Mingqing Xiao

TEL: (+86)15810127868 **Email**: mingqing_xiao@pku.edu.cn **Website**: pkuxmq.github.io

ADDRESS: Room 431, Building 28, Peking University, Beijing 100871, China

Education

School of Electronics Engineering and Computer Science, **Beijing, China**

Peking University (PKU) ***Sep 2016-present***

- Major in Computer Science
- Overall GPA: 3.73/4.0 (88/100, Top 10%), Major GPA: 3.74/4.0 (88/100, Top 10%)
- Selective courses: Mathematical Analysis: 95/100, Probability Theory and Statistics(A): 94/100, Set Theory and Graph Theory: 95/100, Algebraic Structure and Combinatorial Mathematics: 97/100, Introduction to Stochastic Processes: 95/100, Information Theory: 91/100, Data Structure and Algorithm(A): 90/100, Algorithm Design and Analysis: 90/100, Java Programming: 94/100, Introduction to Parallel and Distributed Computing: 95/100

School of Psychological and Cognitive Sciences, **Beijing, China**

Peking University (PKU) ***Sep 2017-present***

- Secondary major, Major GPA: 3.76/4.0 (89/100)
- Selective courses: Functional Anatomy of Central Nervous System: 93/100, General Psychology: 92/100, Experimental Psychology: 88/100, Developmental Psychology: 95.5/100

Internship

Johns Hopkins University **Baltimore, MD, USA**

- Research Intern, supervisor: Prof. Alan Yuille *June 2019-Sep 2019*
- Research on Robust Computer Vision Models and Interpretable Machine Learning.

Microsoft Research Asia **Beijing, China**

- Research Intern at Machine Learning Group led by Dr. Tie-Yan Liu *Sep 2019-Present*
- Research on Machine Learning and Computer Vision.

Publications

Mingqing Xiao; Adam Kortylewski; Ruihai Wu; Siyuan Qiao; Wei Shen; and Alan Yuille. 2019. TDAPNet: Prototype Network with Recurrent Top-Down Attention for Robust Object Classification under Partial Occlusion. *arXiv preprint arXiv:1909.03879*. In submission to AAAI 2020.

Jia Li; **Mingqing Xiao**; Cong Fang; Yue Dai; Chao Xu; and Zhouchen Lin. Training Deep Neural Networks by Lifted Proximal Operator Machines. In submision to IEEE Trans. Pattern Analysis and Machine Intelligence.

Research Interests

My research interests lie in machine learning and computer vision, especially in optimization for neural networks and interpretable models with inspiration from cognitive science and neuroscience.

Research Experience

Prototype-based robust object classification under partial occlusion Baltimore, MD, USA

Supervisor: Prof. Alan Yuille, Johns Hopkins University *June 2019-Sep 2019*

- Tackle vulnerability of deep neural networks under occlusion conditions by introducing prototypes, partial matching and top-down attention regulation, which improves the robustness of DCNNs with increase of 11% on PASCAL3D+ and 17.2% on MNIST for average classification accuracy under different occlusion conditions.
- Learn feature activation prototypes and do partial matching between features and prototypes by estimated attention based on feature dictionary and activation scale.
- Propose top-down attention regulation in convolution layers to reduce the contamination by occlusion with inspiration from neuroscience research.
- **In submission to AAAI 2020 (first author)**.

Extension of Lifted Proximal Operator Machines Beijing, China
Supervisor: Prof. Zhouchen Lin, Peking University *Feb 2019-June 2019*

- Derive and implement Lifted Proximal Operator Machines (LPOM) for recurrent neural networks.
- Introduce auxiliary variables for optimization of neural network and theoretically formulate the expressions for updating all the variables with convergence guarantee.
- Apply fix-point algorithm, Newton's method, APG algorithm, gradient descent algorithm to solve the sub optimization problems and implement them in matlab and C++.

Parallel Lifted Proximal Operator Machines Beijing, China
Supervisor: Prof. Zhouchen Lin, Peking University *Oct 2018-Feb 2019*

- Parallelize Lifted Proximal Operator Machines (LPOM), a newly proposed optimization method to train neural networks without gradient by reformulating it as a multi-convex problem.
- Derive the asynchronous parallel algorithm based on asynchronous block coordinate descent algorithm and identify the problem of slow convergence rate.
- Propose and implement a novel parallel algorithm, which achieves satisfactory speedup over serial LPOM without degradation in performance and outperforms SGD and its variants with faster convergence and lower errors on auto-encoder training.
- **In submission to TPAMI** as part of the work (second author).

New Tensor Decomposition Beijing, China
Supervisor: Prof. Zhouchen Lin, Peking University *May 2018-July 2018*

- To generalize LDU matrix decomposition to tensor.
- Conduct comprehensive literature review about tensor decomposition methods.
- Propose new definitions of tensor forms and operations.
- Produce a preliminary tensor decomposition form through mathematical derivation.

Project Experience

Course projects: *Sep 2017-June 2019*

- Parallelizing shortest single source path problem
- Implementing an automatic-differentiation computation graph
- Implementing a compiler for miniC (a simplified C)
- Operating system project: developing a course lab regarding stack overflow attack under canary protection (for students taking course: Introduction to computer system)
- Developing a smart contract on Ethereum (blockchain)
- Developing a 3D sandbox game by JAVA
- Tackling captcha recognition problem through ResNet
- Designing and carrying out a psychology experiment on memory: the impact of self-construal on collaborative inhibition

Teaching Experience

Teaching assistant of Algorithm Design and Analysis *Feb 2019-June 2019*

- Organize course review and course project, correct homework, explain exercises, and answer questions.

Honors & Awards

- Merit Student of Peking University (Top 10%). 2018
- Award of Academic Excellents of Peking University (Top 15%). 2017
- "May 4th" Scholarship of Peking University (Top 15%). 2017
- First prize of the China Undergraduate Mathematical Contest in Modeling in Beijing. 2017 & 2018.
- Honor prize of American College Mathematical Modeling Competition. 2018.
- Second prize of the Chinese Mathematics Competitions. 2017.
- Third prize of the Programming Contest of Peking University. 2017 & 2018.

Skills

- **TOEFL**: 105 (Reading27/ Listening30/ Speaking23/ Writing25). **GRE**: Verbal 155, Quantitative 169, AW 4.0.
- Programming language: C, C++, python, matlab, Java, lisp (proficient in C++ and python).
- Machine learning library: Tensorflow, PyTorch, mkl.