Xiaohong Liu

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Personal Summary

I'm a Ph.D. candidate at McMaster University. My research direction is aimed at video and image processing based on deep learning, especially in the areas of restoration, retrieval, classification and recognition. As an AI researcher/developer, I'm always energetic and enthusiastic to implement the cutting-edge AI techniques and have already published some papers on the top journal and conference (e.g. TIP, ICCV). Moreover, in order to gain industrial experience, I have worked in several companies as a research-related intern to develop practical AI products.

Education

McMaster University	**Canada**	**Jan. 2018 — Current**

Doctor of Philosophy in Electrical and Computer Engineering
- Research in machine learning, deep learning and computer vision (GPA: 9.8/10.0)

University of Ottawa	**Canada**	**Sep. 2014 — Dec. 2016**

Master of Applied Science in Electrical and Computer Engineering
- Research in machine learning, computer vision and Image &Video Processing (GPA: 9.2/10.0)

Southwest Jiaotong University	**China**	**Sep. 2010 — Jul. 2014**

Bachelor of Engineering in Telecommunication
- Major in Telecommunication (GPA:3.5/4.0)

Technical Skills

- **Python:** 2-year programming experience to implement cutting-edge techniques in the field of machine learning and deep learning. Use **Python** as daily programming language.
- **Matlab:** 4-year programming experience. Use **Matlab** as daily programming language. Proficient in most APIs in the area of computer vision and machine learning.
- **AI framework:** Proficient in **Pytorch/torch**. Good knowledge in **Tensorflow** and **Keras**.
- **C/C++:** Knowledge of advanced level programming in **C/C++** including thread synchronization multithreading, multiprocessing, concurrency and TCP/IP Socket Programming.

AI Research Experience

GridDehazeNet: Attention based Multi-Scale Network for Image Dehazing   Jan. 2019 — Aug. 2019

Haze and smog are among the most common environmental factors impacting image quality and, therefore, image analysis. We propose an end-to-end generative method for single image dehazing. It is based on designing a novel GridDehazeNet to recognize haze structures in input images and restore clear, haze-free images. The proposed method is agnostic in the sense that it does not explore the atmosphere scattering model which is usually used in dehazing problem and achieves superior performance with the comparison of all existing state-of-the-art methods.

Deep Video Super-Resolution based on Dynamic Local Filter Network   Feb. 2018 — Dec. 2018

Video super-resolution aims at reconstructing a high-resolution (HR) image from a set of low-resolution (LR) images taken from the same scene. We proposed a new video super-resolution framework based on dynamic local filter to implicitly estimate motion among video frames.

Image Retrieval with Canonical Correlation Analysis   Jan. 2018 —Aug. 2018

Image retrieval problem is to search the similar Images in large databases based on the given query image. Given a query image, we first send it to a pre-trained model (e.g. vgg-16). Then the proposed canonical correlation analysis (CCA) module is used to extract the inherent eigenvalue difference between the matching pair and the non-matching pair based on their feature maps. This new baseline has the potential to replace the conventional PCA & whitening module which is widely used in image retrieval task.

AI Work Experience

IBM	**IoT & AI Developer - Coop**	**May. 2019 — Aug. 2019**

- I joined the IBM in summer as an IoT & AI developer. Currently, I am working on two projects. The first one is about time series forecasting from Bell Canada that infers bathroom footfalls in future based on the sensor data we collected to make the office building smarter in the aspect of setting the dynamic cleanup schedule. The second one is about the open-set face recognition, where open-set means that there might be an 'unknown' face showing up in testing with the comparison of the close-set problem that all testing faces have been trained in advance. I successfully achieve beyond the 99% accuracy of recognizing the unknown face as 'unknown' and the known face as the corresponding name.

Cymax Group	**Research Intern**	**Jan. 2019 — Jun. 2019**

- Funded by Mitacs, I joined the AI/Machine Learning team in Cymax Group (https://www.cymax.com). As an intern researcher, my duty was to develop a neural network that can recommend the best parameter combination (e.g. the optimal price-cost trade-off) for each product to maximize the chance of winning the competition against other companies in Amazon. Specifically, a novel 1D convolutional neural network was designed that can capitalize on the historical sales data (features) for a wide range to recommend product-specific winning strategies.

Car Media 2.0	**Research Intern**	**Apr. 2018 — Dec. 2018**

- I joined the Research & Development team in Car Media 2.0 (http://www.carpics2p0.com/) as a research intern to help the company develop the next-generation product about a fully automatic car-oriented alpha-matting algorithm based on deep learning and computer version techniques, which recognises image foreground (especially a car) from image background accurately without the help of any side information (such as Tri-map). This R&D project was funded by Natural Sciences and Engineering Research Council of Canada (NSERC) and gave me a precious opportunity to employ deep learning techniques in industry.

Publications

1. **Liu, X.**, Ma, Y., Shi, Z., Dai, L., Chen, J. Towards a Unified Approach to Single Image Deraining and Dehazing. *Submitted to European Conference on Computer Vision (ECCV)*, 2020.
2. **Liu, X.**, Shi, K., Wang, Z., Chen, J. Exploit Camera Raw Data for Video Super-Resolution via Hidden Markov Model Inference. *Submitted to European Conference on Computer Vision (ECCV)*, 2020.
3. Shi, Z., **Liu, X.**, Shi, K., Dai, L., Chen, J. Video Interpolation via Generalized Deformable Convolution. *Submitted to European Conference on Computer Vision (ECCV)*, 2020.
4. **Liu, X.**, Kong, L., Zhou, Y., Zhao, J., & Chen, J. End-to-End Trainable Video Super-Resolution Based on a New Mechanism for Implicit Motion Estimation and Compensation. *IEEE Winter Conference on Applications of Computer Vision (WACV)*, 2020.
5. **Liu, X.**, Ma, Y., Shi, Z., & Chen, J. GridDehazeNet: Attention based Multi-Scale Network for Image Dehazing. *IEEE International Conference on Computer Vision (ICCV)*, 2019.
6. Shi, K., **Liu, X.**, Guo, X., Lin, J., Alrabeiah, M., Liu, H., & Chen, J. Image Retrieval via Canonical Correlation Analysis. *16th Canadian Workshop on Information Theory (CWIT)*, 2019.
7. **Liu, X.**, Chen, L., Wang W., & Zhao, J. Robust Multi-Frame Super-Resolution Based on Spatially Weighted Half-Quadratic Estimation and Adaptive BTV Regularization. *IEEE Transactions on Image Processing*, 2018.
8. Zhou, Y., **Liu, X.**, & Zhao, J. Video Super-Resolution via Dynamic Local Filter Network. *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2018.
9. **Liu, X.**, & Zhao, J. Robust multi-frame super-resolution with adaptive norm choice and difference curvature based BTV regularization", *IEEE Global Conference on Signal and Information Processing (GlobalSIP)*, 2017.

Professional Activities and Awards

- I joint the executive team in McMaster AI Society as a senior project manager.
- I served as a reviewer for *IEEE Transactions on Image Processing*, *IEEE Transactions on Broadcasting* and *WACV 2020*.
- I received a McMaster Graduate Scholarship (C$6000 per year) and an Ontario Graduate Scholarship (C$15000 per year).