

**Fatima Umar**  
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## EDUCATION

**University at Buffalo (UB)** Buffalo, NY  
*Master of Science (Research Track) - Computer Science (CS), Industrial Engineering (IE); GPA: 4.00* 2022 - 2024

- **Coursework (CS):** Stochastic Simulation, Reinforcement Learning, Information Retrieval, Multiagent Systems, Computer Vision
- **Coursework (IE):** Discrete Optimization, Game Theory, Decision Systems & Risk Analysis, Supply Chain Management

**Rochester Institute of Technology (RIT)** Rochester, NY  
*Bachelor of Science (summa cum laude) - Computer Science, Economics; GPA: 3.95* 2018 - 2022

- **Coursework (CS):** Advanced Algorithms, Social Networks, Natural Language Processing, Cryptography, Computational Puzzles
- **Coursework (Econ.):** Econometrics, Game Theory, Computational Economics, Behavioral Economics, Health Care Economics

## RESEARCH EXPERIENCE

**Geisinger Health System - Department of Bioethics & Decision Sciences** Danville, PA  
*Predoctoral Research Assistant (advised by Drs. Michelle Meyer & Christopher Chabris)* Present

**University at Buffalo - Computing for Social Good Lab** Buffalo, NY  
*Thesis Student (CS) (advised by Dr. Kenneth Joseph)* Present

- Modeling structural inefficiencies and biases in the U.S. **refugee resettlement** program using **two-sided matching** theory.
- Developing **multi-armed bandit** mechanisms for allocating services to **foster youth** that minimize impacts of historic biases.
- Consulting a local non-profit on how to decide which treatments to assign vulnerable clients using **causal estimates**.

**University at Buffalo - Operations Research for Sustainability Lab** Buffalo, NY  
*Thesis Student (IE) (advised by Dr. Sayanti Mukherjee)* Present

- Identifying regional **socioeconomic factors** that have the most impact on amount of resources sent to **manage wildfires**.
- Evaluating impacts of **infrastructure failures** on **vulnerable communities** after Hurricane Fiona to suggest **recovery efforts**.

**Pennsylvania State University - Foundations of AI Lab** State College, PA  
*Research Assistant (advised by Dr. Hadi Hosseini)* 2019 - 2022

- Established novel models of **strategic behavior** in centralized **two-sided matching** markets (e.g., residency matching).

**Rochester Institute of Technology - Computational Economics Group** Rochester, NY  
*Capstone Student (advised by Dr. Bharat Bhole)* 2021 - 2022

- Trained **Q-learning** agents to play **iterated prisoner's dilemma** and evaluated them against Axelrod's tournament strategies.

**Rochester Institute of Technology - Environmental Computing Lab** Rochester, NY  
*Research Assistant (advised by Dr. James Winebrake)* 2018 - 2019

- Computed **expected emissions** of petroleum-, natural gas-, and renewable-based fuels from shipments along the U.S. East Coast.

## INDUSTRY EXPERIENCE

**MIT Lincoln Laboratory - Homeland Analytics & Sensors Group** Lexington, MA  
*Machine Learning Intern* Summer 2022

- Tested pretrained **object detection** models in Python on egocentric tutorial-style videos to identify algorithms that would behave optimally in a state-of-the-art **augmented reality system** being designed by DARPA.
- Deployed the DeepSORT **object tracking** algorithm to generate videos with smoother frame-by-frame detections.
- Trained existing detection models to learn new object classes using **transfer learning** techniques given limited data.

**The Hershey Company - Demand & Supply Centers of Excellence** Hershey, PA  
*Data Science Intern* Spring 2022

- Spearheaded the design of advanced uni- and multi-variate **time-series models** in Python to forecast monthly sales for a portfolio of 1000+ products at brand, item, and customer levels.
- Pioneered the implementation of a novel **hierarchical forecast reconciliation** technique, resulting in a significant improvement in accuracy and alignment with business goals.
- Identified **product clusters** using shipment data, enabling the implementation of targeted supply chain optimization strategies.
- Designed **dashboards** in PowerBI to highlight key inferences drawn from **relational database models**.

## TEACHING EXPERIENCE

**University at Buffalo** Buffalo, NY  
*Course Grader* Fall 2023

- IE 322: Analytics & Computing for Industrial Engineers
- IE 373: Optimization in Deterministic Systems

**Rochester Institute of Technology** Rochester, NY  
*CS Theory Tutor* Spring 2022

- Held weekly office hours for undergraduate and graduate level Computational Theory, Algorithms, and Cryptography courses.

*Course Grader* 2020 - 2021

- CSCI 262: Intro to Computer Science Theory (Spring 2020, Fall 2020, Fall 2021)
- MATH 190: Discrete Math for Computing (Spring 2020)

## PUBLICATIONS

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<sup>( $\alpha\beta$ )</sup> Hadi Hosseini, **Fatima Umar\***, and Rohit Vaish. Two for One & One for All: Two-Sided Manipulation in Matching Markets. In *Proceedings of the 31st International Joint Conference on Artificial Intelligence*, pages 321-327, 2022. [arXiv] [proceedings]

<sup>( $\alpha\beta$ )</sup> Hadi Hosseini, **Fatima Umar\***, and Rohit Vaish. Accomplice Manipulation of the Deferred Acceptance Algorithm. In *Proceedings of the 30th International Joint Conference on Artificial Intelligence*, pages 231-237, 2021. [arXiv] [proceedings] [code]

- Appeared in Games, Agents, and Incentives Workshop, 2021. [proceedings]

James J. Winebrake\*, James J. Corbett\*, **Fatima Umar**, and Daniel Yuska. Pollution Tradeoffs for Conventional and Natural Gas-Based Marine Fuels. *Sustainability*, 11(8):1-19, MDPI, 2019. [journal]

<sup>( $\alpha\beta$ )</sup>: alphabetical author ordering      (\*): primary authorship

## PRESENTATIONS

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### *Data-Driven Analysis of Inequity in Wildfire Resource Allocation*

- Society for Risk Analysis Annual Meeting, December, 2023. [slides]
  - Winner of the SRA Justice, Equity, and Risk Specialty Group Student Merit Award.
  - Selected for press release by the SRA. [release]

### *Accomplice Manipulation of the Deferred Acceptance Algorithm*

- International Joint Conference on Artificial Intelligence, July 2021. [slides - 2 min] [slides - 15 min] [poster]
- International Seminar Series on Social Choice, Video Seminar, Rump Session, July 2021. [slides]
- Games, Agents, and Incentives Workshop, May 2021. [slides]

## HONORS & AWARDS

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### **Society for Risk Analysis Justice, Equity, and Risk Student Merit Award** 2023

- Awarded to the best student-written extended abstract relevant to the topic of “justice, equity, and risk.”

### **Google Computer Science Research Mentorship Program** 2022

- Accepted into a competitive 12-week program for developing computing research skills hosted by Google.

### **Omicron Delta Epsilon Invited Member** 2022

- Nominated by RIT faculty for an Economics honor society.

### **RIT Outstanding Undergraduate Scholar** 2021

- Awarded to top 1% of undergraduate students.

### **RIT Computer Science Alumni Scholarship** 2020

- Awarded to one undergraduate student each year for “significant contributions to the Computer Science department.”

### **RIT Carl Reynolds Computer Science Scholarship** 2019

- Awarded to one first-year student each year for “outstanding academic achievement” and “willingness to mentor peers.”

### **RIT Presidential Scholarship** 2018 - 2022

- Highest scholarship level awarded to incoming students.

## SKILLS

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- **Languages:** Python, R, Java, Julia, C, MATLAB, SQL, L<sup>A</sup>T<sub>E</sub>X
- **Frameworks:** TensorFlow, PyTorch, scikit-learn, OpenCV, NLTK, SpaCy, OpenAI, Gurobi, Beautiful Soup, Flask
- **Software:** SAS, PowerBI, Tableau, Google Cloud Platform, Hadoop, Git
- **Spoken Languages:** English, Urdu/Hindi (*bilingual*); Spanish (*limited working*); Punjabi, Arabic (*elementary*)