Xuejing Lei (Rachel)

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EDUCATION

University of Southern California — Los Angeles, CA
Ph.D. Candidate in Electrical and Computer Engineering — *Anticipated Grad: May 2023*
- Media Communication Labs (Advisor: Prof. C.-C. Jay Kuo)
- Machine Learning, Computer Vision, Image Processing, Compression

University of Southern California — Los Angeles, CA
Master of Science in Electrical Engineering — *Aug. 2016 – May 2018*

Xi'an Jiaotong University — Xi'an, China
Bachelor of Engineering in Automation — *Aug. 2012 – Jun. 2016*
- Three-year fellowship
- Exchange student in Computer Science at National Chiao Tung University (Taiwan)

EXPERIENCE

Research Assistant — Aug. 2018 – Now
Media Communications Lab & MediaTek — *USC, CA*
- **Generative Modeling for Texture Synthesis and Natural Image Generation [1-3].** Built a sequence of high-to-low dimensional subspace through a sequence of whitening processes. Generated samples first in the lowest dimensional subspace and then found a proper high-dimensional sample by adding details back. Capable of generating visually pleasant images of good structure and details with fast stable training and small model size.
- **Image Super-Resolution.** Generated diversified representations via unsupervised learning, selected features via supervised learning, and predicted low- and high-resolution residuals via gradient-boosting regression. Achieved comparable PSNR and SSIM with much fewer FLOPS compared to SRCNN.

Compute Silicon Architect Intern (Research Intern equivalent) — Sep. 2021 – Dec. 2021
Facebook/Meta Reality Labs — *Remote*
- **Texture Compression.** Proposed a machine learning solution for efficient PBR texture compression in artificial reality (e.g., AR, VR) applications. Improved the efficiency of compressing multiple texture channels. **Patent filed.**

Research Intern — May 2017 – May 2018
Media Communications Lab — *USC, CA*
- **Online Video Multi-object Tracking [6].** Dealt with error drift and identity switch problems with multiple CNN-based object trackers and enhanced model update and identity association scheme. Outperformed other state-of-the-art online tracking methods against MOT17 and MOT16 datasets. Implemented with MATLAB.
- **Video Object Segmentation [7].** Proposed a light bilateral network based on motion (optical flow) and objectness, which identifies the background by finding regions that have similar motion patterns with low-objectness regions. Researched classifying foreground and background embeddings via graph cut. Achieved state-of-the-art performance against DAVIS 2016 and FBMS-59 datasets. Implemented with TensorFlow and MATLAB.

PROJECTS

Arbitrary Style Transfer and Domain Generalization — 2022 – Now
- Proposed an efficient feature distribution matching method for arbitrary style transfer and domain generalization. Demonstrated the effectiveness of transferring the style of an image to another image and of generalizing CNNs learned from several source domains to an unseen domain. Implemented with PyTorch.

Noise-Aware Texture-Preserving Low-Light Enhancement — May 2020 – Aug. 2020
- Developed a simple but efficient method for low-light image enhancement based on the Retinex model. Removed noises and preserved natural texture by performing Fast Adaptive Bilateral Filtering on the estimated reflectance map. Avoided bold borders between objects or halo next to edges by modifying the cost function.

Pokemon Combat Prediction | *machine learning project* — Sep. 2017 – Nov. 2017
- Implemented different machine learning models for Pokemon combat prediction. Determined hyper-parameters and feature space through cross-validation. Achieved the best accuracy 95% on the test set with the Random Forest classifier.

Intel Cup Embedded System Design Contest | *First Prize*   Feb. 2016 – Aug. 2016

- Designed an EEG-control 3D game system on an Intel Minnow Board Turbot for users to play games via motor imagery. Adapted the system to multiple users by designing a training subsystem's UI, EEG signal processing algorithm, and interface of Qt and unity 3D. Achieved an error rate of about 10% and a delay of 4 seconds.

TECHNICAL SKILLS

Languages: Python, C/C++, Matlab
Frameworks: TensorFlow, PyTorch, Keras
Libraries: NumPy, Matplotlib, Scikit-learn, Scipy, OpenCV, Pandas

PUBLICATIONS

Google Scholar Profile [click]

[1] GENHOP: An Image Generation Method Based on Successive Subspace Learning

Xuejing Lei, Wei Wang, and C.-C. Jay Kuo

IEEE International Symposium on Circuits & Systems (ISCAS), Austin, Texas, USA. May 28-June 1, 2022.

[2] TGHop: An explainable, efficient, and lightweight method for texture generation [paper]

Xuejing Lei, Ganning Zhao, Kaitai Zhang and C.-C. Jay Kuo

APSIPA Transactions on Signal and Information Processing, 10, E17. 2021.

[3] NITES: A Non-Parametric Interpretable Texture Synthesis Method [paper]

Xuejing Lei, Ganning Zhao, and C.-C. Jay Kuo

2020 Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC). 2020.

[4] Dynamic Texture Synthesis by Incorporating Long-range Spatial and Temporal Correlations [paper]

Kaitai Zhang, Wang Bin, Chen Hong-Shuo, Xuejing Lei, Ye Wang, C.-C. Jay Kuo , and C-C. Jay Kuo

International Symposium on Signals, Circuits and Systems (ISSCS). 2021.

[5] Noise-Aware Texture-Preserving Low-Light Enhancement [paper]

Zohreh Azizi, Xuejing Lei, and C.-C. Jay Kuo

2020 IEEE International Conference on Visual Communications and Image Processing (VCIP). 2020.

[6] Online CNN-based multiple object tracking with enhanced model updates and identity association [paper]

Weihao Gan, Shuo Wang, Xuejing Lei, Ming-Sui Lee, and C-C. Jay Kuo

Signal Processing: Image Communication 66 (2018): 95-102.

[7] Unsupervised Video Object Segmentation with Motion-based Bilateral Networks [paper]

Siyang Li, Bryan Seybold, Alexey Vorobyov, Xuejing Lei, and C-C. Jay Kuo

Proceedings of the European conference on computer vision (ECCV). 2018.