Zhenghao Xu

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Education

Zhejiang University - College of Computer Science and Technology **Sep. 2018 – Present**
Bachelor of Engineering in Computer Science and Technology *Hangzhou, Zhejiang*

- **Relevant Coursework**: Introduction to Applied Operations Research, Introductory Lectures on Optimization, Stochastic Process, Computer Vision, Machine Learning Algorithms and Applications
- **Honors & Awards**:
  - Zhejiang Provincial Government Scholarship 2019,2020
  - Zhejiang University Scholarship for Elite Students in Basic Disciplines 2019
  - Zhejiang University Academic Excellence Award 2019,2020,2021

Research Interests

Convex and non-convex optimization, accelerated methods, mathematical foundations of machine learning.

Research Experience

Exact Worst-Case Performance of Bregman Methods | UC Davis **Jul. 2021 – Sep. 2021**
Research Intern, UC Davis GREAT Program Participant *Davis, California (remote)*

Advisor: Prof. Shiqian Ma | Department of Mathematics, UC Davis

- Studied the performance estimation problem (PEP) in semidefinite programming form associated with Bregman proximal gradient (BPG) and Bregman proximal point (BPP) methods for convex composite optimization problem.
- Provided alternative proofs for convergence rates of BPG and BPP methods incorporating relative smoothness and relatively strong convexity conditions.
- Extended the PEP of BPG from convex to nonconvex composite optimization with the nonsmooth term convex, obtained a novel bound with no step size parameter compared with existed analyses, allowing maximally 1/L step size, in which case the previous bound would blow up to infinity.
- Improved the analytical worst-case performance bound of one Bregman gradient (BG) step with smooth strongly convex kernel and observed promising improvement on constant for BPG numerically.
- Derived the PEP of Bregman Halpern's algorithm for Bregman strongly non-expansive operators. Recovered the upper bound on convergence rate of degenerated Halpern's iteration and illustrated unboundedness of general case.

Decentralized Federated Minimax Optimization | Zhejiang University **Apr. 2021 – Jun. 2021**
Research Intern *Hangzhou, Zhejiang*

Advisor: Prof. Hui Qian | College of Computer Science and Technology, Zhejiang University

- Studied the stochastic gradient descent ascent (SGDA) algorithm and its application in saddle-point problem.
- Analyzed the upper convergence bound of SGDA in decentralized federated learning in fixed topology setting.

Projects & Programs

Young People's Attitude towards Society | Zhejiang University **Jul. 2020 – Aug. 2020**
Researcher of NLP Group *Hangzhou, Zhejiang*

Leader: Prof. Lijun Chen | School of Public Affairs, Zhejiang University

- Developed a model to decide positiveness of comments from young subjects' social media.
- The algorithm achieved over 90% accuracy and saved weeks of manual classification work.

Intermind Summer Program | Intermind Co. **Aug. 2019**
Program Participant *Cambridge, Massachusetts*

- Visited Boston's university campuses, including MIT and Havard.
- Attended innovation workshops with guest speakers from MIT.

Skills

Programming & Tools: C, C++, Python, Java, MATLAB, Mathematica, SQL, LaTeX, Verilog HDL
Language: TOEFL 106, CET-6 547