Mingqing Xiao

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Education

School of Electronics Engineering and Computer Science,   Beijing, China

Peking University (PKU)   *Sep 2016-present*
- ➢   B.S. in Computer Science. Diploma expected 2020.
- ➢   Overall GPA: 3.73/4.0 (88/100), Major GPA: 3.73/4.0 (88/100)
- ➢   **TOEFL**: 105 (Reading27/ Listening30/ Speaking23/ Writing25). **GRE**: Verbal 155, Quantitative 169, AW 4.0.

School of Psychological and Cognitive Sciences,   Beijing, China

Peking University (PKU)   *Sep 2017-present*
- ➢   B.S. in Psychology (secondary major). Diploma expected 2020. Major GPA: 3.76/4.0 (89/100)

Internship

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.

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.

Publications

Mingqing Xiao; Shuxin Zheng; Chang Liu; Di He; Jiang Bian; Guolin Ke; Zhouchen Lin; and Tie-Yan Liu. Invertible Image Rescaling. In submission to CVPR 2020.

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 CVPR 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 the general area of machine learning, including deep learning, optimization, statistical modeling, and interpretable models, as well as their application in computer vision, image processing, and intersection with neuroscience.

Research Experience

Invertible Image Rescaling   Beijing, China
Supervisor: Dr. Shuxin Zheng, Dr. Tie-Yan Liu, Microsoft Research Asia   *Sep 2019-Nov 2019*
- ➢   Propose to model image upscaling and downscaling from a novel perspective, i.e. invertible bijective distribution transformation, by embedding lost high-frequency information into a latent variable during image downscaling, which largely mitigates the ill-posed problem of image upscaling after downscaling.
- ➢   Propose and implement Invertible Rescaling Net (IRN) with deliberate model design and efficient training objectives to parameterize the bijective transformation that enables efficient upscaling.
- ➢   Extensive experiments demonstrate significant performance boost of upscaling reconstruction from downscaled images both quantitatively and qualitatively, which can be up to 8.76 dB PSNR boost when compared with the state-of-the-art super-resolution methods after bicubic downscaling. Meanwhile, the amount of parameters of IRN is significantly reduced, indicating the light-weight and high-efficiency of the proposed model.
- ➢   **In submission to CVPR 2020 (first author).**

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 novel occlusion conditions that do not appear in training data by introducing prototypes, partial matching and top-down modulation, which improves the robustness of DCNNs with increase of 11% on PASCAL3D+ and 17.2% on MNIST for average classification accuracy under different simulated occlusion conditions. The robustness can also generalize to real novel occlusion in COCO and under dataset transfer.
- 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 modulation in convolution layers to reduce the contamination by occlusion during feature extraction with inspiration from neuroscience research.
- **In submission to CVPR 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 the optimization as a multi-convex problem.
- Propose and prove the convergence of a new general asynchronous block coordinate descent algorithm with a proximal term for asynchronous-parallel LPOM, and identify the problem of slow convergence rate in practice.
- Propose and implement a novel synchronous parallel update scheme for synchronous-parallel LPOM, 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.