

# PU YANG

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## About me

I am a PhD Student at the School of Mathematical Sciences, Peking University, where I work with Prof. Bin Dong. I am generally interested in inverse problem, reinforcement learning and large language model. My recent research interests are exploring the use of synthetic data in large language models.

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## Education

### **Peking University**

*Ph.D. major in Computational Mathematics*

Beijing, China

Sep. 2021 – Present

### **Peking University**

*Undergraduate major in Mathematics*

Beijing, China

Sep. 2017 – May. 2021

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## Publication

### **L2SR: Learning to Sample and Reconstruct for Accelerated MRI via Reinforcement Learning**

*with Bin Dong*

- Published in Inverse Problem, 2024
- We propose an alternating training framework for jointly learning a good pair of samplers and reconstructors via deep reinforcement learning for accelerated MRI.

### **A Tale of Tails: Model Collapse as a Change of Scaling Laws**

*with Elvis Dohmatob, Yunzhen Feng, Francois Charton, and Julia Kempe*

- Published in International Conference on Machine Learning (ICML 2024)
- We theoretically and empirically explore how the inclusion of synthetic data in training affects neural scaling laws in large language models, revealing potential risks of model collapse.

### **Beyond Model Collapse: Scaling Up with Synthesized Data Requires Reinforcement**

*with Yunzhen Feng, Elvis Dohmatob, Francois Charton, and Julia Kempe*

- Accept by International Conference on Learning Representations (ICLR 2025)
- We theoretically and empirically explore how feedback-augmented synthesized data can mitigate model collapse in fine-tuning large language models.

### **MoColl: Agent-Based Specific and General Model Collaboration for Image Captioning**

*with Bin Dong*

- Under review in IEEE Transactions on Image Processing (TIP)
- We proposes a novel agent-enhanced model collaboration framework, designed to effectively integrate domain-specific and general knowledge.

### **Spend Wisely: Maximizing Post-Training Gains in Iterative Synthetic Data Bootstrapping**

*with Yunzhen Feng, Ciyuan Chen, Yuhang Wu, and Zhuoyuan Li*

- Under review in Neural Information Processing Systems (NeurIPS 2025) (Rating: 4,5,5,5 / 6)
- We theoretically and empirically analysis how should the total budget on generation and training be allocated across iterations to maximize final performance, and demonstrate that an exponential growth policy exhibits significant advantages.

### **REAL-Prover: Retrieval Augmented Lean Prover for Mathematical Reasoning**

*with BICMR's AI4M Team*

- Preprint
- We present REAL-Prover, a new open-source stepwise theorem prover for Lean 4, which consists of a fine-tuned large language model (REAL-Prover-v1) and an integrated with a retrieval system (Leansearch-PS), notably boosts performance on solving college-level mathematics problems.

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## Work experience

### AI Algorithm Internship

*In ByteDance*

2021 Spring

*Beijing, China*

- I am primarily responsible for designing algorithms for audio fingerprinting, which involves extracting fingerprint features, searching through a speech library, and parallel acceleration, among other tasks. We utilize contrastive learning and propose a new feature extraction model that is more suitable for audio data, resulting in faster retrieval speeds and higher accuracy.

### AI Algorithm Internship

*In HiSilicon*

2025 Spring to Summer

*Shanghai, China*

- Classified project.

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## Skills

**Languages:** Python, C/C++, MATLAB

**Human Languages:** Chinese, English

**Development Tools:** Pytorch, Linux (the administrator of our group)

**Familiar Methods:** computational mathematics, common machine learning methods, deep learning theory, reinforcement learning, large language model

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## Awards

### Scholarships

*in the undergraduate and doctoral program*

- College Scholarship, School-level
- Outstanding Research Award, University-level

### Modeling competition

*in the undergraduate program*

- MCM, Honorable Award

### Olympiad in Informatics (OI)

*in high school*

- NOIP, First Prize

### Mathematical Competition

*in high school*

- Peking University Summer Camp, Excellent camper (Admission to PKU)
- China Mathematics Competition, First Prize
- China Mathematics Olympiad, Silver Medal