Xingyu Liu

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EDUCATION

Shanghai Jiao Tong University (SJTU) Sept 2016 – June2020(Expected)

Bachelor of Engineering in Biomedical Engineering

- **Overall GPA**: 88.2/100 (WES: 3.79/4.0) **Major GPA:** 90/100 (WES: 3.99/4.0)
- Summer exchange student in the Department of Informatics at King's College London, 2018.
- Summer research assistant in the Department of Computer Science at Harvard University, 2019.
- **Relevant Courses**: Biomedical Image Processing I (91/100, ranking 1st), Machine Learning (95/100), Fundamentals of Biomedical Statistics (95/100), Circuit Theory (95/100), Algorithm and Data Structure (88/100), Electronics System Design Based on Android (97/100), Computer System Architecture (96/100), Intro to Data Science with Python(88/100)

PUBLICATION

Learning Skeleton-Aware Distance Transform for Segmenting Instances with Complex Shapes

Zudi Lin, Donglai Wei, Xingyu Liu, Aarush Gupta, Deqing Sun, Hanspeter Pfister

Submitted to European Conference on Computer Vision, 2020.

RESEARCH EXPERIENCE

3D Mitochondria Segmentation | Harvard University | Research Assistant July 2019 – Oct 2019

Advisor: Hanspeter Pfister, An Wang Professor of Computer Science

- Used 3D Lightweight U-Net to attain initial segmentation of the mitochondria in mammalian brain tissue electron microscopy images (>1 TB).
- Applied Connected Component labeling to filter out spurious detection and employed marker-controlled Watershed algorithm to improve boundary accuracy.
- Applied online hard negative mining, embedding, and discriminative loss to reduce false positive rate to 2%.
- Paper under preparation for top-tier biomedical journal IEEE TMI

Neuron Skeletonization and Analysis | Harvard University | Research Assistant Aug 2019 – Oct 2019

Advisor: Jeff Lichtman, Jeremy R. Knowles Professor of Molecular and Cellular Biology

- Generated initial skeleton from 3D neuron volumes using ibexHelper, and applied up-sampling and mean filtering to identify the cell body.
- Computed dendrites' orientation and length from skeleton using networkx, and analyzed those data using Pandas.
- Provided statistical data for neuroscientists and taught another intern my pipeline hand by hand.

3D Lung Nodule Segmentation | SJTU | Research Assistant Jan 2019 – Mar 2019

Advisor: Bingbing Ni, Professor at Department of Electrical Engineering.

- Aimed to use 2D CNN to match the performance of 3D CNN in 3D biomedical data and did ablation studies
- Used 3D DenseUNet to perform segmentation on 3D Pulmonary Nodule, achieving dice loss of 0.20.
- Used 2D DenseUNet/ResUNet, combined with Temporal Shift Module to achieved dice loss of 0.20.

Brain Segmentation Based on Deep Learning | SJTU | Research Assistant Aug 2018– Nov 2018

Advisor: Qian Wang, Professor at School of Biomedical Engineering

- Sliced the 3D NIFTI brain images to 2D using SimpleITK. Used U-Net to extract red nucleus, substantia nigra, and swallow tails in 2D brain slices, and reconstructed 3D images from 2D slices.
- Achieved dice loss of 0.23, and segmented images are used for Parkinson's diagnosis.

Radiomics Image Analysis System Design | SJTU | Research Assistant April 2018 – July 2018

Advisor: Qian Wang, Professor at School of Biomedical Engineering

- Used Web Scrawler and Visualization Toolkits (e.g. basemap) to investigate cervical cancer background
- Extracted and selected discriminative MRI-defined features of images with Pyradiomics and Student's t-test
- Used Support Vector Machine for classification of the selected features, and reached AUC of 0.82
- Constructed a graphical user interface (GUI) to facilitate human-computer interaction.

WORK EXPERIENCE

Computer Vision Software Intern| Intel Dec 2019 – Present

Team: Intel Internet of Things Group China, Shanghai

- Developed video analytics products for a wide variety of domains such as industrial and healthcare sectors.

Modeling Contest Projects

Modeling Opioid Crisis Based on Cellular Automata and Chi-Square Test | MATLAB &Python Jan 2019

- Established an Opioid Spread Model based on Cellular Automata, whose update rules are determined by the number of total drug reports in the county itself and its neighboring counties.
- Constructed a Feature Selection Model based on Chi-Square tests to identify the important socio-economic determinants of drug abuse.
- Finalist Winner of the 2019 Mathematical Contest in Modeling (top 0.31% in 25,370 teams).

Heat Conduction Model Based on Finite Difference Method | R &MATLAB Sept 2018

- Derived differential equations (numerically solved by finite difference schemes) to model the heat distribution data in a multilayer high temperature resistant coverall. Used MATLAB for simulation and inference.
- Used Bisection to optimize a single layer of the overalls, and applied the Genetic Algorithm to find the optimal thickness for two layers.
- Won National Second Prize at 2018 Contemporary Undergraduate Mathematical Contest in Modeling (top 4% in 38,573 teams)

Course Projects

Filtered Backprojection Algorithm Implementation | C++ &MATLAB June 2019

- Implemented radon transform, Shepp-Logan and backprojection reconstruction using C++.
- Achieved 0.44 normalized mean square distance for the reconstructed image and built GUI.
- Final grades ranked top ten in this class (Biomedical Image Processing II).

Understanding Cache Memories | C May 2019

- Built a cache simulator and successfully calculated the hits, misses and evictions with the input of traces.
- Optimized matrix transpose to cause as few cache misses as possible.
- Achieved a final grade of 96/100 in the class (Computer Architecture).

Game 2048 Agent based on AI | C++ &Python Jan 2019

- Collected the decision data of a C++ complied search-based 2048 Agent as my training dataset.
- Designed a Neural Network and used online training to train my AI-based 2048 Agent.
- My AI-based 2048 Agent achieved scores above 1000 when playing the Game 2048.
- Got 95/100 final grades for this class (Machine Learning).

Fundus Image Segmentation System | MATLAB &Python Dec 2018

- Implemented three different segmentation methods (indicated below) and built GUI.
- A. Morphological method. Applied morphology and bit plane slicing to get the shape and orientation map of blood vessels; Used the first Gaussian filter to mark the centerline; Combined the map and centerline using region-growing algorithm. Achieved 0.956 Accuracy (ACC), 0.732 Sensitivity (SE) and 0.978 Specificity (SP).
- B. Deep learning method. Used DenseUNet for segmentation. Achieved 0.953 ACC, 0.931 SE and 0.955 SP.
- C. Filtering method. Used match filtering and region-growing algorithm. Achieved 0.951 ACC, 0.684 SE and 0.977 SP.
- Ranked 1st in class (Biomedical Image Processing I).

Honors & Awards

- Hong-Yi Scholarship (10 selected in SJTU) 2019
- Finalist Winner in 2019 Mathematical Contest in Modeling (top 0.31%) 2019
- National Second Prize at 2018 Contemporary Undergraduate Mathematical Contest in Modeling (top 4%) 2018
- Academic Excellence Scholarship, SJTU (top 10%) 2017&2018&2019
- Merit Student, SJTU (top 6%) 2018
- Outstanding Individual in Social Practice, SJTU (top 1%) 2017

Leadership

Study Mentor | School of Biomedical Engineering, SJTU Dec 2018 – Present
Vice Minister | Student Union, SJTU Feb 2018 – Feb 2019
Assistant Director | Student Career Development Union, SJTU May 2018 – May 2019
Dean Assistant | Youth Volunteer Service Team, SJTU May 2017 – May 2018

Skills

Programming: Python (Pytorch, Pandas, Scrawler, Opencv, etc.), C/C++, Verilog, MATLAB, Assembly, R, SQL
Software/Applications: LaTeX, Keil, Proteus, Arduino, Xilinx, Origin, LabVIEW