

## Summary

– Research interests lie in Applied Machine Learning and Data Mining, especially Adversarial Learning, Reinforcement Learning (RL), Graph Neural Networks (GNN), and Natural Language Processing (NLP) with applications to real-world scenarios (Finance, Material, Traffic), such as Portfolio Management, Time Series Forecasting, and Molecular Representation Learning.

## Education

2020 – 2025: **PhD, Computer Science**, *New Jersey Institute of Technology*, Newark.

Advisor: Dr. Guiling (Grace) Wang, Distinguished Professor

2017 – 2019: **Master, Data Science**, *Rutgers University*, New Brunswick.

2013 – 2017: **Bachelor, Economics & Statistics**, *Xiamen University*, China.

## Working Experience

Jun 2023 – **AI/ML Research Intern**, *Samsung Display America Lab*, San Jose, CA.

- Sep 2023:
- Implemented pre-train models under self-supervised learning paradigm to learn molecular representation, utilized GNN and Transformer as backbones to explore 2D topology and 3D spatial position of molecules.
  - Explored the impact of environment-invariant and flexible molecular substructures on properties
  - Finetuned the molecular representation for downstream deployment (e.g., property prediction).

## Research Experience

FinTech Lab, AI Center for Research, New Jersey Institute of Technology

Mar 2023 – **Margin Trader: Portfolio Management with Margin by Reinforcement Learning.**

- Present:
- Established Margin Trader that first integrates margin account and constraints into a realistic trading environment in RL for portfolio management, with the balance between profit and risk.
  - Supported various Deep Reinforcement Learning (DRL) algorithms and offer traders the flexibility to customize critical settings to suit diverse market conditions, individual preferences, and risk tolerance.
  - Realized 3+ times return and a Sharpe Ratio 46% higher than DJIA during a volatile market period.

Dec 2022 – **Risk-Aware Generative Adversarial Model for Stock Interval Construction.**

- Aug 2023:
- Employed a novel framework for *interval prediction* to quantify uncertainty of stock price.
  - Adapted a GAN to simulate future price series with artificial noise from market, employ statistical inference to design a *risk-sensitive interval* to detect market volatility and potential needs for hedging.
  - Achieved 95% of coverage of true next-day price with precise range on multiple indices worldwide, and outperformed existing state-of-the-art (SOTA) benchmarks.

Mar 2023 – **Hierarchical Inpainting GAN with Auxiliary Inputs for RGB and Depth Inpainting.**

- Aug 2023:
- Developed HI-GAN, an innovative method consisting of three GANs operating in an end-to-end fashion for RGBD inpainting, the first attempt incorporating segmentation label images.
  - Auxiliary inputs (edge and label images) guide the inpainting process contextually and optimization-wise.
  - Improved SSIM by 9% and PSNR by 11% in RGB inpainted images compared with SOTA methods.

Jun 2022 – **ADPP, A Novel Anomaly Detection and Privacy-Preserving Framework in Tokenomics.**

- Sep 2022:
- Proposed a privacy-preserving authentication platform to secure users' privacy, with an anomaly detection system with GNN, Gated Recurrent Unit (GRU), and imbalanced learning on topological crypto flow to identify anomalous addresses and regulate illicit behaviors for crypto assets trade.
  - Detected 60%+ of illicit addresses in real-world crypto transaction data under dark market.

Apr 2022 – **Scene Segmentation of Storybook.**

- Jun 2022:
- Annotated sentences in the storybook by BIO tag to split the book into scenes.
  - Fine-tuned BERT, with Next Sentence Prediction (NSP), on consecutive sentence pairs in the storybook, utilized the NSP probability from BERT to detect scene boundaries.
  - Implemented SentenceBERT to segment the book according to movie script scene boundaries.

Feb 2022 – **SafeLight: Collision-Free Traffic Signal Control with Reinforcement Learning.**

- May 2022:
- Enhanced existing RL-based traffic signal control methods which focus on minimizing traffic delay.
  - Designed reward shaping considering efficiency (delay) and safety (collision) in Deep Q Networks (DQN)
  - Achieved 85% reduction in collisions and retained minimum delay in real-world and synthetic data.

CAIT, Rutgers University, New Brunswick

Nov 2018 – **Long Term Bridge Performance (LTBP) .**

- Apr 2019:
- Developed deterioration model by survival analysis and Markov Chain to forecast long-term survival performance of 150k Mid-Atlantic bridge components, simulated condition rating trend by Monte Carlo.
  - Utilized Random Forest to select variables on raw bridge data and improved 15% efficiency.

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## Publications

Peer-reviewed journal and conference papers (\* equal contributions)

- **Jingyi Gu**, Wenlu Du, A M Muntasir Rahman, Guiling Wang. "Margin Trader: A Reinforcement Learning Framework for Portfolio Management with Margin and Constraints." (Oral) *4th ACM International Conference on AI in Finance (ICAIF)*, 2023.
- **Jingyi Gu**, Fadi P. Deek, Guiling Wang. "Stock Broad-Index Trend Patterns Learning via Domain Knowledge Informed Generative Network." *International Journal of Artificial Intelligence & Applications* 14(2):11-28, 2023.
- **Jingyi Gu**, Sarvesh Shukla, Junyi Ye, Ajim Uddin, Guiling Wang. "Deep Learning Model with Sentiment Score and Weekend Effect in Stock Price Prediction." *SN Business & Economics* 3(7): 119, 2023.
- Junyi Ye, **Jingyi Gu**, Ankan Dash, Fadi P. Deek, Guiling Wang. "Prediction with Time-Series Mixer for the S&P500 Index." *IEEE 39th International Conference on Data Engineering (ICDE) Workshops on Big Data Analytics in Finance and Commerce (BDAFC)*, 2023
- Wenlu Du, Junyi Ye, **Jingyi Gu**, Jing Li, Hua Wei, Guiling Wang. "SafeLight: A Reinforcement Learning Method toward Collision-free Traffic Signal Control." *The 37th AAAI Conference on Artificial Intelligence (AAAI)*, 2023.
- Wei Yao\*, **Jingyi Gu\***, Wenlu Du\*, Fadi P. Deek, Guiling Wang. "ADPP: A Novel Anomaly Detection and Privacy-Preserving Framework in Tokenomics." *International Journal of Artificial Intelligence & Applications* 13(6):17-32, November 2022.

### Under Review

- **Jingyi Gu**, Wenlu Du, Guiling Wang. "Risk-Aware Generative Adversarial Model for Stock Interval Construction." *AAAI* 2023.
- Ankan Dash, **Jingyi Gu**, Guiling Wang. "HI-GAN: Hierarchical Inpainting GAN with Auxiliary Inputs for Combined RGB and Depth Inpainting." *AAAI* 2023.
- Ankan Dash, **Jingyi Gu**, Guiling Wang, Nirwan Ansari. "Self-Supervised Learning for User Localization." *ICNC* 2024.

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## Skills

Programming Python (PyTorch, Tensorflow, Gym, HuggingFace), R, SQL, Java, LaTeX, Git  
Language English (Fluent), Chinese (Native), French (Basic proficiency)

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## Service

Web Chair ACM KDD Finance Day 2023

- PC Member 4th ACM International Conference on AI in Finance (ICAIF) 2023
- Reviewer IEEE Transactions on Knowledge and Data Engineering (TKDE), Neural Computing and Applications (NCAA)
- Presenter The 1st International Workshop on Big Data Analytics in Finance and Commerce (BDAFC), The 39th IEEE International Conference on Data Engineering (ICDE) 2023

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## Honors and Leadership

- 2023: **Excellence in Award, Teaching Assistant**, *New Jersey Institute of Technology*.
- 2021 – **Chair**, *ACM-W*, NJIT.
- Present: – Organized the event "Roundtable Conversation with Dr. Jeff Ullman, Turing Award Laureate 2020"
- 2021 – 2022: **President**, *Graduate Woman in Computer Society (GWiCS)*, NJIT.
- 2017: **Dean's List Award**, *The School of Economics, Xiamen University*.