Jerry Lingjie Mei

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EDUCATION

Princeton University — Princeton, New Jersey
Ph.D. candidate in Computer Science — GPA: 3.85/ 4.0 — Sept. 2022 - May 2027

Massachusetts Institute of Technology — Cambridge, Massachusetts
M.Eng. in Computer Science — GPA: 4.7/5.0 — Sept. 2020 - May 2022
B.Sc. in Computer Science (6-3), and Mathematics (18) — GPA: 4.9/5.0 — Sept. 2017 - May 2020

Peking University — Beijing, China
B.Sc. candidate in Mathematics — GPA: 3.84/4.00 — Sept. 2016 - Jun. 2017

RESEARCH EXPERIENCES

Infinigen (Procedural dataset generation) — Vision & Learning Lab, Princeton CS
Advised by Jia Deng — Sept. 2022 - Jun. 2024

- Infinigen is a procedural generator of 3D scenes for nature, indoors and city scenes. Every shape, material and organization comes from some randomized mathematical rules. It is optimized for computer vision research and generates diverse high-quality 3D training data.
- For indoor scenes, we also introduces a constraint-based arrangement system, which consists of a DSL for expressing diverse constraints on scene composition, and a solver that generates scene compositions that maximally satisfy the constraints.

FALCON (FAst Learning of novel visual CONcepts) — CoCoSci Lab, MIT CSAIL
Advised by Chuang Gan, Joshua Tenenbaum — Sept. 2019 - Jun. 2022

- It is important to build machines that can learn concepts that are associated with the physical world in an incremental manner and flexibly use them.
- I proposed a novel unified framework (FALCON) that addresses fast concept learning that combines known concepts and very few data from visual images and language, and applies such concepts in donwstream tasks like question answering. It incorporates neural-symbolic reasoning and meta-learning to learn the novel concept.

ADEPT (Approximate Derenderer, Extended Physics, and Tracking) — CoCoSci Lab, MIT CSAIL
Advised by Jiajun Wu, Joshua Tenenbaum — Sept. 2018 - Jul. 2019

- Humans have expectations about how objects will move and interact. We aim to recreate human's ability to become surprised when expectation does not match observation.
- I designed a novel object-centric model that can discriminate scenes base on whether they are physically plausible at near-human levels, and a new stimulus dataset based on developmental cognitive experiments for probing the core knowledge in the intuitive physics.

Generic and Efficient Convolutions in Julia on Non-traditional Numeric Types — Julia Lab, MIT CSAIL
Advised by Alan Edelman — Feb. 2018 - Jul. 2018

- I optimized Julia's convolutions on GPU with Winograd convolution and CUDAnative library. It also supports half-precision floating-point numbers and fixed-point numbers.
- Throughput is increased by a factor of 1.4 compared to existing implementations.

PUBLICATIONS

1. Raistrick, A.R., Mei, L., Kayan, K.K., Yan, D., Zuo, Y., Han, B., Wen, H., Parakh, M., Alexandropoulos, S., Lipson, L., Ma, Z. Deng, J. Infinigen Indoors: Photorealistic Indoor Scenes using Procedural Generation. **CVPR 2024**.
2. Raistrick, A.R., Lipson, L., Ma, Z., Mei, L., Wang, M., Zuo, Y., Kayan, K., Wen, H., Han, B., Wang, Y., Newell, A., Law, H., Goyal, A., Yang, K., & Deng, J. (2023). Infinite Photorealistic Worlds Using Procedural Generation. **CVPR 2023**.
3. Liu, S., Lydic, K., Mei, L., Saxe, R. (2023). Violations of physical and psychological expectations in the human adult brain. CogSci. Imaging Neuroscience.
4. Mei, L.*, Mao, J.*, Wang, Z., Gan, C., & Tenenbaum, J. (2022). FALCON: Fast Visual Concept Learning by Integrating Images, Linguistic descriptions, and Conceptual Relations. **ICLR 2022**.
5. Smith, K., Mei, L., Yao, S., Wu, J., Spelke, E., Tenenbaum, J., & Ullman, T.D. (2020). The fine structure of surprise in intuitive physics: when, why, and how much? CogSci.
6. Smith, K.*, Mei, L.*, Yao, S.*, Wu, J., Spelke, E., Tenenbaum, J., & Ullman, T. (2019). Modeling Expectation Violation in Intuitive Physics with Coarse Probabilistic Object Representations. **NeurIPS 2019**.

COURSEWORK

Computer Vision, Embodied Intelligence, Computational Sensorimotor Learning, Probablistic Generation Models, NLP, Statistical Learning Theory, Machine Learning, Computational Cognitive Science, Algorithm for Inference, Robotic Manipulation, High-dimensional Statistics, Numerical Methods, Nonlinear Dynamics, Game Theory, Program Analysis.

SERVICES

- Member of *IEEE-Eta Kappa Nu* Honor Society at MIT. Duty includes organizing student-faculty dinners and tutoring.
- Teaching Assistant/Precepter for MIT 6.036, Princeton COS 324 and COS 423.
- Pending reviewer for EECV 2024.

OTHER PROJECTS

- Sim-to-real Transfer with Residual Boostrapped DDPG
- Assessing Generalization of representations in Atari Games.
- Compositional Language Evolution from a Bayesian Standpoint.
- A Iterative Numerical Solver to Elliptic PDE via Multigrid Methods.
- Scallop: A Numerical Solution for Swimming Microorganisms in Low Reynolds Number Fluids via Complement Flows.
- Competitive SIR Model: Rumour Network Dynamics Simulation with Compartmental Models.
- A Numerical Simulation for 1-D N-body Systems with Fast Multiple Methods.
- A RISCV-32I processor with Vectorization extension.

HONORS & AWARDS

- Top 25 individual at the 2017 **Putnam** Competition.
- Top 1 team at the 2017 Boston Dragon Boat Race (as PKU Alumni).
- Gold Medal at the 2016 International Mathematical Olympiad (**IMO**).

ACTIVITIES

- I was an Exec member of **Association of Taiwanese students** organizing *Strait to Taiwan*, a food event at Stata building.
- I am also involved in MIT Asian dance team, MIT CUCN and MIT Technique.