Zhimeng **LUO**

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EDUCATION

School of Computing and Information, University of Pittsburgh (PITT)

- Ph.D. student in Information Science. Sep 2019 - Present
- M.S. in Information Science. GPA: 3.8 Sep 2017 - May 2019

School of Mathematics and Statistics, Huazhong University of Science and Technology (HUST)

- B.S. in Statistics. GPA: 3.2 (**3.9** for all six computer science courses) Sep 2013 - Jun 2017

RESEARCH EXPERIENCE

Graduate Student Researcher, Information Retrieval Integration and Synthesis (iRiS) Lab, University of Pittsburgh

Advised by Dr. Daqing He Feb 2018 – present

- Researched on clinical abbreviation disambiguation for large scale clinical notes (10-100 millions of clinical notes from University of Pittsburgh Medical Center (UPMC));
- **For annotation part:** in order to efficiently process large scale and upcoming notes, proposed a scalable clustering algorithm (based on DBSCAN) on abbreviation instances (word embedding of context words) for annotation, which can:
  - Greatly speedup clustering **(> 100 times faster**, when number of instances for the abbr > 10M);
  - Clustering results for upcoming new notes can be merged into existing clustering result, without recomputing whole dataset;
  - Recommend semantically different/similar instance clusters to help annotators find more senses faster;
- **For model part:** Applied **Transformer** model to abbreviation disambiguation in TensorFlow as a classification problem (one model for all abbreviations). Currently outperform SVM baseline when using pre-trained word embedding on both content word vectors and target sense vectors;
- Preparing public dataset for publication.

Intelligent Computing for Clinical Imaging (ICCI) Lab, University of Pittsburgh

Advised by Dr. Shandong Wu Aug 2018 – Feb 2019

- Applied **3D U-net** on MRI breast tumor segmentation;
- Modified the original 3D U-net from several aspects:
  - Use residual connections within each convolutional module; Use **Group Normalization** to replace Batch Normalization, which shows better performance when batch size is small;
  - Never downsample feature maps along the slice dimension, in order to keep the information along the that dimension;
  - Due to the limitation of training dataset size, add an additional **Variational Autoencoder** (VAE) branch to regularize the encoder.
- 2 papers related to apply U-net and 3D U-net on MRI have been **accepted by Medical Imaging 2019, SPIE**. My contribution is applying 3D U-net on breast tumor MRI and whole breast MRI, and comparing with 2D method;

Team Leader, 2018 Data Science Bowl (Kaggle competition) Feb 2018 – Apr 2018

- Researched on finding the nuclei in divergent microscope images based on **Mask R-CNN** framework;
- Built **Mask R-CNN (SE-ResNeXt-50)** model and entire training pipeline **from scratch** in PyTorch;
- Proposed a framework for nuclei instance segmentation (focus on touching objects). It helps original model segment more accurate objects in two ways:
  - Using **shape aware weighted loss function** to focus learning on touching pixels;
  - Adding **depth head (integrate watershed)** in parallel with mask head to separate multiple objects after RPN (if RPN proposes multiple objects in one RoI);
- Achieved **top 2% (56/3634)** rank on the private leaderboard and won a silver medal.

Research Assistant, School of Mathematics and Statistics, Huazhong Univ of Sci & Tech
Advised by Dr. Hong Li Feb 2017 - Jun 2017

- Applied state-of-the-art Convolutional Neural Networks (CNN) in Hyperspectral Image (HSI) Classification and implemented them by Keras and TensorFlow;
- Designed a HSI classification method based on Fully Convolutional Networks (FCN) and U-Net;
- Proposed a training method according to the absence of large number of labeled samples, resulting in faster training speed, and making full use of the global information of HSI for feature extraction;
- This undergraduate thesis won the **outstanding undergraduate thesis award (1st/91)** in School of Mathematics and Statistics of HUST (2017).

PUBLICATIONS

MANUSCRIPTS

- **Zhimeng Luo**, Lei Zhang, Ruimei Chai, Shandong Wu. 3D U-Net for tumor segmentation in breast DCE-MRI (in preparation).

CONFERENCE PUBLICATIONS

- Lei Zhang, **Zhimeng Luo**, Ruimei Chai, Dooman Arefan, Jules Sumkin, Shandong Wu. Deep-learning method for tumor segmentation in breast DCE-MRI. *Medical Imaging 2019: Imaging Informatics for Healthcare, Research, and Applications.* International Society for Optics and Photonics (SPIE), 2019.
- Lei Zhang, Aly A. Mohamed, Ruimei Chai, Bingjie Zheng, **Zhimeng Luo**, Shandong Wu. Automated deep-learning method for whole-breast segmentation in diffusion-weighted breast MRI. *Medical Imaging 2019: Computer-Aided Diagnosis.* International Society for Optics and Photonics (SPIE), 2019.

HONORS

- **Graduate Student Researcher Scholarship**, PITT Jan 2019
- **Half Graduate Student Researcher Scholarship**, PITT Sep 2018
- **Sliver Medal (56th/3634, Top 2%)** in 2018 Data Science Bowl, Kaggle Apr 2018
- **Outstanding undergraduate thesis award (1st/91)** in School of Math & Stat, HUST Jun 2017
- **Merit scholarship (Top 10%)** in 2014-2015 Academic Year, HUST Sep 2015
- **Merit scholarship (Top 10%)** in 2013-2014 Academic Year, HUST Sep 2014

COMPUTER SKILLS

- **Programming Skills:** Proficient in Python, and MATLAB; capable of R, Java and Git;
- **Libraries for Deep Learning:** Proficient in PyTorch, TensorFlow, and Keras;
- **Operating Systems and Server:** Windows, Linux (Ubuntu), and AWS.