

# Jiaxin (Margot) Yuan

College Park, MD | (240)-423-0251 | jyuan98@umd.edu | <https://margotyjx.github.io/>

## Education

---

**Ph.D. in Applied Mathematics**, University of Maryland | College Park, MD | May 2026 | GPA: 3.84/4.00

- Area of interest: Stochastic differential equation, Molecular dynamics, Machine learning, Optimal control, Causal inference, LLM
- Advisor: Maria Cameron

**B.S. in Mathematics**, The Pennsylvania State University, State College, PA | May 2020

- Minor in **Economics** | **Schreyer Honors College** | Honor Roll and best student award every year | **GPA: 4.0/4.0**
- Dean's list; The President's Freshman Award; The President Sparks Award

## Publications and Preprints

---

- Zezheng Song\*, **Jiaxin Yuan\*** and Haizhao Yang. *Fmint: Bridging human designed and data pretrained models for differential equation foundation model*. arXiv preprint arXiv:2404.14688. *\*equal contribution*.
- **Jiaxin Yuan**, Amar Shah, Channing Bentz, and Maria Cameron. *Optimal control for sampling the transition path process and estimating rates*. Communications in Nonlinear Science and Numerical Simulation. Volume 129, February 2024, 107701.
- Xiaoyu Liu, **Jiaxin Yuan**, Bang An, Yuancheng Xu, Yifan Yang, and Furong Huang. *C-Disentanglement: Discovering Causally-Independent Generative Factors under an Inductive Bias of Confounder*. International Conference on Machine Learning (ICML) workshop on Structured Probabilistic Inference & Generative Modeling, 2023.
- Xiaoyu Liu, **Jiaxin Yuan**, Bang An, Yuancheng Xu, Yifan Yang, and Furong Huang. *C-Disentanglement: Discovering Causally-Independent Generative Factors under an Inductive Bias of Confounder*. Conference on Neural Information Processing Systems (NeurIPS), 2023.

## Work Experience

---

**Apple**, Cupertino, CA

May 2024 – Aug 2024

Display Hardware Engineering Intern in the OLED team, hosted by Yun Liu.

- Improves display production process using machine learning algorithm

## Research Projects

---

**Bridging human designed and data pretrained models for differential equation foundation model** | University of Maryland | College Park, MD | January 2024 – Current

- Introduces a generative pre-trained model that synergizes the precision of human-designed algorithms with the adaptability of data-driven methods
- Demonstrated exceptional generalization across a broad spectrum of real-world applications via incorporating in-context learning and has been pre-trained on a diverse corpus of 500,000 dynamical systems

**Counterfactual image augmentation for spurious correlation in VLM** | University of Maryland

College Park, MD | June 2024 - Current

- Introduces a data augmentation algorithm to reduce spurious correlation in vision language models

**Rethinking Sequential Recommendation from A Causal Perspective** | University of Maryland | College Park, MD | January 2024 – Current

- Proposed the first analytical framework that explicitly isolates the processes of recommendations and users' natural selection and considers how various factors causally and collaboratively influence users' decisions
- Applied the framework to a wide range of recommendation scenarios and integrated into existing recommender systems for improvement that demonstrates competitive results across various baselines.

**Discovery of collective variables that minimizes error from model reduction** | University of Maryland

College Park, MD | May 2023 - Current

- Introduces a method to learn collective variables that preserves original dynamics with variational autoencoder

### **Optimal controller and estimation of transition rate in Transition Path Theory | University of Maryland**

College Park, MD | May 2022 – June 2023

- Derived an optimal controller that is applicable to both overdamped Langevin dynamics and full Langevin dynamics
- Developed an innovative method for estimating the transition rate of rare events with high precision, by using information from optimal controlled processes under the framework of Transition Path Theory
- Obtained transition rates for rare transitions effectively and robustly with simulation of controlled process using committors from reduced model or rough approximation, outperforming ones from Transition Path Theory formula
- Improved the accuracy of estimating transition rate by at most 200% in high-dimensional systems

### **C-Disentanglement: Discovering Causally-Independent Generative Factors under an Inductive Bias of Confounder | University of Maryland**

College Park, MD | September 2022 – June 2023

- Learned causally disentangled representation with inductive bias of confounder, and proved bounded interventional robustness
- Provided a unified framework that solves the conflict between human annotated-labels and causally disentangled representation

### **Computing Committor function using the tensor train format | University of Maryland**

College Park, MD | October 2021— April 2022

- Solved high dimensional committor function using tensor train format in Python
- Adapted the method to example with Mueller's potential in 2D, whose results outperformed the ones solved by neural network

## **Skills**

---

**Programming:** Proficient in Python (Pandas, PyTorch, NumPy, Scikit-learn, Matplotlib), MATLAB, R, C++ , LaTeX

**Languages:** English, Mandarin, Cantonese

## **Leadership**

---

### **Secretary | Women in Math**

College Park, MD | October 2021— April 2022

- Provided support for the organization running via recording minutes and advertising events through emails and social media

### **Teaching Assistant | University of Maryland**

College Park, MD | October 2021— Current

- Guided discussion sessions in pre-calculus, calculus I, II, and fundamental statistic courses and taught pre-calculus as sole instructor
- Helped supervising REU program in summer 2022 as a teaching assistant

### **Sisterhood Development chair | Kappa Beta Gamma Phi Chapter**

Harrisburg, PA | April 2017 - December 2017

- Led and organized a trip to Eastern State Penitentiary and raised funding from educational institutions
- Organized weekly and monthly bonding events for new members and other active members