Jason Hughes

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Research Interests

I am primarily interested in fully autonomous aerial systems and applications of machine learning and optimization to achieve such systems.

Education

Fordham University New York, NY
M.S. in Data Science, GPA: 3.88/4.00 2020–2021
  – Thesis: An Algorithmic Foundation for Fair, Secure, and Differentially Private Distributed Discrete Optimal Transport

Fordham University Bronx, NY
B.S. in Mathematics *Cum Laude*, GPA: 3.70/4.00, Major GPA: 3.90/4.00 2016–2020
  – Minor: Computer Science

Research Experience

United States Military Academy, Robotics Research Center West Point, NY
ARL Journeyman Fellow Sept. 2021 –Present
  – Co-advised by: Dr. Misha Novitzky and COL. Christopher Korpela
  – Researching algorithms to dynamically allocate aerial vehicle swarms for mapping areas.
  – Applying novel methods for object recognition algorithms to distinguish similar objects.
  – Working on government funded robotics research projects.

Fordham University, Juntao Chen Group New York, NY
Graduate Student Researcher Sept. 2020 –Aug. 2021
  – Applied differential privacy to distributed optimal transport (OT) to protect user data.
  – Added fairness constraints to OT for fairer resource allocation.
  – Built a model for distributed OT that considers resource suppliers or targets that may be hacked and untrustworthy.
  – Work 30 hours per week while a full time graduate student.
  – Direct undergraduates to help with research.

Fordham University Robotics & Computer Vision Lab Bronx, NY
Undergraduate Student Researcher Mar. 2019 –Aug. 2020
  – Studied the ability to use drone IMU data to detect obstacles
  – Employed ML algorithms and large sets of data to predict the location of the obstacle in relation to the drone.
  – Programmed autonomous drone flights using ROS and Python.
  – Worked 15 hours a week while a full time student.

Journal Papers

1. **J. Hughes**, J. Chen, "Resilient and Distibuted Discrete Optimal Transport with Deceptive Adversary: A Game-Theoretic Approach", *IEEE Control Systems Letters*, vol 6, pp. 1166 - 1171, 2022.

Conference Papers

1. N. Kaur, **J. Hughes** and J.Chen, "VaxEquity: A Data-Driven Risk Assessment and Optimization Framework for Equitable Vaccine Distribution", Submitted To: *Conference on Information Sciences and Systems (CISS)*, November 2021.

2. **J. Hughes** and J.Chen, "Behavioral Optimal Transport with an Application to Security Investment over Networks", Submitted To: *American Control Conference (ACC)*, October 2021.

3. **J. Hughes** and J.Chen, "Differentially Private ADMM-Based Distributed Discrete Optimal Transport for Resource Allocation", Submitted To: *American Control Conference (ACC)*, October 2021.

4. **J. Hughes** and D. Lyons, "Wall Detection via Air-Disturbance Classification in Autonomous Quadcopters", *The 7th International Conference on Control, Automation and Robotics*, 2021, pp. 189-196.

5. **J. Hughes** and J. Chen, "Fair and Distributed Dynamic Optimal Transport for Resource Allocation over Networks", *2021 55th Annual Conference on Information Sciences and Systems (CISS)*, 2021, pp. 1-6.

6. **J. Hughes** and D. Lyons, "Obstacle Detection via Air-Disturbance Classification in Autonomous Quadcopters", *ICDATA 2020: 16th International Conference on Data Science*, 2020.

7. Q. Zhao, **J. Hughes** and D. Lyons, "Drone proximity detection via air disturbance analysis", Proc. SPIE 11425, *Unmanned Systems Technology XXII*, Vol. 114250, 2020, pp. 141-149.

Conference Presentations

- "Wall Detection via Air-Disturbance Classification in Autonomous Quadcopters", *7th International Conference on Control, Automation and Robotics (ICCAR).*   April 2021
- "Fair and Distributed Dynamic Optimal Transport for Resource Allocation over Networks", *55th Annual Conference on Information Sciences and Systems (CISS).*   March 2021
- "Obstacle Detection via Air-Disturbance Classification in Autonomous Quadcopters", *16th International Conference on Data Science (ICDATA).*   July 2020

Advising & Teaching Experience

- **Graduate Student Advisor** at Fordham University   Mar. 2021 –Apr. 2021
  Advised students on incorporating fairness in optimal transport as a part of Google's ExploreCSR Program.
- **Graduate Student Advisor** at Fordham University Robotics & Computer Vision Lab   Mar. 2021 –May 2021
  Trained undergraduates in robotics lab systems such as ROS and drone environments.
- **Tutor** at Fordham University   Sept. 2019 –Aug. 2020
  Tutored five students in various subjects from Finite Math to Linear Algebra.
- **Grader** at Fordham University   Sept. 2018 –May 2020
  Graded homework and quizzes in multiple classes for professors.
- **Student Teacher** at Theodore Roosevelt High School   Sept. 2018 –Dec. 2018
  Taught a Math SAT prep class once a week to twelve students.

Awards & Scholarships

- Journeyman Fellowship   2021-2022
- ICCAR: Best Presentation Award   April 2021
- Google's Tri-State ExploreCSR: Second Place in Poster Competition   April 2021

- Fordham University: Centennial Scholarship — 2020–2021
- Fordham University: Summer Research Fellowship — Summer 2019
- Pi Mu Epsilon: Mathematics Honors Society — 2019–2020
- Fordham University: Dean's List — 2017–2020
- Fordham University: Dean's Scholarship — 2016–2020

Programming Languages

- **Python:** Packages: Numpy, Pandas, SciPy, Tensorflow/Keras, Matplotlib. Additionally, OOP
- **MATLAB:** Scripting for numerical analysis, PDEs, optimization and more.
- **C++:** Object oriented programming.
- **R:** Scripting for data analysis and graphing.

Skills

- **Linux:** Bash scripting for Linux (or Unix)
- **Big Data:** Hadoop (HDFS), Spark, Google Cloud
- **ROS:** Robotics Operating System
- **MySQL:** Database management
- **Others:** LaTeX, Microsoft Office, Soldering, Woodworking

Relevant Coursework

- **Graduate:** Algorithms for Data Science, Data Analytics: Tools & Scripting, Math for Data Science, Artificial Intelligence, Machine Learning, Data Visualization, Big Data Programming, Cloud Computing.
- **Undergraduate:** Multivariate Calculus I & II, Linear Algebra, Mathematical Modeling, Discrete Math, Differential Equations, Abstract Algebra, Numerical Analysis, Probability, Statistics, Partial Differential Equations, Computer Science I & II, Computer Organization, Data Mining, Programming for Math & Science.

Professional Organizations

- IEEE Student Member — 2021 –Present
- SIAM Student Member — 2020 –Present

Technical Reviewer

- IEEE Control System Letters — 2021