

ZACHARY ROCH

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EDUCATION

University of Central Florida - Office of Research and College of Graduate Studies (ORCGS) Doctoral Fellowship <i>Ph.D. in Computer Engineering – Specialization in Intelligent Systems and Machine Learning</i>	Present GPA: 3.68 December 2023
University of Central Florida <i>Master of Science - Financial Technology (FinTech)</i>	GPA: 3.98 December 2020
University of Central Florida <i>Bachelor of Science in Business Administration - Finance</i>	GPA: 3.64 May 2017
Indian River State College <i>Associate of Arts - General Studies (Magna Cum Laude) - Study Abroad in Costa Rica</i>	GPA: 3.82

PROFESSIONAL EXPERIENCE

Research Assistant **May 2024 - Present**
Orlando, FL
University of Central Florida (College of Engineering & Computer Science)

- Collaborated with a team of 10 other researchers on the Transfer Learning from Imprecise and Abstract Models to Autonomous Technologies (TIAMAT) program sponsored by the Defense Advanced Research Projects Agency (DARPA) to architect distributionally robust approaches to transfer learning to more accurately model real-world uncertainty, this resulted in significant publishable contributions to this field and narrows the simulation-to-real gap.
- Led multiple presentations on cutting-edge reinforcement learning covering Markov decision processes and theoretical frameworks; applied rigorous proofing techniques to inform the design of distributionally robust model-based and model-free algorithms that improve scalability, data efficiency, and sample complexity bounds for robust average-reward Markov decision processes (AMDPs). Presented the above work at the 42nd International Conference on Machine Learning (ICML) in Vancouver, Canada.
- Translated novel pseudocode into a modular Python framework using Gym and Mujoco, conducted extensive experimentation to verify the theoretical results across several problem settings and complex environments; produced many high-quality visualizations for both continuous and discrete environments for TIAMAT reports.
- Derived formal proofs used to design a novel model-free algorithm for finding near-optimal policies for robust AMDPs used in submission of a paper under review at a top conference.
- Current research work in robust average-reward multi-agent reinforcement learning. Specific details omitted due to novelty of work and privacy concerns.

Graduate Teaching Assistant **July 2025 – Present**
Orlando, FL
University of Central Florida

- Facilitated a conducive learning environment for over 50 students in a graduate level course, CIS 5730 - Blockchains and Smart Distributed Contracts. Duties included creating answer keys for quizzes, grading assignments and providing feedback, and an in-depth code review on the creation of Merkle Trees and verification via an interim hash value.

Federal Deposit Insurance Corporation (FDIC) **June 2023 - August 2023**
Columbus, OH
Financial Institution Intern (Division of Risk Management Supervision)

- Analyzed third party risk management procedures related to cryptocurrency exposure in context to AML/CFT.
 - Initiated a pivotal discovery leading to the facilitation of a high-level meeting with senior bank management, revealing multiple critical issues. Collaborated with the Chicago regional center and the Washington D.C. headquarters to formulate comprehensive policies and guidelines aimed at rectifying these concerns. Upon full implementation, these procedures will serve as a blueprint for addressing similar challenges in future institutions.
- Analyzed 4 insured depository institutions to determine the safety and soundness of their financials, procedures, and internal controls with respect to capital, earnings, liquidity, and sensitivity to market risk.
- Uncovered over 10 discrepancies which were presented to the bank's senior management for further clarification.
- Led the earnings and capital conversations with senior management at 1 institution.
- Prepared drafts of schedules, exhibits, and comments for inclusion in the report of examination for 5 banks.

Fidelity Investments **June 2021 - August 2022**
Jacksonville, FL
Customer Relationship Advocate (Stockbroker)

- Worked with over 1,000 clients to execute complex equity and option trading strategies based on their stated goals.
- Optimized strategic business practices which helped grow the total retail accounts by 14% and the total revenue by 5% in the year following Q1 2021.
- Safeguarded the firm and its clients by successfully identifying and addressing 6 instances of fraud detection, risk mitigation, and account reconciliation, exemplifying a zero-tolerance approach towards anomalies in client transactions and interactions. This resulted in positive feedback from management.
- Researched and generated educational career advancement material in collaboration with upper management to grow colleagues' skill sets which resulted in a 41% career mobility of the team.

PAPERS

“**Distributionally Robust Markov Games with Average Reward**”, with Z. Roch and Y. Wang, preprint, 2025.

“**A Finite-Sample Analysis of Distributionally Robust Average-Reward Reinforcement Learning**”, with Z. Roch, C. Zhang, G. Atia, Y. Wang, preprint, 2025.

“**A Reduction Framework for Distributionally Robust Reinforcement Learning under Average Reward**”, with Z. Roch, G. Atia, and Y. Wang, in press, *International Conference on Machine Learning* (2025).

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“Blockchain Services for Digital Government: An Exploration of NFT Applications in the Metaverse”, with Z. Roch and R. Akula, in press, *ABC: AI, Blockchain, and Cybersecurity for Finance* (2023).

ACADEMIC PROJECTS

Zero-Shot Text-to-Image Mapping with Human Preferences in the Fashion Industry **Spring 2025**

- Collaborated in a team of 3 to introduce a unified framework to address misclassification in text\image pairs, often encountered by search engines, by utilizing generative artificial intelligence to rapidly produce synthetic data that was used for deep-feature extraction and training of OpenAi’s CLIP model; the end result showed increased accuracy over the base model and implied a replicable framework for other industries.

Exchange Traded Fund (ETF) Portfolio Rebalancer **Fall 2023**

- Collaborated to develop a machine learning model that builds a portfolio of sector ETFs that automatically rebalances to take advantage of market trends.
- Developed a web scraper to collect news articles from a prominent source and were stored in MongoDB. Natural language processing was used on these articles to gauge the positive, negative, and neutral sentiment to be used as a feature within the main model.

Financial News Aggregator **Fall 2023**

- Created a full stack web development project in JavaScript that utilizes a built-in authentication scheme for users to create an account and store their hashed credentials in a SQLite database.
- Once logged in, an API pulls relevant financial news based on the user’s search criteria.

Cryptocurrency Bubble Detection **Spring 2023**

- Encompassed the sentiment analysis of Twitter data and cryptocurrency price history while experimenting with variable adjustments to enhance the model. Implementation is underway to develop an ensemble learning approach to predict price volatility and derive a risk metric. Using statistical modeling, initial results show an increase of 57.7% and 33.0% to the Exact Match score and the accuracy of the number of cryptocurrency bubbles score respectively.
- Coauthor for a machine learning paper aimed to improve on the Multi Bubble Hyperbolic Network (MBHN) model by Sawhney et al. (2022).

Blockchain-Based Remissions Prototype **Fall 2022**

- Led a team of 4 in the development of a remission’s platform in python incorporating aspects of Know Your Customer (KYC), a front-end user interface, error-checking responses for reasonableness, a prototype private blockchain to facilitate the funds transfer, the internal record keeping of client information, and the creation of 2 “dummy” bank accounts with payment systems to simulate the actual transfer of currency.
- Created a business plan proposal and forecasted company growth/financials to accompany the prototype.
- Led the presentation and demonstration in a “Shark Tank” style pitch competition. Resulted in the proposal being fully funded.

Exchange Traded Fund Creation **Fall 2022**

- Developed a rudimentary tokenization mechanism to analyze the sentiment of the Wall Street Journal. Based on the sentiment scores, the program would allocate a portion of the funds to a subset of 5 stocks in the DJIA.

Robo-advisor **Fall 2022**

- Led a team of 4 in the development of a robo-advisor that took in several features from a client to output a recommended asset allocation. Built out error-checking mechanism to ensure all client responses were reasonable.

LEADERSHIP EXPERIENCE

University of Central Florida, College of Business **August 2023 – December 2023** *Graduate Teaching Assistant – College of Business* **Orlando, FL**

- Given the implementation of new anti-cheating software, employed data analysis and visualization to determine thresholds for cheating for student submissions for an undergraduate course.
 - Presented 2 reports of findings which resulted in the modification of the assignments for future courses.
- Collaborated with the teaching assistant team to support over 1,000 students by grading assignments, providing feedback, and assisting students with course content during office hours.

CEO Knights **March 2019 - January 2020** *Vice President* **Orlando, FL**

- Planned, organized, and led meetings for 15-78 students with topics covering many aspects of entrepreneurship.
- Fostered relationships with local small-medium business owners. This resulted in the organization and execution of numerous guest speakers including a panel presentation by 6 local business owners.
- Collaborated with the executive committee to map out and implement the group’s budget and marketing efforts.

SKILLS AND CERTIFICATIONS

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| • Python (Gym, NumPy, Scikit-learn, SciPy, PyTorch, Transformers, Tensorflow, Pandas, Matplotlib etc.) | • Solidity |
| • Reinforcement Learning Theory and Application | • HTML and CSS |
| • Machine learning and Artificial Intelligence | • Data Structures and Algorithms |
| • Javascript | • Full Stack Development |
| • R | • Data Visualization |
| • SQL | • Data Analysis |
| | • Algorithmic Trading |