high speed evader
   M. V. Ramana and M. Kothari
   Journal of Intelligent & Robotics Systems (JINT), 2017

7. Pursuit strategy to capture high-speed evaders using multiple pursuers
   M. V. Ramana and M. Kothari
   Journal of Guidance, Control, and Dynamics (JGCD), 2016

Conference Proceedings

1. Reachability-based covariance control for pursuit-evasion in stochastic flow fields
   V. R. Makkapati, J. Ridderhof, and P. Tsiotras
   AIAA SciTech Forum, 2022

2. Desensitized trajectory optimization for hypersonic vehicles
   V. R. Makkapati, J. Ridderhof, P. Tsiotras, J. Hart, and B. van Bloemen Waanders
   IEEE Aerospace Conference, 2021

3. Covariance steering for discrete-time linear-quadratic stochastic dynamic games
   V. R. Makkapati, T. Rajpurohit, K. Okamoto, and P. Tsiotras
   IEEE Conference on Decision and Control (CDC), 2020

4. C-DOC: Co-state desensitized optimal control
   V. R. Makkapati, D. Maity, M. Dor, and P. Tsiotras
   American Control Conference (ACC), 2020

5. Sequential auto-landing of multiple UAVs using control constrained path following
   J. Patrikar, **V. R. Makkapati**, and M. Kothari
   AIAA Guidance Navigation and Control Conference (GNC), SciTech, 2019

6. Trajectory desensitization in optimal control problems
   V. R. Makkapati, M. Dor, and P. Tsiotras
   IEEE Conference on Decision and Control (CDC), 2018

7. Pursuit-evasion problem involving two pursuers and one evader
   V. R. Makkapati, W. Sun, and P. Tsiotras
   AIAA Guidance, Navigation, and Control Conference (GNC), SciTech, 2018

8. Motion planning for a fixed-wing UAV in urban environments
   M. V. Ramana, S. A. Varma, and M. Kothari
   Advances in Control and Optimization of Dynamical Systems (ACODS), 2016

9. A cooperative pursuit strategy for a high speed evader
   M. V. Ramana and M. Kothari

AIAA Guidance Navigation and Control Conference (GNC), SciTech, 2016

10. A cooperative pursuit-evasion game of a high speed evader
M. V. Ramana and M. Kothari
IEEE Conference on Decision and Control (CDC), 2015

Workshop Papers

1. Apollonius allocation algorithm for heterogeneous pursuers to capture multiple evaders
V. R. Makkapati and P. Tsiotras
Workshop on Heterogeneous Multi-Robot Task Allocation and Planning, Robotics: Science and Systems (RSS), 2020

Invited Talks

- **Workshop on Decision and Control: Optimal Planning, ML & Games, IIT Kanpur** *Feb 2021*
Introductory lectures on *optimal control, differential games, and pursuit-evasion games*

- **IRIM-Robograds Virtual Student Seminar on Robot Planning** *Oct 2020*
Desensitization for safe planning under parametric uncertainties

- ***International Symposium on Dynamic Games and Applications*** *Jul 2018*
Optimal strategies and task allocation in multi-pursuer single-evader problems

Teaching

- **Graduate Teaching Assistant**, *Georgia Institute of Technology*
  - AE 6511: Optimal guidance & control *Spring 2019*
  - AE 6530: Multi-variable linear systems and control *Fall 2018*

- **Teaching Assistant**, *Indian Institute of Technology Kanpur*
  - AE647A: Flight dynamics *Fall 2015*
  - AE648A: Flight stability & control *Spring 2016*

Awards

Long Distance Running

- **Bronze Medal** *Apr 2014*
Dean's Trophy Road Race, IIT Madras

- **Team Record – Longest Distance (87 km) on a Treadmill** *Mar 2014*
Treadathon, Chennai

SERVICE

INSTITUTE SERVICE

- **Graduate Representative** *Jan 2020 - present*
  School of Aerospace Engineering Student Advisory Council (SAESAC), Georgia Tech

- **Senator** (Aerospace Engineering) *Jan 2020 – Aug 2020*
  Graduate Student Government Association (Grad SGA), Georgia Tech

EVENT ORGANIZATION

- **Lectures Series on Learning and Control** *Nov 2020 – Jan 2021*
  Virtual event

REVIEWER

- Automatica
- IEEE Transactions on Automatic Control
- IEEE Transactions on Robotics
- IEEE Robotics and Automation Letters
- Dynamic Games and Applications
- Journal of Aerospace Information Systems
- Journal of Air Transportation
- IEEE International Conference on Robotics and Automation
- IEEE Conference on Decision and Control
- American Control Conference
- AIAA SciTech Forum
- Advances in Control and Optimization of Dynamical Systems

OTHER

- **Consultant** *Jun 2019 – present*
  Office of the Principal Scientific Adviser to Government of India