

YUFAN ZHUANG

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EDUCATION

University of California San Diego, La Jolla, CA

Sep 2021 - Present

PhD in Computer Science, Department of Computer Science & Engineering, Advisor: Prof. Jingbo Shang

Research Interests: Natural Language Processing, Large Language Models, Meta Learning

Columbia University, New York, NY

Aug 2018 - Dec 2019

MS in Data Science, Data Science Institute, GPA: 3.96 / 4.00

Coursework: Machine Learning, Deep Learning, Reinforcement Learning, Mathematical Analysis

Hong Kong Polytechnic University, Kowloon, HK

Sep 2014 - May 2018

BSc (Hons) with First Class Honors in Applied Mathematics, Minor in Computer Science, GPA: 4.00 / 4.00

EMPLOYMENT

PhD Research Intern

June 2023 - Sep 2023

Microsoft Research - Deep Learning Group, Supervisor: Dr. Chandan Singh, Dr. Liyuan Liu

Redmond, WA

- Designed LLM for tabular datasets that can outperform optimal/classical decision tree algorithms
- Developed large-scale data collection and model pertaining pipeline
- Paper released on Arxiv

Graduate Research Assistant

Sep 2022 - Current

UC San Diego, Department of Computer Science & Engineering, Advisor: Prof. Jingbo Shang

San Diego, CA

- Generally interested in making LLMs more powerful
- Now is the best time to work on NLP!
- Developed method to teach transformers algorithms - MetaTree
- Developed framework to enhance Transformers by learning attention in adaptive wavelet space - WaveSpa

Research Software Engineer (Full-time)

Jan 2020 - Sep 2021

IBM T. J. Watson Research Center, Supervisor: Dr. Alessandro Morari, Jim Laredo

New York, NY

- Explored ways for neural methods to understand the logic structure of source code for better robustness and interpretability
- Researched novel graphical neural network architecture for vulnerability detection
- Published two papers & filed four patents (2 global patents, 2 US patents)

Graduate Research Intern

May 2019 - August 2019

IBM T. J. Watson Research Center, Supervisor: Dr. Alessandro Morari, Jim Laredo

New York, NY

- Designed and implemented framework for large scale data analysis on HPC
- Developed deep learning pipeline for vulnerability detection and localization

Graduate Research Assistant

Jan 2019 - Dec 2019

Columbia University, Department of Computer Science, Advisor: Prof. Baishakhi Ray, Prof. Suman Jana

New York, NY

- Worked on problems in software engineering that utilize NLP and deep learning, focusing on dataset bias analysis
- Developed models for automated vulnerability detection

Undergraduate Research Assistant

Feb 2017 - Apr 2017 & Mar 2018 - Jul 2018

HKPU, Department of Applied Mathematics, Advisor: Prof. Xin Guo, Prof. Ting-kei Pong

Hong Kong

- Built medical MRI demo using non-convex sparse optimization algorithm
- Conducted analysis of probabilistic as well as SVD-based topic modelling methods

RESEARCH PROJECTS

Transformer for Generating Explainable Decision Tree

Jun 2023 - Feb 2024

Microsoft Research & UC San Diego, Advisor: Dr. Chandan Singh, Dr. Liyuan Liu, Prof. Jingbo Shang

- Training Transformers to generate optimal decision trees on tabular data
- Able to outperform optimal decision tree algorithms and regular decision tree algorithms.

· *Keywords: Meta learning, Tabular Dataset, Explainable Model*

Large Language Model and Social Constructs

Jun 2023 - Present

University of British Columbia, Department of Sociology, Advisor: Prof. Qiang Fu

- LLM provides an innovative perspective on sociology, an ocular we have never had before
- We aim to study how media constructs our reality, using LLM as our powerful probe
- *Keywords: Large Language Model, Prompt Engineering, Computational Sociology*

Effective and Efficient Natural Language Processing

Sep 2022 - June 2023

UC San Diego, Department of Computer Science & Engineering, Advisor: Prof. Jingbo Shang

- Solving challenges related to effectiveness and efficiency of current NLP models
- Thinking from both the model and data perspective
- *Keywords: efficient transformer, data concentration*

Topic Modelling and Sentiment Analysis of Newspaper Articles

Sep 2017 - June 2023

University of British Columbia, Department of Sociology, Advisor: Prof. Qiang Fu

- Analyzed western media's sentiment of Chinese related articles by applying BERT and topic modeling
- Proposed a systematic way of comparing topic modeling methods, including both statistical and neural methods
- *Keywords: sentiment analysis, topic modelling, data mining*

Deep Learning for Software Vulnerability Analysis

Jan 2020 - Sep 2021

IBM Research, Department of Hybrid Cloud, Supervisor: Dr. Alessandro Morari, Jim Laredo

- Probing how much do deep learning models' truly understand about learned software vulnerability
- Enhancing deep learning models' robustness/reliability with software engineering methods
- Explored how GNN can be utilized in fuzzing to reach pre-defined targets
- *Keywords: robustness & interpretability, adversarial learning, GNN, hybrid fuzzing*

Deep Learning for Software Vulnerability Detection

Sep 2018 - Dec 2019

Columbia CS - Analytical Research in Software Engineering Lab, Advisor: Prof. Baishakhi Ray, Prof. Suman Jana

- Utilized deep learning models to discover data biases in current public datasets
- Proposed methodologies in measuring & categorizing the data biases, both quantitatively and qualitatively
- Collected real-world vulnerability data from Chrome Bugzilla and National Vulnerability Database (NVD)
- *Keywords: dataset bias, support vector machine, code normalization*

PREPRINT & PUBLICATION

Yufan Zhuang, Liyuan Liu, Chandan Singh, Jingbo Shang, and Jianfeng Gao "Learning a Decision Tree Algorithm with Transformers" *arXiv preprint arXiv:2402.03774*, (2024).

Yufan Zhuang, Zihan Wang, Fangbo Tao, Jingbo Shang "WavSpA: Wavelet Space Attention for Boosting Transformers' Long Sequence Learning Ability" *NeurIPS UniReps: the First Workshop on Unifying Representations in Neural Models*, 2023

Sahil Suneja, **Yufan Zhuang**, Yunhui Zheng, Jim Laredo, Alessandro Morari, Udayan Khurana, "Incorporating Signal Awareness in Source Code Modeling: An Application to Vulnerability Detection" *ACM Transactions on Software Engineering and Methodology*, Volume 32, Issue 6, Article No.: 145 pp 1-40, 2023

Sahil Suneja, **Yufan Zhuang**, Yunhui Zheng, Jim Laredo, Alessandro Morari, Udayan Khurana, "Code Vulnerability Detection via Signal-Aware Learning" *IEEE 8th European Symposium on Security and Privacy (EuroSecP)*, 2023

Qiang Fu, **Yufan Zhuang**, Yushu Zhu, Xin Guo, "Sleeping Lion or Sick Man? Combining Computational Approaches to Deciphering Heterogeneous Images of Chinese in North America, 1978-2019." *Annals of the American Association of Geographers (IF: 4.683)*, 2022

Yufan Zhuang, Sahil Suneja, Veronika Thost, Giacomo Domeniconi, Alessandro Morari, Jim Laredo "Software Vulnerability Detection via Deep Learning over Disaggregated Code Graph Representation." *arXiv:2109.03341*, 2021

Sahil Suneja, Yunhui Zheng, **Yufan Zhuang**, Alessandro Morari, Jim Laredo "Towards Reliable AI for Source Code Understanding." *ACM Symposium on Cloud Computing (SOCC) Vision Track*, 2021

Yufan Zhuang*, Sahil Suneja*, Yunhui Zheng* (*equal contribution*), Alessandro Morari, Jim Laredo "Probing Model Signal-Awareness via Prediction-Preserving Input Minimization." *ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE)*, 2021

Qiang Fu, **Yufan Zhuang**, Jiaxin Gu, Yushu Zhu, Xin Guo, "Agreeing to Disagree: Choosing among Topic-Modeling Methods." *Big Data Research (IF: 3.578)*, 2020

Luca Buratti, Saurabh Pujar, Mihaela Bornea, Scott McCarley, Yunhui Zheng, Gaetano Rossiello, Alessandro Morari, Jim Laredo, Veronika Thost, **Yufan Zhuang**, Giacomo Domeniconi, “Exploring Software Naturalness through Neural Language Models.” *arXiv:2006.12641*, 2020

Sahil Suneja, Yunhui Zheng, **Yufan Zhuang**, Jim Laredo, Alessandro Morari, “Learning to map source code to software vulnerability using code-as-a-graph.” *arXiv:2006.08614*, 2019

Qiang Fu, **Yufan Zhuang**, Jiaxin Gu, Yushu Zhu, Huihui Qin, Xin Guo, “Search for K: Assessing Five Topic-Modeling Approaches to 120,000 Canadian Articles.” *BPOD workshop at IEEE International Conference on Big Data: 3640-3647*, 2019

PATENT

Sahil Suneja, **Yufan Zhuang**, Yunhui Zheng, Alessandro Morari, Jim Alain Laredo, “Artificial intelligence model learning introspection”, US/WO Patent, No. US20230130781A1, 2023

Sahil Suneja, **Yufan Zhuang**, Yunhui Zheng, Alessandro Morari, Jim Alain Laredo, “Training data augmentation via program simplification”, US/TW/WO Patent, No. US20230113733A1, 2023

Sahil Suneja, **Yufan Zhuang**, Yunhui Zheng, Alessandro Morari, Jim Alain Laredo, “Complexity based artificial intelligence model training”, US/CN/JP Patent, No. US20230115723A1, 2023

Sahil Suneja, **Yufan Zhuang**, Yunhui Zheng, Alessandro Morari, Jim Alain Laredo, “Probing Model Signal Awareness”, US Patent, No. US20220358400A1, 2023

PROFESSIONAL ACTIVITIES

TA Experience: CSE 250A - Probabilistic Reason & Learning (Fall 2022, Fall 2023), CSE 257 - Search and Optimization (Winter 2023), CSE 251A - Machine Learning: Learning Algorithms (Spring 2023)

Reviewer: OOPSLA’20, TSE’21, AAAI’21, OOPSLA’21, NeurIPS’23 (UniReps), WWW’23

Lab instructor of workshop, “An Introduction to Big Data and Automated Text Analysis for Social Scientists”, University of British Columbia, June 7-8, 2019

SELECTED ACCOMPLISHMENTS AND AWARDS

Jacobs School of Engineering Fellowship	2021
Department of Applied Mathematics Scholarship for Hall Residents	2017/18
The Hong Kong Polytechnic University (Eastern Canada) Association Scholarship	2017/18
The Hong Kong Polytechnic University Scholarship	2016/17
Honorable Mention, The Mathematical Contest in Modeling	2016
HKSAR Government Scholarship - Reaching Out Award	2015/16
Dean’s List	2014/15, 2016/17, 2017/18
Second Prize in National Olympiad in Informatics (Anhui Province)	2011