Curriculum Vitae

Du, Xuefeng

Xi'an Jiaotong University
Automation

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EDUCATION

Xi'an Jiaotong University (XJTU), School of Electronic and Information Engineering   Xi'an, China
B.Eng. in Automation   Sept. 2016 - Present
- Overall GPA: **91.95/100(3.8/4.0)**, Rank: **5st/171**, Major GPA: **93.04/100(3.9/4.0),** Rank: **3st/171**
- **Selected awards：**
  National Scholarship (Twice, top 1%)
  Sun Hung Kai Group Scholarship (top 5%)
  National English Competition for College Students: The Second Prize (top 8% in China)
  National Undergraduate Mathematical Modeling Contest: The First Prize (top 10% in China).
  Mathematical and Interdisciplinary Contest in Modeling (MCM/ICM), Meretricious Award (Top 10%).

RESEARCH EXPERIENCE

Institute of Automatic Control, XJTU   Xi'an, China
Research Assistant, Supervised by Associate Prof. Dexing Zhong   Jun. 2017 - Present
Machine Learning powered Hand-based Biometrics
- Set up a literature database of palmprint and dorsal hand vein recognition (DHV) in recent two decades containing over 200 articles. Figure out the development track for hand-based biometrics used in personal identification. Propose a detailed survey of palmprint and DHV recognition.
- Built five open-environment palmprint databases containing over 7000 images from 700 volunteers to simulate the practical palmprint image acquisition. Apply PCA, LBP, 2D Gabor filter and Hamming distance for feature extraction and matching, which achieves an average recognition accuracy of 99%.
- Explore deep-learning based methods in hand-based biometrics. Adapt the Deep Hashing Network (DHN) to encode palmprint image into a 128-bit code. Apply Biometric Graph Matching (BGM) to extract features between two DHV samples and fuse it with the encoded palmprint image for fast image retrieval and accurate matching. Experiment result reaches an accuracy of 99.975%.
- Adapt the Siamese network to encode the similarity of two palmprint images. Experiments on self-constructed palmprint datasets achieve a state-of-art recognition accuracy of 99.99%.
- Conduct experiments on the fusion of palmprint and DHV on four different levels, *i.e.* pixel level, feature level, score level and decision level for robust hand-based biometrics.
- Adapt the Adversarial Domain Adaptation, maximum mean discrepancy (MMD) on Deep Hashing Network for cross-domain palmprint recognition. The corresponding palmprint verification are weakly supervised whose results outperforms the direct transferring representation by over 3.08% and 6.28% in the constrained and unconstrained environment respectively.
- Explore the application of few-shot learning for Small-Sample-Size (SSS) palmprint recognition. Propose Meta-Siamese network for one-shot and zero-shot palmprint recognition which reaches the same recognition rate as the fully supervised training.
- Introduce lifelong learning into hand-based biometrics to help the recognition systems powered by deep learning less susceptible to catastrophic forgetting. Obtain a promising accuracy by dynamically changing the network structure while decreasing the trainable parameters by 50%.
- Considering the security of biometrics by introducing four adversarial attacks, namely DeepFool, JSMA, CW and Fast Gradient Sign Method. Propose a cascaded autoencoder approach to denoise the poisoned palmprint images. Reach a recognition rate of 90% compared to 10% without defense.
- Propose a novel image super resolution algorithm to increase the image resolution and quality for palmprint recognition. Two cascaded CycleGANs are concatenated in order to build an unpaired setting.

Institution of Automation, Chinese Academy of Sciences (CASIA)   Beijing, China
Research Assistant, Supervised by Professor. Gang Xiong   Jun. 2018 - Present
Intelligent transportation
- Designed an integrated vehicle forewarning system for dangerous overtaking, drive blind areas and emergency break. It consists of GPS&BDS system for navigation, improved GPRS module for background monitoring, ARM processor to conduct the self-designed angle-based judgment algorithm.
- Explore the deep-learning based traffic flow prediction algorithms. Adapt the regular LSTM module to incorporate the spatial information (*i.e.* distance between neighboring stations) into LSTM cells. Build another LSTM in the spatial order linking all the stations on the same mainline. Experiments shows that the prediction results are more stable than vanilla LSTM, single Multi-Layer Perceptron (MLP) and Autoregressive Integrated Moving Average Model (ARIMA) under three error indexes of MAE, MAPE and MSE.
- Explore the application of Graph CNN and network embedding models for real-time traffic management and forecasting.

Department of Computational Biology, Carnegie Mellon University (CMU)   Pittsburgh, PA, USA
Student Intern, Supervised by Associate Research Professor, Min Xu   July 2018 - Present
Cellular Electron Cryo-Tomography
- Work on data analysis for Cellular Electron Cryo-Tomography (CECT). Propose a reinforcement learning based homogeneous subtomograms selection model to perform best set selection task. Experimental results verified the effectiveness of our model in both 2D and 3D real datasets. It can be incorporated in the automated subtomogram averaging systems as a standalone component that selects out homogeneous subtomograms in an unsupervised manner, which lets the averaging process yield a higher resolution and signal-to noise level.
- Design a novel discriminative active learning model into CECT to decrease the required large-scale annotation, since the biomedical image annotation is highly costly and specialty-oriented. Propose a simple heuristic sampling strategy to select the most salient samples for label assignment.
- Introduce open-set macromolecule recognition and novel structure detection in CECT single-particle analysis tasks because the classes of testing data are not usually overlapping with that of training images. Propose a novel loss function called Largin Margin Cosine Centralized Loss (LMCCL) as a supervised signal in order to learn a discriminative embedding space.

Department of Machine Learning, Carnegie Mellon University (CMU)   Pittsburgh, PA, USA
Student Intern, Supervised by Ph.D. Candidate Haohan Wang and Professor, Eric. P. Xing   April 2019 -
Robust Machine Learning on Adversarial Attacks
- Work on adversarial attacks based on active learning and domain adaptation. (In progress)

Publications
- D. Zhong, **X. Du**, and K. Zhong, "Decade progress of palmprint recognition: a brief survey", *Neurocomputing*, 2018, vol.328, pp.16-28. **(IF 3.241)**
- D. Zhong, Y. Yang, and **X. Du**, "Palmprint Recognition Using Siamese Network", in *13-th Chinese Conference on Biometric Recognition, CCBR 2018*, pp. 48-55
- Dexing Zhong, Shuming Liu, and Wenting Wang and **Xuefeng Du**, "Palm vein recognition with Deep hashing network", *Chinese Conference on Pattern Recognition and Computer Vision*, 2018. pp.38-49
- **Xuefeng Du**, Dexing Zhong, Pengna Li, "Low-shot Palmprint Recognition based on Meta-Siamese Network", in *IEEE International Conference on Multimedia and Expo, ICME 2019*, **Oral Presentation**, pp. 79-84.
- Huikai Shao, Dexing Zhong and **Xuefeng Du**, "Efficient Deep Palmprint Recognition via Distilled Hashing Coding", in *IEEE Conference on Computer Vision and Pattern Recognition, CVPR Workshops 2019* (Accepted).
- Huikai Shao, Dexing Zhong and **Xuefeng Du,** "A Hand-based Multi-biometrics via Deep Hashing Network and Biometric Graph Matching**", in *IEEE Transactions on Information Forensics and Security. (TIFS)*, vol.14, issue.12, pp. 3140 - 3150. **(IF 6.211)**

- **X. Du**, D. Zhong, and H. Shao, "Building an Active Palmprint Recognition System", in *2019 IEEE International Conference on Image Processing (ICIP)*, 2019. (Accepted).
- **X. Du**, D. Zhong, and H. Shao, "Continual Palmprint Recognition without Forgetting", in *2019 IEEE International Conference on Image Processing (ICIP)*, 2019. (Accepted).
- H. Shao, D. Zhong, and **X. Du**, "Cross-Domain Palmprint Recognition Based on Transfer Autoencoder", in *2019 IEEE International Conference on Image Processing (ICIP)*, 2019. (Accepted).
- **Xuefeng Du**, Xiangrui Zeng, Bo Zhou, Alex Singh and Min Xu, "Open-set Recognition of Unseen Macromolecules in Cellular Electron Cryo-Tomograms by Soft Large Margin Centralized Cosine Loss", in *British Machine Vision Conference (BMVC)*, 2019. (Accepted, **Spotlight Presentation**).
- Siyuan Liu, **Xuefeng Du**, Rong Xi, Fuya Xu, Xiangrui Zeng, Bo Zhou and Min Xu, "Semi-supervised Macromolecule Structural Classification in Cellular Electron Cryo-Tomograms using 3D Autoencoding Classifier", in *British Machine Vision Conference (BMVC)*, 2019. (Accepted, Poster Presentation).

Competition Paper Track
- Gubins, Ilja; Schot, Gijs van der; Veltkamp, Remco C.; Förster, Friedrich; **Du, Xuefeng**; Zeng, Xiangrui; Zhu, Zhenxi; Chang, Lufan; Xu, Min; Moebel, Emmanuel; Martinez-Sanchez, Antonio; Kervrann, Charles; Lai, Tuan M.; Han, Xusi; Terashi, Genki; Kihara, Daisuke; Himes, Benjamin A.; Wan, Xiaohua; Zhang, Jingrong; Gao, Shan; Hao, Yu; Lv, Zhilong; Wan, Xiaohua; Yang, Zhidong; Ding, Zijun; Cui, Xuefeng; Zhang, Fa (The Eurographics Association, 2019), "Classification in Cryo-Electron Tomograms", in *Eurographics 2019 Workshop on 3D Object Retrieval*, rank 2-nd.

Chinese Patent
- D. X. Zhong, H. K. Shao, and **X. F. Du**, Multi-sensor based vehicle warning intelligent system, CN108492624A, 09/04/2018. (Pending)

Publications (Expected)
- **Xuefeng Du**, YiSheng Lv, Fenghua Zhu and Gang Xiong, "Traffic Flow Prediction using Temporal-Spatial LSTM" (Under Review).
- **Xuefeng Du,** Dexing Zhong, Huikai Shao, "Semi-supervised palmprint recognition based on adversarial adaptative hashing" (Under review)

SERVICE
- Reviewer for IEEE Transactions on Circuits and Systems for Video Technology (T-CSVT).

OTHER SELECTED PROJECTS
- Construct a student information management system with functions for writing, searching, deleting, etc., design a simple calculator based on stack and queue in C.
- Set up a Huffman encoding and decoding system, devise a file information extraction system using KMP in C++.
- Gave a pricing scheme of tasks in an APP using Spearman correlation analysis and Logit function based on Python.
- Apply data packet accumulation algorithm and data fitting tool to process large data sets and conduct proper evaluation of mobile video service based on Matlab and SPSS.

EXTRACURRICULAR ACTIVITIES
Youth League Committee, XJTU, Head of science and technology　　　　　　　　Nov. 2016 - Present
- Organizing over 20 essential seminars of science and technology on campus.
- Held several technology competitions which more than 600 students were involved in.

Student Congress in XJTU, Student representative　　　　　　　　　　Oct. 2017 – Present
- Held regular meetings offline and online to discuss the problems waiting to be solved and helped addressing over 15 issues in students' lives.

ADDITIONAL INFORMATION
- **Language skills：** Native speakers of Mandarin with fluent English speaking capability (CET4: 633, CET6: 627, TOEFL: 106, GRE: 160+166)

- **Computer skills:** Proficient with C, Python, C++, TensorFlow, PyTorch and Keras. Familiar with SPSS, Matlab to conduct big statistical data processing. Familiar with CUDA, OpenACC, Cython for parallel computing.
- **Interests：** Writing、Travelling、Basketball、Running.