Miao Zhang

40 Newport Pkwy, Jersey City, NJ 07310, USA • miaozhng@nyu.edu | LinkedIn | Google Scholar

EDUCATION

New York University – New York, USA *Sep. 2021 – present*
Ph.D. student. Computer Science, Tandon school of Engineering
Supervisor: Prof. Rumi Chunara
Courses: Algorithmic machine learning and data science, Deep learning, Information Visualization, Computer vision

Stanford University – Stanford, CA, USA *Sep. 2018 – Jun. 2020*
M.A. Music Science and Technology, Center for Computer Research in Music and Acoustics (CCRMA)
Courses: Programming Abstractions, Computer Organization and Systems, Machine Learning, Deep Learning, Mathematic Models and Medical Decisions, etc.

Beijing University of Posts and Telecommunications – Beijing, China *Sep. 2014 – Jun. 2018*
B.Eng. Electronic Engineering, School of Electronic Engineering
Courses: Advanced Mathematics, Linear Algebra, Probability Theory and Stochastic Processes, Discrete Mathematics, Information Application Based on Networks, Digital signal Processing, etc.

SELECTED PUBLICATION

Research Interests:
Deep learning for computer vision, Fair and de-biasing learning, AI Healthcare

Miao Zhang, Rumi Chunara. "Fair contrastive pre-training for geographic images". The IEEE/CVF Conference on Computer Vision and Pattern Recognition 2023. **(Under review)**

Miao Zhang, Harvineet Singh, Lazarus Chok, Rumi Chunara. "Segmenting across places: The need for fair transfer learning with satellite imagery". Fair, Data-efficient, and Trusted Computer Vision (TCV) 2022.

Miao Zhang, Liangqiong Qu, Daniel Rubin. "SplitAVG – A Federated Deep Learning Method to Tackle Data Heterogeneity for Medical Imaging". Journal of the Biomedical and Health Informatics, 2022.

Liangqiong Qu, Niranjan Balachandar, **Miao Zhang**, Daniel Rubin. "Handling Data Heterogeneity with Generative Replay in Distributed Deep Learning Models for Medical Imaging". Medical Image Analysis, 2022.

Miao Zhang, Xiaofei Kang, Yanqing Wang, Lantian Li, Zhiyuan Tang, Haisheng Dai, Dong Wang. "Human and Machine Speaker Recognition based on Short Trivial Events". IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), pp. 5009-5013. IEEE, 2018.

Miao Zhang, Yixiang Chen, Lantian Li, Dong Wang. "Speaker Recognition with Cough, Laugh, and 'Wei'". Asia-Pacific Signal and Information Processing Association Annual Summit and Conference (APSIPA ASC), PP. 497-501. IEEE, 2017.

RESEARCH EXPERIENCE

The Visualization and Data Analytics Research Center (VIDA), New York University
Graduate Researcher | Supervisor: Prof. Rumi Chunara *Nov. 2021 - present*

Semantic segmentation for remote-sensing imagery and transfer learning. To benchmark fairness implications and de-bias deep learning models across domains.

- I focused on land-cover objects semantic segmentation problems for satellite imagery and tackled model performance disparities across protected groups: urban and rural area, in the context of self-supervised learning. The proposed method is to de-bias dense representation hierarchy of the encoder guided by mutual information.

- Examined robustness of common transfer learning and unsupervised domain adaptation methods for adapting model across places, where the unfairness between groups was further enlarged.

Laboratory of Quantitative Imaging and Artificial Intelligence (QIAI), Stanford University
Graduate Researcher | Supervisor: Prof. Daniel Rubin, Dr. Liangqiong Qu *Nov. 2019 - Nov. 2021*

To address the limitation in data-sharing among institutions, I simulated federated deep learning across 4-10 medical institutions, and proposed novel federated learning algorithms to tackle data heterogeneity problem.

- Compared multiple existing federated learning (FL) algorithms on classification tasks with diabetic retinopathy eye image dataset, regression tasks with X-ray hand image dataset, and segmentation tasks with BraTS brain tumor dataset.
- Proposed a heterogeneity-robust federated learning algorithm: Split Averaging (SplitAVG), which aggregates intermediate feature maps instead of the whole model from local institutions to avoid weight divergence. The method successfully mitigated the impacts of heterogeneity even under extreme cases of single-class data partitions, which greatly surpasses all comparing algorithms.
- Proposed generative replay strategy which developed novel dual model architecture: a primary model to learn desired tasks, and an auxiliary Generative adversarial network (GAN) to aggregate knowledge from local institutions.

Aghaeepour Laboratory, Stanford University
Graduate Researcher | Supervisor: Prof. Nima Aghaeepour, Dr. Ivana Maric, Dr. Alan Lee Chang *Nov. 2019 – Oct. 2020*

- Performed predictive analysis on a single-cell dataset collected by flow cytometry, which consists of 9 patients' samples showing intracellular signaling responses during pregnancy. I explored the shared genome and proteomes latent spaces. Deep multivariate neural network and Elastic Net (EN) model were used as the learning methods.
- Experimented on the ability of genes features to predict two groups of biological function related proteins: cellular exhaustion and cellular suppression.
- This work aims in deep understanding of functional immune responses, which provides diagnostic opportunities and helps to develop immune therapies.

Beijing National Research Center for Information Science and Technology, Tsinghua University
Undergraduate Research Assistant | Supervisor; Prof. Dong Wang, Dr. Lantian Li *May. 2017 – July. 2018*

Led the machine speaker recognition (SRE) research project based on human trivial vocal events (e.g., cough, laugh, sniff) and obtained 86% - 90% accuracy with deep feature learning.

- Collected and published datasets (ViVi_SRE) for six types of human phonation events, and disguised speech to study if machine learning can help discover genuine speaker in circumstances such as forensic examination.
- Implemented deep learning structure (Convolutional Time-delayed Neural Network) to learn speaker vocal traits from the raw text-independent speech signals and distinguish different speakers.
- Launched a survey by an interactive web tool for human listening tests on trivial and disguised events.

WORK EXPERIENCE

Amazon Web Services, Amazon – Seattle, WA
Software Engineer (full-stack): Built and maintained database migration service. *Sept. 2020 – Sept. 2021*

Engineering Department, Poly (Plantronics) – Santa Cruz, CA
Technology Strategy Intern: Developed speech recognition DL architectures for headphone chips. *Jun. 2019 – Dec. 2019*

SKILLS

Programming languages: Python, C++, JavaScript, Ruby, Matlab, HTML, Bash
Software & Tools: Pytorch, Tensorflow, Latex, Jupyter, Node.js, Git, Linux, SQL