

# Xingyu Liu

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## EDUCATION

### Harvard University

Expected to start from Aug 2020

*Master of Science in Data Science*

### Shanghai Jiao Tong University (SJTU)

Sept 2016 – June 2020 (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)

## PUBLICATIONS

**One paper (3<sup>rd</sup> author) was submitted to European Conference on Computer Vision, 2020.**

**One paper (3<sup>rd</sup> author) was submitted to Medical Image Computing and Computer Assisted Intervention, 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. Two papers submitted to ECCV2020 and MICCAI2020 separately.

**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
- Used `PyQt5` to 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).

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

- Collected the decision data of a C++ compiled 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, TensorFlow, Pandas, Opencv, etc.), C/C++, Verilog, MATLAB, Assembly, R, SQL

**Software/Applications:** LaTeX, Keil, Proteus, Arduino, Xilinx, Origin, LabVIEW