Yuanzhe Liu

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Education

Rensselaer Polytechnic Institute — Troy, NY
Ph.D. in Computer Science — **Aug. 2023 – Expected May. 2028**

New York University- Courant Institute of Mathematics — New York, NY
Master of Science in Computer Science — **Sep. 2021 – May. 2023**

Oberlin College and Conservatory — Oberlin, OH
Bachelor of Arts in Computer Science, Mathematics, Piano Performance; College scholarship; GPA: 3.86 — **Sep. 2016 – May. 2021**

Research Experience

Calcification Detection — New York, NY
Research Assistant — **Feb. 2023 - Present**

Assist Dentistry Doctors in detecting Internal Carotid Artery Calcification by machine learning.

Apply Mask R-CNN algorithm and Swin Transformer as the backbone to detect and segment calcification in 2D images.

Independent Study — Remote
Theoretical Computer Science Research Assistant — **Feb. 2021 - Aug. 2021**

Assisted Professor Sam Taggart in extending the proof of the existence of the low bound under several constraints, from 3-approximation to 2-approximation.

Attempted to disprove the 2-approximation of the threshold policy by invoking examples that would break the 2-approximation.

Explored several instances of potential counter examples, demonstrated the reason they were considered as counter examples, and investigated why they failed to be counter examples.

Oberlin College Computer Science Department — Oberlin, OH
Theoretical Computer Science Research Assistant — **Jun. 2019 - Sep. 2019**

Assisted Professor Sam Taggart in extending the proof of the existence of the low bound under several constraints.

Proved the APX hardness result of this particular delegation problem under certain conditions with one colleague.

Attempted to disprove the 2-approximation of the threshold policy by invoking examples that would break the 2-approximation.

Oberlin College Computer Science Department — Oberlin, OH
Theoretical Computer Science Research Assistant — **Jul. 2018 - Sep. 2018**

Assisted professor Sam Taggart in analyzing the welfare and revenue of Bayes-Nash equilibrium in first-price auctions with agents.

Wrote a python program to computer the equilibrium by applying dynamic programming.

Oberlin College Mathematics Department — Oberlin, OH
Winter Term Mathematics Research Assistant — **Jan. 2018 - Feb. 2018**

Assisted Professor Kevin Gerstle in researching on f-functions of Brownian Motion on Cantor Set.

Programmed Cantor Set by MATLAB as the sample space of Brown Motion.

Studied the teleportation model, tested the code on Cantor Set and produced the graph of Brownian Motion by MATLAB.

Projects and Work Experience

MiniGoogLeNet PyTorch Implementation New York, NY
Personal Project **Dec. 2022 - Jan. 2023**

Implemented MiniGoogLeNet in PyTorch for image classification. Only Tensorflow version found prior to this contribution.

Intro to Deep Learning System Class Final Project New York, NY
Group Leader **Oct. 2022 - Jan. 2023**

Implemented and compared Transformer and ResNet-50 to perform object detection and segmentation tasks.

Pretrained Swin-Transformer and ResNet-50 backbone as feature extractors on 2017 ImageNet DET dataset by self-supervised learning. Executed Mask R-CNN with Feature Pyramid Network and backbones to detect objects and segment images.

Achieved 40 percent of Average Precision in object detection and segmentation on 2017 COCO object detection dataset with Swin Transformer, and more than 20 percent of Average Precision with ResNet-50.

Deep Learning Class Final Project New York, NY
Group Member **Apr. 2022 - May. 2022**

Implemented self-supervised learning to perform object detection in 100 classes.

Pretrained ResNet-50 backbone by DINO and SwAV, then trained Faster R-CNN with customized backbone and feature pyramid network and DETR.

Achieved more than 18 percent of accuracy with bounding boxes under DINO and Faster R-CNN.

Natural Language Processing Class Final Project New York, NY
Group Member **Oct. 2021 - Dec. 2021**

Investigated the mapping between music and words by N-gram.

Created the output of words by the model using music series as the input, where the words are grammatically eligible.

Achievements

Third Prize of Ohio Wesleyan Programming Contest: Won Third Prize as a team member in Apr. 2019.

Presentation

Presentation at the Ohio Section MAA Annual Meeting: Presented the Simulation of Brownian Motion (winter term mathematics research in 2018) at the Ohio Section MAA Annual Meeting in Apr. 2018.

Programming Skills

Languages: Python, Latex, Java, C++, MATLAB

Technologies: Linux, GCP, React, Numpy, PyTorch, Tensorflow

Revelant Courses

Computer Science: Algorithm, Deep Learning, Intro to Deep Learning System, Natural Language Processing, Machine Learning, Operating System, Programming Language

Mathematics: Linear Algebra, Group Theory, Number Theory, Analysis, Fourier Series, Probability