Pratap Tokekar

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Education

University of Minnesota, Minneapolis, U.S.A.
Ph.D. in Computer Science, 2008–2014.
Advisor: Volkan Isler.
Thesis: *Placement and Motion Planning Algorithms for Robotic Sensing Systems.*

College of Engineering Pune, University of Pune, India.
Bachelor of Technology in Electronics & Telecommunication, 2004–2008.

Employment

Assistant Professor, Fall 2019–Present.
Dept. of Computer Science (primary) and UMIACS
Electrical & Computer Engineering (affiliate), Maryland Robotics Center, Center for Machine Learning.
University of Maryland at College Park.

Assistant Professor, Fall 2015–August 2019.
Dept. of Electrical & Computer Engineering, Virginia Tech.

Post-Doctoral Researcher, September 2014–July 2015.
GRASP Laboratory, University of Pennsylvania.
Supervisor: Vijay Kumar.

Research Assistant, January 2009–August 2014.
Dept. of Computer Science, University of Minnesota.
Advisor: Volkan Isler.

Visitor, Max-Planck Institute for Biological Cybernetics, Tübingen, Germany. May 2013.
Host: Antonio Franchi.

Teaching

(Courses marked by * are new courses that I have developed.)

Instructor, Department of Computer Science, University of Maryland.

CMSC 421: Introduction to Artificial Intelligence	S '20
CMSC 818B: Decision Making for Robotics*	F '19, F '20

Instructor, Department of Electrical & Computer Engineering, Virginia Tech.

ECE 4984/5984: (Advanced) Robot Motion Planning*	S '17, F '18
ECE 2500: Computer Organization and Design	S '16, F '16, S '18, S '19

ECE 6504: Advanced Topics in Decision Making* F '17
ECE 6504: Advanced Topics in Robotics* F '15

Teaching Assistant, Department of Computer Science, University of Minnesota.
Computer Vision. S '11, S '14
Introduction to Intelligent Robotics. F '12

Awards

NSF CAREER Award 2020
NSF CISE Research Initiation Initiative Award 2016

Publications

(Authors marked by * are my group members.)

Journal Articles

Published/Accepted

[J20] Y. Sung* and **P. Tokekar**. GM-PHD Filter for Searching and Tracking an Unknown Number of Targets with a Mobile Sensor with Limited FoV. *IEEE Transactions on Automation Science & Engineering*, 2020. Note: conditionally accepted.

[J19] P. Maini, **P. Tokekar**, and P. B. Sujit. Visibility-based Persistent Monitoring of Piece-wise Linear Features on a Terrain using Multiple Aerial and Ground Robots. *IEEE Transactions on Automation Science & Engineering*, 2020. Note: conditionally accepted.

[J18] V. Suryan* and **P. Tokekar**. Learning a Spatial Field in Minimum Time with a Team of Robots. *IEEE Transactions on Robotics,* 2020.

[J17] V. Suryan*, N. Gondhalekar*, and **P. Tokekar**. Multifidelity Reinforcement Learning With Gaussian Processes: Model-Based and Model-Free Algorithms. *IEEE Robotics & Automation Magazine,* 27(2):117–128, 2020. Note: Special Issue on Deep Learning and Machine Learning in Robotics.

[J16] Y. Sung*, A. Budhiraja*, R. Williams, and **P. Tokekar**. Distributed Assignment with Limited Communication for Multi-Robot Multi-Target Tracking. *Autonomous Robots,* 44:57–73, 2020. Note: special issue on Robot Communication Challenges.

[J15] L. Zhou* and **P. Tokekar**. Sensor Assignment Algorithms to Improve Observability while Tracking Targets. *IEEE Transactions on Robotics,* 35(5):1206–1219, 2019. Note: Also selected for presentation at ICRA 2020.

[J14] L. Zhou*, V. Tzoumas, G. Pappas, and **P. Tokekar**. Resilient Active Target Tracking with Multiple Robots. *IEEE Robotics and Automation Letters (RAL),* 4(1):129–136, 2019. Note: Also selected for presentation at ICRA 2019.

[J13] L. Zhou* and **P. Tokekar**. Active Target Tracking with Self-Triggered Communications in Multi-Robot Teams. *IEEE Transactions on Automation Science & Engineering (T-ASE),* 16(3):1085–1096, 2019.

[J12] K. Yu*, A. Budhiraja*, S. Buebel*, and **P. Tokekar**. Algorithms and Experiments on Routing of Unmanned Aerial Vehicles with Mobile Recharging Stations. *Journal of Field Robotics (JFR),* 36(3):602–616, 2018.

[J11] J.L. Susa Rincon, **P. Tokekar**, V. Kumar, and S. Carpin. Rapid Deployment of Mobile Robots under Temporal, Performance, Perception, and Resource Constraints. *IEEE Robotics and Automation Letters (RAL)*, 2(4):2016–2023, 2017.

[J10] P. Dames, **P. Tokekar** and V. Kumar. Detecting, Localizing, and Tracking an Unknown Number of Moving Targets Using a Team of Mobile Robots. *International Journal of Robotics Research (IJRR)*, 36(13–14):1540–1553, 2017.

[J9] G. Christie, A. Shoemaker, K. Kochersberger, **P. Tokekar**, L. McLean, and A. Leonessa. Radiation Search Operations using Scene Understanding with Autonomous UAV and UGV. *Journal of Field Robotics (JFR)*, 34(8):1450-1468, 2017.

[J8] **P. Tokekar**, J. Vander Hook, D. Mulla and V. Isler. Sensor Planning for a Symbiotic UAV and UGV System for Precision Agriculture. *IEEE Transactions on Robotics (T-RO)*, 32(6):1498–1511, 2016.

[J7] **P. Tokekar** and V. Isler. Polygon Guarding with Orientation. *Elsevier Computational Geometry: Theory & Applications.* 58:97–109, 2016.

[J6] J. Vander Hook, **P. Tokekar** and V. Isler. Algorithms for Cooperative Active Localization of Static Targets with Mobile Bearing Sensors under Communication Constraints. *IEEE Transactions on Robotics (T-RO)*, 31(4):864–876, 2015.

[J5] **P. Tokekar**, N. Karnad and V. Isler. Energy-Optimal Trajectory-Planning for Car-like Robots. *Autonomous Robots (AURO)*, 37(3): 279–300, 2014.

[J4] J. Vander Hook, **P. Tokekar** and V. Isler. Cautious Greedy Strategy for Bearing-Only Active Localization: Analysis and Field Experiments. *Journal of Field Robotics (JFR)*, 31(2): 296–318, 2014.

[J3] **P. Tokekar**, E. Branson, J. Vander Hook and V. Isler. Tracking Aquatic Invaders: Autonomous Robots for Monitoring Invasive Fish. *IEEE Robotics and Automation Magazine (RAM)*, 20(3): 33–41, 2013.

[J2] P. A. Plonski, **P. Tokekar** and V. Isler. Energy-Efficient Path Planning for Solar-Powered Mobile Robots in Complex Environments. *Journal of Field Robotics (JFR)*, 30(4):583–601, 2013.

[J1] **P. Tokekar**, D. Bhadauria, A. Studenski and V. Isler. A Robotic System for Monitoring Carp in Minnesota Lakes. *Journal of Field Robotics (JFR)*, 27(6):779–789, 2010.

Under Review

[UJ7] P. Maini, **P. Tokekar**, and P. B. Sujit. Visual Monitoring of Points of Interest on a 2.5D Terrain using a UAV with Limited Field-of-View Constraint. *Submitted to the IEEE Transactions on Aerospace and Electronic Systems.* Note: under review.

[UJ6] E. Bianchi, L. Abbott, **P. Tokekar**, and M. Hebdon. COCO-Bridge: Common Objects in Context Dataset for Structural Detail Detection of Bridges. *Submitted to the ASCE Journal of Computing in Civil Engineering* Note: under review.

[UJ5] L. Zhou* and **P. Tokekar**. Risk-Aware Submodular Optimization for Multi-Robot Coordination. *Submitted to the IEEE Transactions on Robotics.* Note: under review.

[UJ4] Y. Sung*, D. Dixit*, and **P. Tokekar**. Online Multi-Robot Exploration of a Translating Plume: Competitive Algorithm and Experiments. *Submitted to Autonomous Robots.* Note: under review.

[UJ3] Z. Zhang* and **P. Tokekar**. Computational Techniques for Efficient Active Target Tracking with State-Dependent Noise. *Submitted to the IEEE Transactions on Control Systems Technology.* Note: revision under review.

[UJ2] Z. Zhang*, L. Zhou*, and **P. Tokekar**. Strategies to Inject Spoofed Measurement Data to Mislead Kalman Filter. *Submitted to the IEEE Transactions on Automatic Control.* Note: revision under review.

[UJ1] Z. Zhang*, J. Smereka, J. Lee, L. Zhou*, and **P. Tokekar**. Tree Search Techniques for Minimizing Detectability and Maximizing Visibility. *Submitted to Autonomous Robots, 2020.* Note: submitted.

Conference Proceedings (Refereed)

Published/Accepted[1]

[C37] V. Sharma*, M. Toubeh*, L. Zhou*, and **P. Tokekar**. Risk-Aware Planning and Assignment for Ground Vehicles using Uncertain Perception from Aerial Vehicles. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020.*

[C36] H. Dhami*, K. Yu*, T. Xu*, Q. Zhu, K. Dhakal, J. Friel, S. Li, and **P. Tokekar**. Crop Height and Plot Estimation for Phenotyping from Unmanned Aerial Vehicles using 3D LiDAR. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS), 2020.*

[C35] G. Shi*, L. Zhou*, and **P. Tokekar**. Robust Multiple-Path Orienteering Problem: Securing Against Adversarial Attacks. *Robotics: Science and Systems (RSS), 2020.*

[C34] L. Zhou*, V. Tzoumas, G. Pappas, and **P. Tokekar**. Distributed Attack-Robust Submodular Maximization for Multi-Robot Planning. *IEEE International Conference on Robotics and Automation (ICRA), 2020.*

[C33] Y. Sung* and **P. Tokekar**. A Competitive Algorithm for Online Multi-Robot Exploration of a Translating Plume. *IEEE International Conference on Robotics and Automation (ICRA), 2019.*

[C32] K. Yu*, J. O'Kane, and **P. Tokekar**. Coverage of an Environment Using Energy-Constrained Unmanned Aerial Vehicles. *IEEE International Conference on Robotics and Automation (ICRA), 2019.*

[C31] Z. Zhang*, J. Lee, J. Smereka, Y. Sung*, L. Zhou*, and **P. Tokekar**. Tree Search Techniques for Minimizing Detectability and Maximizing Visibility. *IEEE International Conference on Robotics and Automation (ICRA), 2019.*

[C30] L. Zhou* and **P. Tokekar**. An Approximation Algorithm for Risk-averse Submodular Optimization. *Springer Proceedings in Advanced Robotics (SPAR). Proceedings of the Workshop on Algorithmic Foundations of Robotics (WAFR 2018).*

[C29] V. Suryan* and **P. Tokekar**. Learning a Spatial Field with Gaussian Process Regression in Minimum Time. *Springer Proceedings in Advanced Robotics (SPAR). Proceedings of the Workshop on Algorithmic Foundations of Robotics (WAFR 2018).*

[C28] P. Shanthakumar*, K. Yu*, Mandeep Singh*, Jonah Orevillo*, Eric Bianchi, Matt Hebdon, and **Pratap Tokekar**. View Planning and Navigation Algorithms for Autonomous Bridge Inspection with UAVs. *Experimental Robotics. Springer Tracts in Advanced Robotics.* Proceedings of the *International Symposium on Experimental Robotics (ISER) 2018.*

[C27] V. Suryan*, N. Gondhalekar*, and **P. Tokekar**. Multi-Fidelity Model-Free Reinforcement Learning with Gaussian Processes. *AAAI 2018 Fall Symposium on Reasoning and Learning in Real-World Systems for Long-Term Autonomy.*

[1] Following journal papers were also selected for presentation at the IEEE International Conference of Robotics and Automation and are not repeated in the following section: [J14], [J15]

[C26] M. Toubeh* and **P. Tokekar**. Risk-Aware Planning by Extracting Uncertainty from Deep Learning-Based Perception. *AAAI 2018 Fall Symposium on Reasoning and Learning in Real-World Systems for Long-Term Autonomy.*

[C25] P. Maini, K. Yu*, P. B. Sujit, and **P. Tokekar**. Persistent Monitoring with Refueling on a Terrain using a Team of Aerial and Ground Robots. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 2018.

[C24] P. Maini, G. Gupta, **P. Tokekar**, and P. B. Sujit. Visibility-based Persistent Monitoring in a 1.5 D Terrain using a Heterogenous Robot Team. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 2018.

[C23] Z. Zhang*, Lifeng Zhou*, and **P. Tokekar**. Strategies to Design Signals to Spoof Kalman Filter. *Proceedings of the American Control Conference (ACC), 2018.*

[C22] K. Yu*, A. Budhiraja,* and **P. Tokekar**. Algorithms for Routing of Unmanned Aerial Vehicles with Mobile Recharging Stations. *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2018.*

[C21] Y. Sung*, A. Budhiraja,*, R. Williams, and **P. Tokekar**. Distributed Simultaneous Action and Target Assignment for Multi-Robot Multi-Target Tracking. *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2018.*

[C20] M. Fowler, **P. Tokekar**, T. Clancy, and R. Williams. Constrained-Action POMDPs for Multi-Agent Intelligent Knowledge Distribution. *Proceedings of the IEEE International Conference on Robotics and Automation (ICRA), 2018*

[C19] L. Zhou* and **P. Tokekar**. Active Target Tracking with Self-Triggered Communications. *IEEE International Conference on Robotics and Automation (ICRA), 2017.*

[C18] Y. Sung* and **P. Tokekar**. Algorithm for Searching and Tracking an Unknown and Varying Number of Mobile Targets using a Limited FoV Sensor. *IEEE International Conference on Robotics and Automation (ICRA), 2017.*

[C17] Z. Zhang*, and **P. Tokekar**. Non-Myopic Target Tracking Strategies for Non-Linear Systems *IEEE Conference on Decision and Control (CDC)* 2016.

[C16] A. Premkumar*, K. Yu*, and **P. Tokekar**. A Geometric Approach for Multi-Robot Exploration in Orthogonal Polygons. *Springer Proceedings in Advanced Robotics (SPAR). Proceedings of the Workshop on Algorithmic Foundations of Robotics (WAFR 2016).*

[C15] P. Dames, **P. Tokekar** and V. Kumar. Detecting, Localizing, and Tracking an Unknown Number of Moving Targets Using a Team of Mobile Robots. *Robotics Research. Springer. Proceedings of the International Symposium on Robotics Research (ISRR 2015)*, 513–529, 2018.

[C14] V. Isler, N. Noori, P. Plonski, A. Renzaglia, **P. Tokekar** and J. Vander Hook. Finding and Tracking Targets in the Wild: Algorithms and Field Deployments. *IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR)* 2015.

[C13] **P. Tokekar** and V. Kumar. Visibility-based Persistent Monitoring with Robot Teams. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)* 2015.

[C12] J. Das, G. Cross, C. Qu, A. Makineni, **P. Tokekar**, Y. Mulgaonkar and V. Kumar. Devices, Systems, and Methods for Automated Monitoring enabling Precision Agriculture. *IEEE International Conference on Automation Science and Engineering (CASE)* 2015.

[C11] **P. Tokekar**, V. Isler and A. Franchi. Multi-Target Visual Tracking with Aerial Robots. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2014.

[C10] **P. Tokekar** and V. Isler. Polygon Guarding with Orientation. *IEEE International Conference on Robotics and Automation (ICRA)*, 2014.

[C9] **P. Tokekar**, J. Vander Hook, D. Mulla and V. Isler. Sensor Planning for a Symbiotic UAV and UGV System for Precision Agriculture. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2013.

[C8] **P. Tokekar** and V. Isler. Sensor Placement and Selection for Bearing Sensors with Bounded Uncertainty. *IEEE International Conference on Robotics and Automation (ICRA)*, 2013.

[C7] P. A. Plonski, **P. Tokekar** and V. Isler. Energy Efficient Path Planning for Solar Powered Mobile Robots in Complex Environments. *Experimental Robotics. Springer Tracts in Advanced Robotics.* Proceedings of the *International Symposium on Experimental Robotics (ISER) 2012*, 717–731, 2013.

[C6] J. Vander Hook, **P. Tokekar**, E. Branson, P. Bajer, P. Sorensen and V. Isler. Local-Search Strategy for Active Localization of Multiple Invasive Fish. *Experimental Robotics. Springer Tracts in Advanced Robotics.* Proceedings of the *International Symposium on Experimental Robotics (ISER) 2012*, 859–873, 2013.

[C5] J. Vander Hook, **P. Tokekar** and V. Isler. Cautious Greedy Strategy for Bearing-based Active Localization: Experiments and Theoretical Analysis. *IEEE International Conference on Robotics and Automation (ICRA)*, 2012.

[C4] **P. Tokekar**, J. Vander Hook and V. Isler. Active Target Localization for Bearing Based Robotic Telemetry. *IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)*, 2011.

[C3] **P. Tokekar**, N. Karnad and V. Isler. Energy-Optimal Velocity Profiles for Car-like Robots. *IEEE International Conference on Robotics and Automation (ICRA)*, 2011.

[C2] D. Bhadauria, V. Isler, A. Studenski and **P. Tokekar** (in alphabetical order). A Robotic Sensor Network for Monitoring Carp in Minnesota Lakes. *IEEE International Conference on Robotics and Automation (ICRA)*, 2010.

[C1] **P. Tokekar**, V. Bhatawadekar, D. Fehr and N. Papanikolopoulos. Experiments in Object Reconstruction with a Robot-mounted Laser Range-finder. *17th Mediterranean Conference on Automation and Control*, 2009.

Editorials

[E2] R. Fitch, V. Isler, **P. Tokekar**, and D. Scaramuzza. Guest Editorial: Special Issue on Active Perception. *Autonomous Robots,* 42(2): 176–176, 2018.

[E1] D. Ball, B. Upcroft, E. Van Henten, A den Hengel, **P. Tokekar**, and J. Das. JFR Special Issue on Agricultural Robotics. *Journal of Field Robotics,* 34(6): 1037–1038, 2017.

Posters/Lightly-Reviewed Conferences

[M5] M. Hassan Tanveer, A. Thomas, X. Wu, R. Muller, **P. Tokekar**, H. Zhu. Recreating Bat Behavior on Quad-rotor UAVs-A Simulation Approach. *The 33rd International FLAIRS Conference*, 2020.

[M4] H. Dhami*, T. Xu*, Q. Zhu, S. Li, and **P. Tokekar**. Crop Height Estimation with LiDAR Equipped Robots. *Do Good Robotics Symposium*, 2019.

[M3] L. Zhou* and **P. Tokekar**. An Approximation Algorithm for Distributed Resilient Submodular Maximization. *International Symposium on Multi-robot and Multi-Agent Systems (MRS)*, 2019.

[M2] K. Yu*, A. Budhiraja*, and **P. Tokekar**. Algorithms for Routing of Unmanned Aerial Vehicles with Mobile Recharging Stations and for Package Delivery. *International Symposium on Multi-robot and Multi-Agent Systems (MRS)*, 2017.

[M1] J. Vander Hook, **P. Tokekar**, E. Branson, P. A. Plonski and V. Isler. Finding and Localizing Radio-Tagged Carp with an Autonomous Robotic Boat. *142nd Annual Meeting of the American Fisheries Society*, 2012.

Patents

[P3] V. Isler, **P. Tokekar**, N. Stefas, and P. Roy. Robotic Surveying of Fruit Plants. *US Patent 9,922,26 published in March 2018*

[P2] V. Isler, D. Mulla, **P. Tokekar** and J. Vander Hook. Symbiotic Unmanned Aerial Vehicle and Unmanned Ground Vehicle System. *US Patent 20,160,018,224 published in January 2016.*

[P1] Vision-based Surveying of Apple Orchards with an Autonomous Aerial Vehicle. *US Provisional Patent 62/148,462 filed in April 2015.*

Funding

Total external funding: $6,893,605. Personal share: $2,650,459.

External (Current)

1. National Science Foundation. *CAREER: Secure, Resilient, and Risk-Aware Multi-Robot Coordination.* Single PI: Pratap Tokekar. $548,808. Duration: 02/2020-01/2025.
2. National Science Foundation. *NRI: Coordinated Detection and Tracking of Hazardous Agents with Aerial and Aquatic Robots to Inform Emergency Responders.* PI: Pratap Tokekar. Co-PI: David Schmale. $900,836. Personal share: $502,855. Duration: 10/2016-09/2020.
3. Office of Naval Research. *Joint Perception and Temporal Logic Planning for Distributed Agents in Dynamic Environments.* PI: Lu Feng (Univ. of Virginia). Virginia Tech PI: Pratap Tokekar. $2,000,000. Personal share: $484,999. Duration: 09/2018-08/2022.
4. National Science Foundation. *FW-HTF: First Person View and Augmented Reality for Airborne Embodied Intelligent Cognitive Assistants.* PI: Craig Woolsey. Co-PIs: Pratap Tokekar, Joseph Gabbard, Matthew Hebdon. $1,500,000. Personal share: $318,415. Duration: 09/2018-08/2021.
5. US Department of Agriculture/NIFA. *CPS: Medium: Multi-Scale Planning in Robot Teams for Persistent Monitoring and Intervention in Precision Grazing.* PI: Ryan Wiliams. Co-PIs: Pratap Tokekar, Megan O'Rourke, Ben Tracy. $823,902. Personal share: $292,000. Duration: 09/2018-09/2021.
6. Automotive Research Center: U.S. Army Center of Excellence for Modeling and Simulation of Ground Vehicles. *Manned-Unmanned Teaming for Reconnaissance in Adversarial Environments.* PI: Pratap Tokekar. Co-PI: Ed Durfee (University of Michigan). $96,996. Personal share: $77,200. Duration: 01/2019-07/2020.
7. National Science Foundation. *CDS&E: A Computational Framework for Parsimonious Sonar Sensing.* PI: Hongxiao Zhu. Co-PIs: Pratap Tokekar, Rolf Mueller, Xiaowei Wu. $668,465. Personal share: $91,583. Duration: 08/2018-07/2021.

External (Completed)

1. National Science Foundation. *CRII: RI: Assignment, Routing, and Coordination of Diverse Robotic Sensors.* Single PI: Pratap Tokekar. $175,000. Duration: 04/2016-03/2019.

2. 4-VA. *Human-in-the-Loop Planning of Distributed Multi-Robot Teams for Emergency Response.* PI: Lu Feng (University of Virginia). Co-PI: Pratap Tokekar. $30,000. Personal share: $10,000. Duration: 08/2017-06/2019.

3. Automotive Research Center: U.S. Army Center of Excellence for Modeling and Simulation of Ground Vehicles. *Manned-Unmanned Team Positioning for Minimizing Detectability and Maximizing Visibility.* Single PI: Pratap Tokekar. $88,493. Duration: 09/2017-12/2018.

4. National Science Foundation I/UCRC Center for UAS. *Agile Autopilot Control for Infrastructure Inspection.* PIs: Pratap Tokekar and Matthew Hebdon. $94,000. Personal share: $59,565. Duration: 08/2016-08/2018.

5. US Department of Agriculture/NIFA. *Robot Swarms and Human Scouts for Persistent Monitoring of Specialty Crops.* PI: Vijay Kumar (University of Pennsylvania). Virginia Tech PI: Pratap Tokekar. Personal share: $61,105. Duration: 09/2015-08/2017.

Internal

1. *Developing SmartSense: A Robotic Platform for High Throughput Phenotyping and Genome Wide Association Analysis*, ICAT Big Agriculture Data project. With Song Li and Bo Zhang. $20,000. Duration: 07/2018-06/2019.

2. *SmartPlants/Animals and SmartFarms for Global Food, Feed, and Fiber Security*, Fralin Life Science Institute, $40,000 (This is an initiative submitted by 23 faculty in response to a call for concepts to be further developed as part of the Global Systems Science Destination Area). Duration: 07/01/2017-12/31/2018.

    - *Developing SmartSense, a multispectral sensor suite for high-throughput plant phenotyping.* With Song Li and Saghai Maroof. $6,000 of the total funds. Duration: 2018.

3. *Multi-Robot Exploration.* ICTAS Seed Funding, $5,000. 2016.

4. *Plume Detection and Tracking with Unmanned Systems.* With David Schmale III. ICTAS Seed Funding, $4,000. 2016.

Other

1. EcoCar Mobility Challenge Virginia Tech team. Sponsorship from the competition organizers (Department of Energy) and sponsors (General Motors and The Mathworks). Approximately $400,000 plus hardware donations that includes a Chevrolet Blazer. Faculty Advisors: Doug Nelson (lead), Pratap Tokekar. Period: 2018–2022.

Students Advised

Current Students

Ph.D. Advisees

- Harnaik Dhami. UMD CS. (Fall 2019 – Present)

- Vishnu Sharma. UMD CS. (Fall 2019 – Present)
- Guangyao Shi. UMD ECE. (Spring 2020 – Present)
- Varun Suryan. UMD CS. (Fall 2017 – Present)
- Maymoonah Toubeh. VT ECE. *Bradley and Weber Fellow.* (Fall 2017 – Present)
- Kevin Yu. VT ECE. (Spring 2016 – Present; Completed Proposal in Summer 2020)
- Zhongshun Zhang. UMD CS. (Fall 2015 – Present)

Masters Thesis Advisees

- Deeksha Dixit. UMD CS. (Fall 2018 – Present)
- Tianshu Xu. UMD CS. (Fall 2019 – Present)

Students who have Graduated

Ph.D. Advisees

- Lifeng Zhou. VT ECE (Fall 2016 – Spring 2020). Thesis: Parsimonious, Risk-Aware, and Resilient Multi-Robot Coordination.
- Yoonchang Sung. (Fall 2016 – Fall 2019). Thesis: Multi-Robot Coordination for Hazardous Environmental Monitoring. First Position: Postdoc at CSAIL MIT.

M.S. Thesis Advisees

- Clayton Mangette. M.S. ECE. *Bradley Fellow.* (Fall 2018 – Spring 2020). Thesis: Perception and Planning in Connected and Automated Vehicles.
- Varun Suryan. M.S. ECE (Fall 2017 – Present). Thesis: Learning a Spatial Field in Minimum Time with a Team of Robots. First Position: Ph.D. student in CS at UMD.
- Harnaik Dhami. M.S. ECE (Fall 2017 – Summer 2019). Thesis: Using UAV Mounted LiDAR to Estimate Plant Height and Growth. First Position: Ph.D. student in CS at UMD.
- William Gerhard. M.S. ECE (Spring 2017 – Summer 2019). Thesis: Pseudo Doppler Direction Finding System for Localizing Non-Cooperative VHF Transmitters with a Hybrid UAS. First Position: Aurora Flight Sciences.
- Maymoonah Toubeh. M.S. ECE (Fall 2017 – Fall 2018). Thesis: Risk-Aware Planning by Extracting Uncertainty from Deep Learning-Based Perception. First Position: Ph.D. student in ECE at VT.
- Kevin Yu. M.S. ECE (Spring 2016 – Spring 2018). Thesis: Persistent Monitoring with Energy-Limited Unmanned Aerial Vehicles Assisted by Mobile Recharging Stations. First Position: Ph.D. student in ECE at VT.
- Aravind Preshant Premkumar. M.S. ECE (Fall 2015 – Summer 2017). Thesis: Competitive Algorithms and System for Multi-Robot Exploration of Unknown Environments. First Position: Apple.
- Ashish Kumar Budhiraja. M.S. ECE (Fall 2015 – Summer 2017). Thesis: View Point Planning for Inspecting Static and Dynamic Scenes with Multi-Robot Teams. First Position: Apple.
- Nahush Gondhalekar. M.S. ECE (Fall 2015 – Summer 2017). Thesis: Reinforcement Learning with Gaussian Processes for Unmanned Aerial Vehicle Navigation. First Position: Qualcomm.

M.Eng. Project Advisees (substantial work under my supervision)

- Prajwal Shanthakumar. M.Eng. ECE (Summer 2017 – Spring 2018). First Position: Continental Automotive.
- Keerthi-Gowda Balehalli-Satyanarayana. M. Eng. ECE (Fall 2018). First Position: Qualcomm.

Masters in Robotics. Independent Study (ENPM 808)

- Amrish Bhaskaran, Pranali Desai, Sanket Goyal (Spring 2020)

Undergraduate Advisees (Research Project/Independent Study)

- Jingxi Chen (March 2020 – Present)
- Russell Schwartz (December 2019 – Present). *Winston Family Honors Research Paper Award.*
- Fanzhe Zhu (Summer 2018 – Summer 2019)
- Peter Schmitz (Summer 2018)
- Tianshu Xu (Summer 2018 – Sumer 2019)
- Nikhil Jigjinni (Fall 2017 – Fall 2018)
- Spencer Buebel (Fall 2017 – Fall 2018)
- Jonah Orevillo (Spring 2017 – Fall 2018)
- Sanyukta Somani (Spring 2017 – Fall 2018)
- Collin Smith (Summer 2016, Summer 2017). *ASEE SMART Scholarship Winner.*
- Collin Deans (Summer 2017)
- Harnaik Dhami (Fall 2016 – Fall 2018)
- Madhav Patel (Fall 2016 – Spring 2017)
- Rohan Dani (Spring 2016 – Spring 2017)
- Dev Lakhia (Fall 2016)
- Bishesh Baniya. M.E. (Spring 2016)

Visiting Students/Interns

- Vera Rust (Blacksburg High School; Summer 2018)
- Mandeep Singh (Indian Institute of Technology, Kanpur; Summer 2017 – Spring 2018)
- Varun Suryan (Indian Institute of Technology, Jodhpur; Fall 2016 – Summer 2017)

Undergraduate/Graduate Team Projects

- Faculty advisor for the "Connected and Automated Vehicles" swimlane of the EcoCar Mobility Challenge, a four year competition sponsored by Department of Energy (2018-19).
- Subject matter expert for three ECE major design experience projects, AY 2018-19.
- Subject matter expert for three ECE major design experience projects, AY 2017-18.

Ph.D. Thesis Committee Member

- George Kontoudis (Advisor: Dan Stilwell). Virginia Tech.
- Alessandro Riva (Advisor: Francesco Amigoni). Politecnico di Milano. (Thesis reviewer).
- Ujwal Krothapalli (Advisors: Lynn Abbott & Dhruv Batra). Electrical & Computer Engineering, Virginia Tech.
- Jason Ziglar (Advisors: Al Wicks & Ryan Williams). Electrical & Computer Engineering, Virginia Tech.
- Duotong Yang (Advisor: Virgilio Centeno). Electrical & Computer Engineering, Virginia Tech.
- Harun Yetkin (Advisor: Dan Stilwell). Electrical & Computer Engineering, Virginia Tech.
- Michael Fowler (Advisors: Charles Clancy & Ryan Williams). Electrical & Computer Engineering, Virginia Tech.
- Shuangfei Fan (Advisors: Jia-Bin Huang & Bert Huang). Electrical & Computer Engineering, Virginia Tech.
- Georgios Kontoudis (Advisor: Tomonari Furukawa & Kyriakos Vamvoudakis). Mechanical Engineering, Virginia Tech.
- Scott Gibson (Advisor: Dan Stilwell). Electrical & Computer Engineer, Virginia Tech.
- Gaurang Naik (Advisor: Jerry Park). Electrical & Computer Engineer, Virginia Tech.
- Yue Zhan (Advisor: Michael Hsiao). Electrical & Computer Engineer, Virginia Tech.
- Haseeb Chaudhry (Advisor: Kevin Kochersberger). Mechanical Engineering, Virginia Tech.
- Robert Griffin (Advisor: Alex Leonessa). Mechanical Engineering, Virginia Tech.
- Bijo Sebastian (Advisor: Pinhas Ben-Tzvi). Mechanical Engineering, Virginia Tech.
- Ryan Brown (Advisor: Al Wicks). Mechanical Engineering, Virginia Tech.
- Xiao Lin (Advisor: Devi Parikh). Electrical & Computer Engineering, Virginia Tech.
- Karim Abdelatty (Advisor: Kevin Kochersberger). Mechanical Engineering, Virginia Tech.
- Tamer Attia (Advisor: Kevin Kochersberger). Mechanical Engineering, Virginia Tech.
- John Peterson (Advisor: Kevin Kochersberger). Mechanical Engineering, Virginia Tech.
- Gordon Christie (Advisors: Kevin Kochersberger & Dhruv Batra). Electrical & Computer Engineering, Virginia Tech.

Invited Talks

- *Autonomous Near Earth Sensing with Aerial, Ground, and Marine Robots*
  - Navy Center for Applied Research in Artificial Intelligence Symposium Series at the Naval Research Laboratory (December 2019)
  - University of South Carolina (October 2019)
  - Laboratory For Telecommunication Sciences (October 2019)

  - Frontiers in Optics Conference (September 2019)
  - University of Maryland (April 2019)
  - University of Texas at Austin (April 2019)
  - AUVSI Ridge & Valley Chapter. 2nd Annual Unmanned Systems Symposium (October 2018)
  - Oregon State University (August 2018)
  - DoD Center of Excellence, North Carolina A & T State University (April 2018)
  - AUVSI Ridge & Valley Chapter Symposium on Cultivating Trust in Autonomous Systems (October 2017)
  - Automotive Research Center Seminar, University of Michigan (September 2017)
  - Department of Mechanical Engineering, Temple University (September 2017)
  - UAS in Public Safety, Emergency, and Disaster Response - conference organized by VA Dept. of Emergency Management (February 2017).
  - Institute for Robotics and Intelligent Machines, Georgia Tech (February 2017).
  - Department of Systems and Information Engineering, University of Virginia (February 2017).
  - Army Research Lab Workshop on Heterogeneity, Diversity, and Resilience in Multi-Robot Systems (August 2016).

- *Systems, Algorithms, and Applications for Robotic Sensing.*
  - Computer Science Graduate Seminar, Virginia Tech (September 2015).
- *Multi-robot Routing Algorithms for Coverage in Rich Environments.* Invited talk at the "Beyond Geometric Constraints" workshop at ICRA 2015.
- *Systems, Algorithms, and Applications for Robotic Sensing.*
  - Arizona State University, New York University, University of Nebraska-Lincoln, University of Utah, Virginia Tech, Worcester Polytechnic Institute (February–March 2015).
- *Algorithms for Persistent Surveillance in Complex Environments.* Smart Adaptive Reliable Teams for Persistent Surveillance (SMARTS) MURI Annual Review Meeting. MIT (Dec 2014).
- *Sensing Planning for Robotic Environment Monitoring: Systems and Algorithms.*
  - University of Colorado, Boulder (March 2014), University of Pennsylvania (May 2014).
- *Robotic Sensor Networks for Environmental Monitoring.* Invited talk at the "Towards Fully Decentralized Multi-Robot Systems" workshop at ICRA 2013.

Service

- Associate Editor:
  - IEEE Transactions on Automation Science & Engineering (2019–Present)
  - IEEE Robotics & Automation Letters (2017–Present)
  - IEEE International Conference on Robotics and Automation (ICRA) Conference Editorial Board (2016–Present)
  - IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS) Conference Editorial Board (2019–Present)

  - International Conference on Unmanned Aircraft Systems (ICUAS) Conference Editorial Board (2020)
  - IEEE Conference on Automation Science & Engineering (CASE) Conference Editorial Board (2019)

- Guest Editor:
  - Special issue on "Active Perception" for Autonomous Robots journal, 2015–17.
  - Special issue on "Robotics in Agriculture" for Journal of Field Robotics, 2015–17.

- Workshop Organizer:
  - Robots in the Wild: Challenges in Deploying Robust Autonomy for Robotic Exploration, RSS 2020.
  - Foundations of Multi-Robot Systems, ICRA 2020.
  - Robots in the Wild: Challenges in Deploying Robust Autonomy for Robotic Exploration, RSS 2019.
  - Perception and Planning for Robotic Inspection, IROS 2017.
  - Robotics in Agriculture, ICRA 2015.

- Advisory Board:
  - Connected and Automated Vehicles Faculty Advisory Board for the EcoCar Mobility Challenge (DOE sponsored student-design competition for Level 2 automated driving), 2018–19.

- Program Committee:
  - IEEE International Conference on Unmanned Aircraft Systems (ICUAS) 2020.
  - Workshop on Algorithmic Foundations of Robotics (WAFR) 2016, 2018, 2020.
  - Autonomous Agents and Multiagent Systems (AAMAS) 2019.
  - ACM Symposium on Applied Computing, Track on Intelligent Robots and Multi-Agent Systems (IRMAS) 2016, 2017, 2018, 2019.
  - IFAC Conference on Sensing, Control and Automation Technologies for Agriculture (Agricontrol), 2016, 2019.
  - International Symposium on Multi-robot and Multi-Agent Systems (MRS) 2017.
  - IEEE International Symposium on Safety, Security, and Rescue Robotics (SSRR) 2015, 2016, 2017.
  - Robotics: Science & Systems (RSS) 2016.
  - Second Workshop on Robotic Sensor Networks, part of Cyber-Physical Systems week, 2015.

- Awards Committee: MRS 2019.

- Session Co-Chair: ICRA 2012, ICRA 2017.

- Reviewer:
  - National Science Foundation Panelist 2016, 2017, 2019.
  - Agence nationale de la recherche (French National Research Agency). External proposal reviewer, 2017.

  - *Journals:* IEEE Transactions on Robotics, IEEE Robotics & Automation Magazine, IEEE Transactions on Automation Science & Engineering, IEEE/ACM Transactions on Networking, IEEE Journal on Selected Areas in Communication, IEEE Transactions on Parallel and Distributed Systems, Autonomous Robots, International Journal of Advanced Robotic Systems, Elsevier Adhoc Networks, Information Processing Letters, Annals of Mathematics and Artificial Intelligence, MDPI Sensors.
  - *Conferences:* IEEE/RSJ International Conference on Intelligent Robots and Systems, IEEE International Conference on Robotics and Automation, IEEE Conference on Automation Science and Engineering, Workshop on Algorithmic Foundations of Robotics, International Symposium on Robotics Research, Symposium on Computational Geometry (SoCG).

- Maryland Robotics Center Executive Committee member (2020-21)
- Search Committee Member for the Assistant Director of Communications in Computer Science at University of Maryland, 2019–20.
- Panelist for the Clark School's Future Faculty Fellows program, 2020.
- Design review panel for the University of Maryland Autonomous Micro Air Vehicle Team, 2019.
- Faculty Search Committee Member (Dept. of Electrical & Computer Engineering at Virginia Tech). 2017–18, 2018-19.
- Faculty Search Committee Member (Dept. of Mechanical Engineering at Virginia Tech). 2016–17.
- Area Recruiting Representative (ECE Computer Systems), 2017.

Other

- Part of the 5 member team that submitted the "Autonomous Inspection of Civil Infrastructure" white paper to ICTAS at Virginia Tech. This white paper has been selected for funding in 2016-18 to develop an NSF ERC proposal.
- Part of the 23 member team that submitted the "SmartPlants and SmartFarms for Global Food, Feed, and Fiber Security" concept paper for Global Systems Science destination area at Virginia Tech. This concept has been selected for funding in 2017-18 by the Fralin Institute.
- Professional Membership: IEEE, IEEE Robotics and Automation Society.

Last updated: July 1, 2020