Xianlong Zeng

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Research Interest

My research interests lie in Big Data Analysis and Artificial Intelligence, particularly building big data processing interfaces and tailored deep learning architectures for real-world problem-solving. I am also passionate about applying modern machine learning techniques to domains such as Healthcare and Education Learning.

Education

Ohio University (OU), Ohio	Aug. 2016 -- Dec 2021 (expected)
Ph.D. in Electrical and Computer Engineering	GPA: 4.0/4
Ohio University (OU), Ohio	Aug. 2014 -- Apr. 2016
M.S. in Mathematics	GPA: 3.3/4
University of Science and Technology Beijing (USTB), Beijing	Sep. 2010 -- Jun. 2014
B.S. in Mathematics	GPA: 3.4/4
Fu Jen Catholic University (FJU), Taiwan	Jan. 2013 -- Jul. 2013
Student Exchange Program, Mathematics	

Publications

Journal Article

- **Xianlong Zeng**, Simon Lin, Chang Liu. " Multi-View Deep Learning Framework for Predicting Patient Expenditure in Healthcare. " ***IEEE OJCS***. 2021.
- Peng, Jin(*), **Xianlong Zeng**(*), Janice Townsend, Gilbert Liu, Yungui Huang, and Simon Lin. "A Machine Learning Approach to Uncovering Hidden Utilization Patterns of Early Childhood Dental Care Among Medicaid-Insured Children." ***Frontiers in Public Health***, 2021.
- En-Ju Lin, Jennifer Hefner, **Xianlong Zeng**, Soheil Moosavinasab, Thomas Huber, Jennifer Klima, Chang Liu, and Simon Lin. "A deep learning model for pediatric patient risk stratification." ***American Journal of Managed Care***, 2019.

Conference

- **Xianlong Zeng**, Fanghao Song, Zhongen Li, Krerkkiat Chusap, and Chang Liu. "Human-in-the-loop model explanation via verbatim boundary identification in generated neighborhoods." ***International Cross-Domain Conference, CD-MAKE 2021,*** Digital Conference, Aug. 2021.
- **Xianlong Zeng**, Simon Lin, and Chang Liu. "Transformer-based unsupervised patient representation learning based on medical claims for risk stratification and analysis." ***ACM BCB***, Digital Conference, Aug. 2021.
- **Xianlong Zeng**, Simon Lin, Chang Liu. " Multilevel Self-attention Model and Its Use on Medical Risk Prediction." ***PACIFIC SYMPOSIUM ON BIOCOMPUTING***, Hawaii, USA, 2019.

Preprint

- **Xianlong Zeng**, Simon Lin, and Chang Liu. "Pre-training Transformer-based Framework on Large-scale Pediatric Claims Data for Downstream Population-specific Tasks." ***arXiv preprint (under review by Scientific Reports)***, 2021.
- **Xianlong Zeng,** Soheil Moosavinasab, En-Ju D Lin, Simon Lin, Razvan Bunescu, Chang Liu. " Distributed representation of patients and its use for medical cost prediction." ***arXiv preprint***, 2021.

Conference Poster

- **Zeng, Xianlong,** Soheil Moosavinasab, Enju Lin, Yungui Huang, Chang Liu, and Simon Lin. "DeepChild: Hospitalization Prediction via Neural Network." ***AMIA,*** *San Francisco, USA*, 2021.

Honors & Awards

Winner of the Three Minute Thesis (3MT) Competition	2021
Winner in the DII National Data Science Challenge	2019
Russ College Graduate Scholarships for Ph.D Degree	2016-2021
Mathematics Graduate Scholarships for Master Degree	2014-2016

Talks

Human-in-the-loop model explanation via verbatim boundary identification in generated neighborhoods 2021

Host & Location: CD-MAKE, virtual event

Transformer-based unsupervised patient representation learning 2021

Host & Location: ACM-BCB, virtual event

A Deep Learning Model for Pediatric Patient Risk Stratification 2019

Host & Location: OSU CCTS, OSU center.

Sepsis Mortality Prediction using Deep Learning 2019

Host & Location: UT Health School of Biomedical Informatics, Houston, USA

Research Experience

Ohio University & Nationwide Children's Hospital

Research topic: ***Medical Risk Stratification using Deep Learning*** Jun. 2017 -- Present

Principal Investigator: *Dr. Simon Lin and Dr. Chang Liu*

- Developed pre-processing algorithms based on *Python* and *Jupyter* for processing large-scale medical transactions, and reduce computation time by 80%.
- Designed algorithms (i.e., *MSAM* and *Multi-view*), for high-risk patient identification and future medical cost prediction. Three related papers are published.
- Designed algorithms for patient representation learning, which enables similar patient extraction and patient subtyping. One related paper is published.
- Designed algorithms for medical code embedding learning and cross-generation medical code mapping, and improve the performance of downstream applications by more than 50%. Two related papers are published

Ohio University

Research topic: Explainable artificial intelligence (XAI) Aug. 2019 -- Aug. 2020

Principal Investigator: *Dr. Chang Liu*

- Developed visualization tools and black-box explaining tools for model interpretation, particularly focusing on deep learning models on image dataset, such as *MINST*. One related paper is published, and Two papers are under review.

Research topic: ***Software Bug Report Localization*** Aug. 2017 -- Aug. 2018

Principal Investigator: *Dr. Chang Liu*

- Developed a pipeline to crawl, process, and store the bug reports from open-source software on *GitHub,* and more than 40000 reports are collected.
- Designed algorithms for software bug report localization and identification, and improve accuracy by 15%.

Research topic: ***Food image recognition and calorie estimation*** Aug. 2016 -- Aug. 2017

Principal Investigator: *Dr. Chang Liu*

- Developed a pipeline to crawl, process, and store the food images from websites.
- Designed algorithms for food image recognition and segmentation on smart phone, and reduce computation time by 10% and improve accuracy by 5%. More than 40000 reports are collected.

Teaching Experience

Ohio University Computer Science Department Aug. 2016 – Apr. 2021

- Design and Analysis of Algorithms (Teaching Assistant)
- Introduction to Computer Science in C++ (Teaching Assistant)
- Game Design (Teaching Assistant)
- Computational Theory (Teaching Assistant)

Ohio University Mathematics Department Aug. 2014 -- Apr 2016

- College Algebra (Lecturer)
- Calculus I (Lecturer)

Work Experience

Research IT R&D at Nationwide Children's Hospital. Data Scientist Intern.

Project topic: ***Apply Word2vec and Doc2vec to Medical Domain*** Jun. 2017 -- Sep. 2017

- Wrote the design document of tailored medical-word2vec algorithm in Python and finished the implementation, which successfully compiled using the large-scale medical claims data and achieved 80% reduction in training time.
- Wrote the design document of tailored medical-doc2vec algorithm in Python and finished the implementation, which outperformed local commercial model by more than 60% in accuracy and impact an additional $5 millions in cost.

Project topic: ***Predict High-cost Patient using Language Models*** Jun. 2018 -- Sep. 2019

- Wrote the design document of PMCA algorithm in Python, and finished the implementation, which is the key baseline in many related research projects.
- Wrote the design document of tailored LSTM, CNN, and Transformer algorithms in Python and finished the implementation, and reduced the high-utilizer identification error rate by 30%.
- Built a UI where a user can write query, and the query results are visualized on the map with selected coloring gradient and resolution, which involves writing HTML, JavaScript, and Jupiter.
- Built interpretability toolbox for predictive deep learning models to help physicians understand the results. These tools help to bridge the gaps between medical physicians and AI researchers.

Skills

Operating System: Mac OS X, Linux, Windows.

Language: Python, C, C++, Java, SQL, Golang, Javascript, ReactJS, PHP, HTML, CSS.

Tools: Git, Matlab, Spark, JUnit, Flask, Amazon EC2, RESTful, ElasticSearch, Google Cloud, Unity.

References

Liu Chang, Professor, Ohio University

- Email: liuc@ohio.edu
- Homepage: https://www.ohio.edu/engineering/about/people/liuc

Simon Lin, Chief Research Information Officer, Nationwide Children's Hospital

- Email: Simon.Lin@nationwidechildrens.org
- Homepage: https://www.nationwidechildrens.org/find-a-doctor/profiles/simon-m-lin