Bowen Xu

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Place of birth: Yangzhou, Jiangsu, China ✻ *Date of birth:* 2002-08-16

Personal Profile

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

Mentor: Ziyu Shao

Research Interests: Bandit & (Deep) Reinforcement Learning, Network Intelligence, Online Learning and Optimization, Deep Learning with Principled Design.

Personal Website: xubowen0816.github.io/bowen-xu.github.io/.

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; (Junior) 4.0 / 4.0 (top 1); (Overall) 3.8 / 4.0.
- **Honors:** Outstanding Student (top 3-7%, 2021, 2023), Merit Student (top 7-8%, 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.
Jul, 2021 - Present

Constrained Personalized Federated Learning (to be submitted for ICML-2024)
Position: Main Researcher *Apr 2023 - Present*

- 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.
- Apply this framework in federated distillation systems to solve the online client selection problem with constrained resources in wireless communication tasks between an edge server and edge clients.
- Conduct code simulation experiments and excel in federated distillation systems, using the MNIST handwritten dataset for recognition as the machine learning task of the edge clients.
- Achieve theoretical guarantees and obtain superior numerical performance of this algorithm framework through the Lyapunov optimization technique.

Constrained GNN Bandit Algorithm with Social Network (to be submitted for ICML-2024) *May 2023 - Present*
Position: Project Leader

- Combine GNN (Graph Neural Network) and Bandit algorithm to solve the client selection task in graph structure problems.
- Design a novel GNN-Based Primal-Dual algorithm to address resource-constrained client selection problems involving graph structures, particularly in social network scenarios.
- Obtain theoretical guarantees and numerical performance of GNN-Based Primal-Dual algorithm through GNTK (Graph Neural Tangent Kernel), Lyapunov optimization and Virtual Queuing.
- Conduct code simulation experiments and excel in resource-constrained client selection problem with graph structures.

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 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.

At University of Michigan, Ann Arbor, USA.
Oct, 2023 - Present

MaxWeight with Discounted UCB Algorithm with Unbounded Service Time
Position: Main Researcher *Oct 2023 - Present*

- Make improvements to the original MaxWeight with Discounted UCB algorithm and its settings to enable its application in multi-server queuing systems with unbounded service time.
- Prove convergence of the asymptotic average queue length of the algorithm and derive its bound.

Honors and Awards

- **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 - Jun 2023*

- 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, course projects, exam papers).

Activities

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

Technical skills

Programming Languages/Tools C, C++, Python(Pytorch), Matlab, LaTeX, etc.
English Proficiency TOEFL iBT: 100 (Writing Score: 28).