Curriculum Vitae

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School of EECS

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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: **91.6/100(3.8/4.0)**, Rank: **1st/170**, Major GPA: **93.04/100(3.9/4.0),** Rank: **3rd/170**
- **Selected awards：**
  National Scholarship (Twice, top 1% in China)
  Sun Hung Kai Group Scholarship (top 5% in School)
  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 Professor, Dexing Zhong   Jun. 2017 - Apr. 2019
Machine Learning Powered Hand-based Biometrics

- Propose a detailed survey of palmprint and dorsal hand vein (DHV) recognition used in personal identification containing over 200 articles.
- Build XJTU unconstrained palmprint databases (XJTU-UP) containing over 10,000 images from 100 volunteers and 10 different domains to simulate the practical palmprint image acquisition, which is the **largest** benchmark dataset in the research community. Apply PCA, LBP, 2D Gabor filter and other traditional ML techniques for feature extraction and matching, which achieve an average recognition accuracy of 99%. **URL:** http://gr.xjtu.edu.cn/web/bell/resource
- 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. Conduct different level of fusion (*i.e.* pixel, feature, score and decision level) to construct a multi-biometrics recognition system. 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%.
- Unify Adversarial Domain Adaptation, Maximum Mean Discrepancy (MMD) and Deep Hashing Network for cross-domain palmprint recognition in different acquisition scenarios. This unsupervised palmprint verification outperforms the direct transferring 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 palmprint recognition. Propose a novel Meta-Siamese Network for one-shot and zero-shot palmprint recognition which reaches similar recognition rate as the fully supervised training.
- Introduce lifelong learning into hand-based biometrics to help it resist catastrophic forgetting. Obtain a promising accuracy by dynamically changing the network structure by Advantage Actor Critic (A2C) RL algorithm. while decreasing the trainable parameters by 50% while incurring no semantic drift.

Institution of Automation, Chinese Academy of Sciences (CASIA)   Beijing, China
Research Assistant, Supervised by Professor, Gang Xiong and Yisheng Lv   Jun. 2018 – Apr. 2019
Intelligent transportation via Deep Learning

- Design 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 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 show 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.
- Explore the application of GCN and network embedding models for real-time traffic management and forecasting.

Ministry of Education Key Lab for Intelligent Networks and Network Security, XJTU   Xi'an, China
Research Assistant, Supervised by Professor, Pinghui Wang   Nov. 2018 – Present
Network Embedding and Meta Learning
- Propose a novel setting in network embedding: Few-shot Node classification with emerging labels.
- Integrate Meta-Learning flavored few-shot learning with classic network embedding techniques, such as DeepWalk and LINE to jointly learn the structure and classification information in graphs.

Department of Computational Biology, Carnegie Mellon University (CMU)   Pittsburgh, PA, USA
Student Intern, Supervised by Assistant Research Professor, Min Xu   July 2018 - Present
Deep Learning for Cellular Electron Cryo-Tomography (CECT)
- Work on set selection problem in CECT. Model it as a Markov Decision Process and formulate the best-set selection problem using reinforcement learning. Develop subset selection with reinforcement learning (SSRL) algorithm for homogeneous subtomogram selection and high-resolution averaging, which outperformed baselines (Genetic Algorithm, Image Matching, etc.) by 34%.
- Design a novel generative active learning model 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 task in CECT single-particle analysis since the classes of testing data are not usually overlapping with that of training images. Propose a novel loss function called Large Margin Cosine Centralized Loss (LMCCL) as a supervision signal in order to learn a discriminative feature 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 (In progress)
- Propose two simple and effective intuitions to improve adversarial training. 1) Answering a "yes or no" question is much easier than answering a multiple-choice question. 2) The bound that samples are allowed to be perturbed during adversarial training may not necessarily be the same.
- Apply One-Vs-All (OVA) models to improve adversarial training, which naturally allows the perturbation bound to be different for different classes.
- Propose a conditional adversarial training method that gradually improves the perturbation bound until no perturbed adversarial examples are considered valid.

Publications
- Dexing Zhong, **Xuefeng Du**, and Kuncai Zhong, "Decade progress of palmprint recognition: a brief survey", *Neurocomputing*, 2018, vol. 328, pp.16-28. **(IF 4.072)**
- **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**.
- 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*.
- 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)**
- **Xuefeng Du**, Dexing Zhong, and Huikai Shao, "Building an Active Palmprint Recognition System", in *2019 IEEE International Conference on Image Processing (ICIP)*, 2019.
- **Xuefeng Du**, Dexing Zhong, and Huikai Shao, "Continual Palmprint Recognition without Forgetting", in *2019 IEEE International Conference on Image Processing (ICIP)*, 2019.
- Huikai Shao, Dexing Zhong and **Xuefeng Du**, "Cross-Domain Palmprint Recognition Based on Transfer Autoencoder", in *2019 IEEE International Conference on Image Processing (ICIP)*, 2019.
- **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, **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, Poster Presentation.

Competition Track Paper
- Ilja Gubins, Gijs van der Schot, Remco C Veltkamp, Friedrich Förster, **Xuefeng Du**, Xiangrui Zeng, Zhenxi Zhu, Lufan Chang, Min Xu, Emmanuel Moebel, Antonio Martinez-Sanchez, Charles Kervrann, Tuan M Lai, Xusi Han, Genki Terashi, Daisuke Kihara, Benjamin A Himes, Xiaohua Wan, Jingrong Zhang, Shan Gao, Yu Hao, Zhilong Lv, Xiaohua Wan, Zhidong Yang, Zijun Ding, Xuefeng Cui, Fa Zhang, "Classification in Cryo-Electron Tomograms", in *Eurographics 2019 Workshop on 3D Object Retrieval*, rank 2/10.

Chinese Patent
- Dexing Zhong, Huikai Shao, and **Xuefeng Du**, Multi-sensor based vehicle warning intelligent system, CN108492624A (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, "Cross-domain palmprint recognition based on adversarial domain adaptative hashing" (Under review)
- **Xuefeng Du,** Haohan Wang, Zhenxi Zhu, Bo Zhou, Xiangrui Zeng, Yi-wei Zhang, Min Xu, "Learning to Actively Classify Macromolecules with Significantly Fewer Labeled Training Data in Cellular Electron Cryo-Tomography" (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 datasets 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
- Organize over 20 essential seminars of science and technology on campus.
- Hold several technology competitions which more than 600 students were involved in.

Student Congress in XJTU, Student representative   Oct. 2017 – Present
- Hold regular meetings offline and online to discuss the problems waiting to be solved and help 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 (S22), GRE: 160+166+4.5)
- **Computer skills:** Proficient with C, Python, C++, TensorFlow, PyTorch and Keras. Familiar with SPSS, Matlab to conduct statistical data processing. Familiar with CUDA, OpenACC, Cython for parallel computing.
- **Interests**：Writing、Travelling、Basketball、Running.