Rajiv Chaitanya Muttur

(Rajiv Chaitanya M)

Bengaluru, India rajiv.muttur@gmail.com LinkedIn Google Scholar arXiv ORCID

Research interests in reinforcement learning, optimization, and graph-structured learning, with applications to quantitative finance and macro-financial systemic risk. Experienced in designing reproducible RL pipelines, risk-aware reward modeling, and streaming graph systems under real-world deployment constraints.

Education

Dayananda Sagar College of Engineering (DSCE) *Sep 2022 - Jun 2026*
BE in Computer Science and Engineering; *(Expected)*
Minor: Economics and Finance (CGPA: 9.63/10.0)

Key Coursework: Machine Learning, Deep Learning, NLP, Corporate Finance, Security Analysis & Portfolio Management, Financial Mathematics, Investment Management.

Experience

Student Research Intern (AI/ML for Biomedical Imaging) *Jan 2026 - May 2026*
Indiana University Bloomington, School of Optometry *Bloomington, USA*

- Built deep learning pipelines for ocular signal and image analysis, including preprocessing, feature extraction, and sequence modeling of vertical EOG data.
- Implemented and evaluated BiLSTM-based architectures for blink-phase segmentation across normal and dry-eye cohorts.
- Conducted model validation, statistical analysis, and technical reporting for conference dissemination (ARVO 2026).

Econometrics and Applied Research Intern *Jan 2026 - Present*
JSPM University, Pune *(Part-time, Remote)*

- Applied econometric models (panel regression, time-series methods) to confidential macro-financial and institutional datasets.
- Performed statistical inference, robustness checks, and empirical validation using Python-based quantitative analysis tools.
- Contributed to draft research outputs through quantitative modeling, result interpretation, and documentation.

AI/ML & Research Intern *Jan 2025 - July 2025*
SISA Information Security *Bengaluru, India*

- Designed and implemented an input/output validation pipeline for enterprise LLM systems, integrating intent classification, keyword filtering, and sentiment-aware response controls.
- Evaluated model behavior under adversarial and edge-case prompts to improve robustness and compliance in regulated industry settings.
- Collaborated with security analysts to align LLM outputs with legal, ethical, and operational risk constraints.

Conference Papers and Presentations

REBOUND: Resilience-Based Output Allocation for Nonlinear Drawdowns ***World Finance Conference 2026***
Sole Author. Proposes a resilience-based allocation framework modeling drawdown geometry and recovery stability. Evaluated on 31 years of multi-asset data; Sharpe 1.54 and max drawdown 9.11% vs buy-and-hold 0.52 / 55.19%, with out-of-sample validation across independent splits. *Ireland* *(Accepted)*

BiLSTM-based Segmentation of Blink Phases from Vertical EOG in Normal and Dry Eye Subjects ***ARVO Annual Meeting 2026***
First Author. Accepted abstract at ARVO 2026. Developed a BiLSTM-based model for blink-phase segmentation from vertical EOG signals for dry eye assessment. *Denver, CO, USA* *May 2026 (Accepted)*

ARISE: Adaptive Reinforcement Integrated with Swarm Exploration ***WCSC 2026***
First Author. Proposed a swarm-augmented exploration mechanism improving the robustness of policy-gradient RL under non-stationary rewards. *Bangkok, Thailand* *Jan 2026 (Presented)*

SRAS: RL-based Document Selector for Edge-Native RAG Pipelines ***ICEdge 2025***
Sole Author. Lecture-track paper; **Selected as a Best Paper Candidate**. Developed a sparse reward-aware RL selector for document relevance in edge-optimized RAG systems. *IISc Bangalore* *Dec 2025 (Presented)*

The Power of AI/ML in Entrepreneurial Growth ***ICEI 2025***
Sole Author. Presented analysis of AI/ML-driven growth opportunities and associated *MET IOM, Mumbai*

ethical risks in startup ecosystems. Recieved the Best Paper Award. *April 2025 (Presented)*

Wiener Index of Hypercubes and Their Variants ***ICCMDSAI 2025***
First Author. Presented original results deriving Wiener index expressions for hypercubes and related graph variants. *DSCE, Bengaluru*
Feb 2025 (Presented)

Manuscripts Under Review

Sovereign Wealth Funds and Macroeconomic Risk: A Critical Review of Stability, Volatility, and Crisis Transmission ***Journal of Economic Surveys***
Submitted Apr 2026
Sole Author. Reformulates sovereign wealth funds as dynamic risk systems using stochastic control and causal ML under regime uncertainty.

RAMP: Residency-Aware Micro-Partitioning for Drifting Graph Streams ***ICPP 2026***
Sole Author. Streaming graph partitioner with per-vertex residency prediction and utility-based migration admission; evaluated against seven baselines on synthetic and real temporal networks with offline-oracle decision-quality analysis. *Singapore*
Under Review

Working Papers / In Preparation

- **RRR: Reward Recovery and Reoptimization for Black-Box Trading Strategies**
  Two-stage inverse reinforcement learning + RL framework for inferring and reoptimizing the implicit reward functions of opaque quant strategies. Emphasis on risk-aware reward modeling, transaction-cost-aware optimization, and reproducibility; evaluation on historical equity and derivatives data.
- **Swarm-Augmented Policy Gradients under Non-Stationary Rewards**
  Journal extension of ARISE (WCSC 2026). Develops theoretical analysis of convergence and exploration-exploitation trade-offs for swarm-based perturbation in policy-gradient RL, with expanded empirical evaluation across non-stationary benchmarks.
- **MetaGraph: Meta-Learning Graph Neural Networks for Regime-Adaptive Financial Forecasting**
  Two-level meta-learning GNN with transformer-based temporal encoding over dynamic S&P 500 correlation graphs. Our preliminary results show cumulative return of 708% and Sharpe 2.02 on out-of-sample evaluation, and statistically significant risk-adjusted performance vs. zero-return benchmarks ($p < 0.001$).

Academic Service

- **Reviewer - IEEE World Congress on Computational Intelligence (WCCI 2026)** *Mar 2026*
  Reviewed 3 submissions for the Congress on Evolutionary Computation (CEC) covering optimization algorithms, economic modeling, and graph-based forecasting methods (1 primary, 2 secondary reviews).
- **Reviewer - IEEE International Conference on AI and Security for Industrial IoT Systems (AISIIS 2026)** *Mar 2026*
  Reviewed 7 submissions on AI-driven security, intelligent sensing systems, and Industrial IoT applications; evaluated novelty, methodological rigor, and experimental validation.

Projects

Portfolio Optimization using Reinforcement Learning (PPO) *Apr 2025 - Jun 2025*

- Built a PPO-based RL portfolio manager for HDFC, ICICI, and Kotak (2018-2023), achieving **155.7% cumulative return** and Sharpe ratio **0.730**.
- Modeled transaction costs and turnover (**0.683**) for cost-efficient trading; visualized portfolio evolution and drawdowns.

GridCast: GNN Load Forecasting *Aug 2025 - Sep 2025*

- Developed a graph neural network for short-term load forecasting on the IEEE-14 bus system, capturing spatio-temporal correlations across nodes.
- Achieved higher accuracy than baseline statistical and deep learning methods; implemented a modular PyTorch pipeline for reproducibility.

Awards and Certifications

- **Student Travel Grant Award (STGA) - ICEdge 2025** *Dec 2025*
  Awarded a competitive student travel grant to present research at the International Conference on Edge Computing (ICEdge 2025), IISc Bangalore.
- **Fourth Place - Agri-Hackathon 2025** *Oct 2025*
  Awarded the fourth place at the district level hackathon for coming up with an innovative solution to solve the everyday problems faced by the Indian farmers.
- **IBM RAG and Agentic AI - Specialization Certificate** *Oct 2025*
  Offered by IBM through Coursera. The topics include Retrieval-Augmented Generation (RAG), agentic AI frameworks (LangChain, LangGraph, CrewAI), vector databases, and multimodal generative AI applications.
  View Certificate
- **Third Prize - Antariksha Avalokam** *Aug 2025*
  Project presentation competition, Department of ETE, DSCE.
- **Winner - Ideathon'25 (Green Energy Track)** *Jun 2025*
  Awarded first place in the Green Energy Track at Ideathon'25 hosted by IEEE DSCE and IEEE CAS.
- **Best Research Paper Award - MET IOM** *Apr 2025*
  Awarded at the International Conference on Entrepreneurship and Innovation for the paper *"The Power of AI/ML in Entrepreneurial Growth."*
- **Certificate of Merit - ISRO IIRS** *Mar 2025*
  Completed "Geodata Processing using Python and ML" with an **A+ grade**.
  Credential ID: `114d641dfa6ff4b1afe4d97f5e152b20`
- **Winner - Innotech Ideathon'24** *Dec 2024*
  Awarded **INR 100,000** for developing a scalable solution for sewage water recycling.

Team & Leadership Experience

- **ByteXync** *May 2024 - Aug 2025*
  Coordinated a student-driven tech club under the Department of CSE, DSCE; guided project teams, organized workshops, and supported peers in research and technical initiatives.
- **OSCode DSCE** *May 2024 - Nov 2024*
  Led PR efforts and collaborated with a team to plan outreach for coding events, ensuring smooth coordination and increased participation.
- **IEDC DSCE** *Dec 2022 - Sep 2024*
  Contributed to content strategy for innovation and entrepreneurship events, working alongside team members to deliver high-quality materials.