Yanna Ding

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Education

▷ Rensselaer Polytechnic Institute (RPI) — Spring 2022 - Current
Ph.D. program in Computer Science — GPA: 4.0/4.0
Expected Graduation: June 2026

▷ University of Toronto (UofT) — 2017 - 2021
Honours Bachelor of Science in Computer Science and Mathematics — GPA: 3.92/4.0

Work Experience

▷ Samsung Research America, Research Engineer Intern — Fall 2025 (Upcoming)
▷ IBM, Research Extern — Summer 2024, 2025
▷ RPI, Research Assistant — Spring 2022 - Current

Selected Publications

▷ Epigraph Based Multilevel Optimization (EMO) For Enhancing Chain Of Thought Reasoning Capabilities
Lu S., Ding Y., Horesh L., Gao J, Magdon-Ismail M. — ICASSP'25 (acceptance rate ~48%)

▷ Architecture-Aware Learning Curve Extrapolation via Graph Ordinary Differential Equation
Ding Y., Huang Z., Shou X., Guo Y., Sun Y., Gao J. — AAAI'25 (acceptance rate 23.4%)

▷ Inferring from Logits: Exploring Best Practices for Decoding-Free Generative Candidate Selection
Ma M.*, Ding Y.*, Huang Z., Gao J., Sun Y., Wang W. — *ACL'25* (acceptance rate ~22%)
* (Equal contribution)

▷ Efficient Parameter Inference in Networked Dynamical Systems via Steady States: A Surrogate Objective Function Approach Integrating Mean-field and Nonlinear Least Squares
Ding Y., Gao J., Magdon-Ismail M. — *Phys. Rev. E'24* (acceptance rate 20-30%)

▷ Learning Network Dynamics via Noisy Steady States
Ding Y., Gao J., Magdon-Ismail M. — ASONAM'23 (acceptance rate 36.5%)

Selected Projects

▷ Transformer Expressivity for Dynamic Sequence Learning — IBM, Research Extern (Summer 2025)
- Established theoretical framework proving multi-layer Transformers can learn Markov chains with regime shifts through systematic attention construction
- Designed bi-level probabilistic language model with discourse and token dependencies, validated empirical transition probabilities on natural language datasets support bi-level modeling assumptions
- Achieved ~90% accuracy in next-token prediction for regime-shift sequences using disentangled Transformer with multi-layer attention

⋆ *Related Skills: Theoretical Machine Learning, Sequence Modeling, Probabilistic Methods*

▷ Dynamics of Language Model Training Systems — IBM, Research Extern (Summer 2024)
- Developed a theoretical framework to understand the mechanism of in-context learning for Markovian data
- Discovered a novel interpretation of Transformers in in-context learning for Markov chains
- Implemented a multilevel optimization framework to enhance chain-of-thought reasoning capabilities, achieving up to a 40% reduction in out-of-distribution errors compared to traditional training strategies

⋆ *Related Skills: LLM Reasoning, Learning Theory, Multilevel Optimization*

▷ Architecture-Aware Learning Curve Extrapolation — UCLA, Visiting Student (Spring 2024)
- Developed a novel architecture-aware neural differential equation model to predict learning curve trajectories

- Achieved a 20x speedup in model selection with an up to 59.63% improvement in extrapolation accuracy compared to existing methods
- ⋆ *Related Skills: Neural Differential Equations, Graph Neural Networks, Neural Architecture Search (NAS)*

▷ Decoding-Free Candidate Selection — UCLA, Visiting Student (Spring 2024)

- Introduced and evaluated novel decoding-free methods for generative candidate selection
- Analyzed diverse datasets from QA tasks and clinical decision-making scenarios with up to 94k candidates
- Achieved up to a 29.25-point improvement in recall for lab test orders compared to full decoding methods, while reducing runtime by up to 145x on selected tasks.
- ⋆ *Related Skills: Language Model Inference, Generative Candidate Selection*

▷ Reverse Engineering Networked Dynamical Systems — RPI, Research Assistant (Spring 2022)

- Developed a surrogate objective function to infer parameters from noisy steady-state data
- Achieved up to a 300x speed-up in runtime compared to baseline methods
- ⋆ *Related Skills: Differential Equations, Network Dynamics, Optimization, Mean-field Approach*

Honours and Awards

▷ Selected as a graduation spotlight student — UofT, Spring 2021
▷ Dean's List Scholar, Faculty of Arts and Science — UofT, 2018 - 2021
▷ Mitacs Research Training Award — UofT, Fall 2020
▷ Department of Computer Science, Undergraduate Research Award — UofT, Summer 2020
▷ The Chancellor's Scholarship for high academic achievement — St. Hilda's Fund, 2019-2020
▷ Admission Scholarships — UofT, Fall 2017

Service

▷ Reviewer for ICML 2022, KDD 2024, COLM 2025

Skills

▷ Progamming Languages: Python, LaTeX C/C++, MATLAB, Java, JavaScript, and Markdown
▷ Libraries: Pytorch, Weights & Biases, Scikit-learn, Pandas, NumPy, SciPy, NetworkX, Git, MongoDB