Bowen Xu

Residence: 393 Middle Huaxia Rd, Shanghai
E-mail: xubw1@shanghaitech.edu.cn ✻ *Telephone number:* 18852719756
Place of birth: Yangzhou, Jiangsu, China ✻ *Date of birth:* 2002-08-16

Personal Profile

Senior, Major in **Computer Science (CS)**

Advisor: Ziyu Shao

Research Interests: Bandit & Reinforcement Learning, Network Intelligence, Federated Learning, Deep Reinforcement Learning.

Personal Website: Link of Bowen Xu's personal website.

Education

ShanghaiTech University (Co-Founded by the Chinese Academy of Sciences)
Sep 2020 - Jun 2024 (Expected)

- **Undergraduate**; School of Information Science and Technology.
- **GPA:** (Graduate courses) 4.0 / 4.0; (Overall) 3.8 / 4.0 (12 / 177, top 6%); (Junior) 4.0 / 4.0.
- **Honors:** Merit Student (2020-2021), Outstanding Student (2021-2022).

Curriculum

- **Mathematics:** Convex Optimization (Graduate course, A+) / Matrix Computations (Graduate course, A+) / Numerical Optimization (A+) / Mathematical Analysis I (A) / Mathematical Analysis II (A) / Linear Algebra (A).
- **Major:** Reinforcement Learning (Graduate course, A+) / Deep Learning (Graduate course, A) / Online Optimization and Learning (Graduate course, A) / Computer Architecture I Project (A+) / Artificial Intelligence I (A).

Research Experience

At Network Intelligence Center (NICE), ShanghaiTech University, Shanghai, China.
Jan, 2022 - Present

Personalized Federated Learning *Apr 2023 - Present*
Position: Main Researcher

- Design an innovative algorithm framework combining online feedback (in particular, bandit feedback) and supervised feedback to solve the complex task of integrating online learning with offline machine learning.
- Simulate this framework in the edge-based federated distillation system to complete the wireless communication and transmission task between an edge server and edge devices. It also improves the performance of each edge device in the machine-learning task of digital recognition under the MNIST dataset.
- Achieve theoretical guarantees and obtain superior numerical performance of this algorithm framework through the Lyapunov optimization technique.

Constrained GNN (Graph Neural Network) Bandit *Apr 2023 - Present*
Position: Project Leader

- Combine GNN and Bandit algorithm to solve the client selection task in graph structure problems.
- Design a novel GNN-Based Primal-Dual algorithm to solve the client selection problem of graph structure with constraint conditions.
- Obtain theoretical guarantees and numerical performance of GNN Bandit algorithm and GNN-Based Primal-Dual algorithm through GNTK (Graph Neural Tangent Kernel) technique. And verify these theoretical results through algorithm simulation.

AI for Science by Deep Reinforcement Learning *Apr 2023 - Present*

Position: Project Leader

- Apply deep reinforcement learning algorithm (Monte Carlo Tree Search) in protein design projects to help design protein structures with specific properties and geometric constraints.
- Innovate the network structure based on the classical deep reinforcement learning network in AlphaZero through techniques such as Squeeze-and-Excitation Block. And obtain relatively better performance compared with traditional networks.

Penalty PPO Algorithm *Nov 2022 - Jan 2023*

Position: Project Leader

- Introduce the Penalty Function Method and Sample-Based Estimation to the PPO algorithm to solve the bias in the estimation of the value function caused by the inappropriate step size.
- Use the Pendulum environment in the gym package to test our algorithm and achieve better results compared with the classical PPO algorithm.

Honors and Awards

- **Merit Student (top 3%),** ShanghaiTech University, 2020-2021.
- **Outstanding Student (top 7-8%),** ShanghaiTech University, 2021-2022.
- **Mathematical Contest in Modeling (MCM):** Honorable Mention, 2022.
- **Mathematics Competition of Chinese College Students:** Second Prize, 2021.
- **Mathematics Competition of Chinese College Students:** Third Prize, 2022.
- **Mathematics Competition of Shanghai College Students:** Second Prize, 2021.
- **Mathematics Competition of Shanghai College Students:** Third Prize, 2022.
- **National Collegiate Mathematics Competition Network Challenge:** Third Prize, 2022.

Teaching Assistantship

Mathematical Analysis II (Head TA) *Feb 2022 - Jun 2022*
Probability and Statistics for EECS *Feb 2023 - Present*

- Organized teaching assistant work & carried out online teaching.
- Weekly in-person tutorial and after-class questions (including exercise & discussion sessions).
- Designed and graded assignments (including weekly assignments, exam papers, etc.).

Activities

- **Social Practice, Group Leader (Outstanding Individual)**, Gansu, 2021.
- **Artificial Intelligence Industrial Practice (Outstanding Team)**, Shanghai, 2022.

Technical skills

Programming Languages/Tools C, C++, Python(Pytorch), Matlab, LaTeX, etc.