Venkata Ramana Makkapati

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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, USA
  Automatic Flight Control Systems (AFCS) / Advanced Research
  Responsibilities:
  - Support research, design, development, integration, and certification of AFCS and advanced systems, such as Rudder Bias Systems, Augmeneted Steering Assistance System, Autothrottle, Emergency Autoland, Aileron Boost System
  - Development, modification, and validation of aircraft simulation models in support of advanced R&D
  - Support verification testing requirements, including laboratory (hardware-in-the-loop) and flight tests
  - Prepare system development and certification documents (requirements, interface documents, test plans and reports)

- **Graduate Research Assistant** *Aug 2016 – May 2021*
  Georgia Institute of Technology, Atlanta, USA
  Projects:
  - 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, USA
  Project: POMDPs and RL based motion planning and driving decisions algorithms & software

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

- **Summer Intern** *May 2012 – Jul 2012*
  CSIR - National Aerospace Laboratories, Bangalore, India
  Project: 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)**
  Federal Aviation Administration (FAA)

- **Open Water Diver**
  Professional Association of Diving Instructors (PADI)

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

Publications

Peer-reviewed

Journal Articles

J1. 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

J2. Optimal evading strategies and task allocation in multi-player pursuit-evasion problems
V. R. Makkapati and P. Tsiotras
Dynamic Games and Applications (DGAA), 2019

J3. 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

J4. 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

J5. 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

J6. Pursuit-evasion games of high speed evader
M. V. Ramana and M. Kothari
Journal of Intelligent & Robotics Systems (JINT), 2017

J7. 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

C1. A game-theoretic model for one-on-on air combat
V. Ramteke, V.Comandur, **V. R. Makkapati**, and M. Kothari
IFAC International Symposium on Automatic Control in Aerospace (ACA), 2022

C2. Desensitized strategies for pursuit-evasion games with asymmetric information
V. R. Makkapati, V.Comandur, H. Sarabu, P. Tsiotras, and Seth Hutchinson
IEEE Conference on Control Technology and Applications (CCTA), 2022

C3. Reachability-based covariance control for pursuit-evasion in stochastic flow fields
V. R. Makkapati, J. Ridderhof, and P. Tsiotras
AIAA Scitech Forum, 2022

C4. Desensitized trajectory optimization for hypersonic vehicles
V. R. Makkapati, J. Ridderhof, P. Tsiotras, J. Hart, and B. van Bloemen Waanders
IEEE Aerospace Conference, 2021

C5. 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

C6. C-DOC: Co-state desensitized optimal control
V. R. Makkapati, D. Maity, M. Dor, and P. Tsiotras
American Control Conference (ACC), 2020

C7. 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

C8. Trajectory desensitization in optimal control problems
V. R. Makkapati, M. Dor, and P. Tsiotras
IEEE Conference on Decision and Control (CDC), 2018

C9. 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

C10. 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

C11. A cooperative pursuit strategy for a high speed evader
M. V. Ramana and M. Kothari
AIAA Guidance Navigation and Control Conference (GNC), SciTech, 2016

C12. 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

W1. 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 Tech*
  - AE 6511: Optimal guidance & control *Spring 2019*
  - AE 6530: Multi-variable linear systems and control *Fall 2018*

- **Teaching Assistant**, *IIT 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 - May 2021*
  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*
  IIT Kanpur (Virtual event)

Reviewer

Automatica
IEEE Transactions on Automatic Control
IEEE Transactions on Robotics
IEEE Robotics and Automation Letters
Dynamic Games and Applications
Journal of Intelligent & Robotics Systems
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
IFAC International Symposium on Automatic Control in Aerospace
Advances in Control and Optimization of Dynamical Systems