Siddharth **Mayya**

Georgia Institute of Technology
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PhD Candidate · *Robotics* · *Bio-Physics Inspired Robot Swarms* · *Resilient Robot Teams*

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Research Focus

Minimalistic Robot Swarms	Simple proximity encounters as information sources in robot swarms
Statistical Mechanics In Robotics	Design of predictable emergent behaviors in robot swarms enabled by statistical mechanics
Resilient Multi-Robot Teams	Task allocation and task execution in multi-robot systems for long-term operations

Education

Georgia Institute of Technology — *Atlanta, GA*

PhD in Electrical and Computer Engineering — *August. 2016 - Dec. 2019 (expected)*

- *Thesis: Local Interactions as Information Sources in Robot Swarms*
- Advisor: Magnus Egerstedt
- GPA: 4.0/4.0

Georgia Institute of Technology — *Atlanta, GA*

Masters in Electrical and Computer Engineering — *August. 2014 - May 2016*

- *Thesis: Safe open-loop strategies for handling intermittent communications in multi-robot systems*
- Advisor: Magnus Egerstedt
- GPA: 4.0/4.0

Manipal Institute of Technology — *Manipal, India*

B.E. in Electronics and Communication Engineering — *August. 2010 - June 2014*

- Received a 100% scholarship on college tuition.
- GPA: 8.98/10.00

Professional Appointments

Georgia Institute of Technology — *Atlanta, GA*

Graduate Research Assistant (PhD) — *Aug. 2016 - Current*

- Co-Designer of the Brushbot: a vibration-driven robot designed for large-scale low cost deployment (2019).
- Investigated how concepts from active matter physics can be used to achieve non-uniform densities in robot swarms (2018-2019).
- Developed an optimization framework for minimum energy task allocation in a team of robots with heterogeneous capabilities (2018).
- Developed algorithms to use inter-robot proximity encounters as an information source for achieving decentralized density regulation, localization and task allocation (2016-2018).
- Served as a firmware developer, circuit-board designer for the Robotarium project: an open-access swarm robotics platform at Georgia Tech (2015-2018).

Arizona State University — *Tempe, AZ*

Visiting Scholar with Dr. Stephen Pratt, School of Life Sciences — *May 2018 - June 2018*

- Investigated how *Temnothorax Rugatulus* ants utilize inter-ant encounters to detect quorum.
- Performed experiments on *Temnothorax Rugatulus* ant colonies with the aim of achieving non-uniform ant densities within the nest.
- Investigated the emergence of reverse tandem runs during disrupted emigrations of ant colonies.
- Used Open-CV to track the moving positions of ants within a colony via a camera.

Georgia Institute of Technology — *Atlanta, GA*

Graduate Research Assistant (Masters) — *Aug. 2015 - May 2016*

- Developed reachability-based methods for handling intermittent communications in multi-robot systems.
- Developed an optimization based power-saving hybrid control strategy for multi-robot systems.
- Design and development of the GRITSBot: an open-source robot for use on the Robotarium.

Tesla Motors — *Palo Alto, CA*

Autopilot Intern — *May 2015 - Aug. 2015*

- Conceptualized schemes to diagnose anomalous driving conditions and realized them in embedded C. These schemes detect potentially dangerous conditions by taking into account factors such as vehicle dynamics, driver reaction times and current road parameters.
- Developed a Software-In-Loop simulator to compute safety performance metrics using test-drive data.
- Implemented MATLAB scripts to automatically facilitate cross-checking of the simulator output with field data and generate statistics to fine tune the design parameters.
- Implemented a spline interpolation method to generate estimates of the road curvature based on intermittent trajectory and GPS data.

Manipal Institute of Technology *Manipal, India*

Team Lead, Parikshit Student Satellite Team *March 2011 - Dec. 2013*

- Designed and successfully tested a three-axis PID control system for stabilization of the satellite.
- Managed a team of 7, supervising and aiding the design of attitude estimation algorithms, orbit determination algorithms, hardware design and system integration.
- Incorporated the Attitude Determination and Control System algorithm into the Real Time Operating System (RTOS) of the satellite. This included addressing various scheduling issues and developing firmware code.
- Designed and developed an integrated satellite environment simulator in MATLAB featuring modules for torque analysis, performance testing and orbital positioning. The whole system was later implemented in C.
- GitHub Repository Link: https://gist.github.com/siddharth119/c90f96c1bd18292a2db1

Freescale Semiconductors *Noida, India*

Analog & Mixed Signal Intern *Jan. 2014 - July 2014*

- Designed and implemented Test Cases to verify specific functionalities of certain I/O Pads within a SoC.
- Deployed scripts to automate execution of test cases involving a large number of files.

Publications

Refereed Journal Publications

[1] Sean Wilson, Paul Glotfelter, Li Wang, **Siddharth Mayya**, Gennaro Notomista, Mark Mote, and Magnus Egerstedt. The Robotarium: Opportunities, challenges, and lessons learned in remote-access, distributed control of multi-robot systems. *IEEE Control Systems Magazine, Submitted, March 2019.*

[2] **Siddharth Mayya**, Sean Wilson, and Magnus Egerstedt. Closed-loop task allocation in robot swarms using inter-robot encounters. *Swarm Intelligence, vol. 13, no. 2, pp. 115-143, June 2019.*

[3] **Siddharth Mayya**, Pietro Pierpaoli, Girish Nair, and Magnus Egerstedt. Localization in densely packed swarms using interrobot collisions as a sensing modality. *IEEE Transactions on Robotics, vol. 35, no. 1, pp. 21–34, Feb 2019.*

Peer-Reviewed Conference Publications

[4] María Santos, **Siddharth Mayya**, Gennaro Notomista, and Magnus Egerstedt. Decentralized Minimum Energy Coverage Control for Time-Varying Density Functions. *Accepted for Publication, IEEE International Symposium on Multi-robot and Multi-agent Systems (MRS) 2019.*

[5] **Siddharth Mayya**, Gennaro Notomista, Dylan Shell, Seth Hutchinson, and Magnus Egerstedt. Non-Uniform Robot Densities in Vibration Driven Swarms Using Phase Separation Theory. *Submitted, IEEE International Conference on Intelligent Robots and Systems (IROS) 2019. Preprint available at: arXiv:1902.10662, Feb 2019.*

[6] Gennaro Notomista, **Siddharth Mayya**, Anirban Mazumdar, Seth Hutchinson, and Magnus Egerstedt. A Study of a Class of Vibration-Driven Robots: Modeling, Analysis, Control and Design of the Brushbot. *Submitted, IEEE International Conference on Intelligent Robots and Systems (IROS) 2019. Preprint available at: arXiv:1902.10830, Feb 2019.*

[7] Gennaro Notomista, **Siddharth Mayya**, Seth Hutchinson and Magnus Egerstedt. An optimal task allocation strategy for heterogeneous multi-robot systems. *In European Control Conference (ECC) 2019*.

[8] **Siddharth Mayya**, Pietro Pierpaoli, and Magnus Egerstedt. Voluntary retreat for decentralized interference reduction in robot swarms. *In IEEE International Conference on Robotics and Automation (ICRA) 2019. Preprint available at: arXiv:1812.02193*.

[9] **Siddharth Mayya**, Pietro Pierpaoli, Girish Nair, and Magnus Egerstedt. Collisions as Information Sources in Densely Packed Multi-Robot Systems Under Mean-Field Approximations. In *Proceedings of Robotics: Science and Systems (RSS), Cambridge, Massachusetts, July 2017.*

[10] **Siddharth Mayya** and Magnus Egerstedt. Safe open-loop strategies for handling intermittent communications in multi-robot systems. In *IEEE International Conference on Robotics and Automation (ICRA) 2017, pages 5818–5823.*

[11] Smit Kamal, Karun Potty, Chandrasekhar Nagarajan, **Siddharth Mayya**, and Adheesh Boratkar. Descent modeling and attitude control of a tethered nano-satellite. In *IEEE Aerospace Conference 2014, pages 1–14.*

Thesis

[12] **Siddharth Mayya**. Safe open-loop strategies for handling intermittent communications in multi-robot systems. *Master's Thesis, Georgia Institute of Technology, 2016*.

Honors & Awards

2018	**Among top 6 papers selected for Extended Publication in IEEE Transaction on Robotics**, Robotics: Science and Systems Conference	*Boston, MA*
2018	**Executive Vice President of Research Award for Best Poster**, Career, Research and Innovation Development Conference	*Atlanta, GA*
2010	**Full Tuition Fellowship Award**, Manipal Institute of Technology	*Manipal, India*

Presentations

Invited Talks

Strength in Numbers: Swarm Robotics and Its Applications *Mumbai, India*
Bhabha Atomic Research Center *Jul. 2017*
Future Technologies Talk

Local Interactions as Information Sources in Robot Swarms *Atlanta, GA*
Georgia Institute of Technology *Sept. 2018*
Robotics Student Seminar Series

Conference Talks and Presentations

Workshop on Resilient Robot Teams: Composing, Acting, and Learning, ICRA 2019 *Montreal, Canada*
Spotlight Talk and Poster Presentation *May 2019*
"Optimal Task Allocation in Heterogeneous Multi-Robot Systems Using a Mixed Centralized/Decentralized Strategy"

2019 International Conference on Robotics and Automation *Montreal, Canada*
Poster Presentation *May 2019*
"Voluntary Retreat for Decentralized Interference Reduction in Robot Swarms"

2017 International Conference on Robotics and Automation *Singapore*
Spotlight Talk and Poster Presentation *May 2017*
"Safe open-loop strategies for handling intermittent communications in multi-robot systems"

2017 Robotics: Science and Systems Conference 2017 *Boston, MA*
Spotlight Talk and Poster Presentation *July 2017*
"Collisions as Information Sources in Densely Packed Multi-Robot Systems Under Mean-Field Approximations"

Workshop on Robust Autonomy in Heterogeneous Robot Teams, RSS 2017 *Boston, MA*
Poster Presentation *July 2017*
"Robust Autonomy in Centralized Multi-Robot Systems"

Teaching Experience

Research Mentoring

As a part of the ECE 8803 Special Research Topics course (Fall 2017), I provided research guidance and mentoring to 4 students over the course of a semester. This involved weekly meetings to discuss progress in their research and point them towards relevant results in the literature.

Teaching Assistant & Co-Instructor

Georgia Institute of Technology. ECE 6553: Optimal Control (Spring 2017)

Service

Peer Reviewer

1. IEEE International Conference on Robotics and Automation (ICRA) 2018
2. IEEE International Conference on Intelligent Robots and Systems (IROS) 2018

Media Coverage

1. "This Robot Lab Has No Idea What Its Robots Are Doing ", *The Wall Street Journal*, Aug 15,2017
2. "Ga. Tech Unveils World's First Open Robotics Research Lab", *National Public Radio*, Aug 24 2017
3. "'Robotarium' gives anyone access to robots", *BBC*, Aug 18 2017

References

1. Magnus Egerstedt, Georgia Institute of Technology
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2. Stephen Pratt, Arizona State University
   School of Life Sciences
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3. Dylan Shell, Texas A&M University
   Department of Computer Science & Engineering
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4. Seth Hutchinson, Georgia Institute of Technology
   School of Interactive Computing
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