Yufan Zheng

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Scholar: https://scholar.google.com/citations?user=btkYKNAAAAAJ | **ORCID**: 0000-0003-0781-0308
Research Interests: data mining, machine learning, network science, dynamic systems.

EDUCATION

NanFang College of Sun Yat-Sen University, Electrical and Computer Engineering Guangdong, China
Bachelor of Engineering Sep 2018 - Jun 2022
- **GPA**: 86.36/100. Major in Computer Science and Technology.
- **Scholarship**: Outstanding Graduates (2022), **Nation Scholarship** (2020).

SELECTED PUBLICATIONS

[1] **Zheng Y**, Yue K, Wong, Eric W M, Yuan, H Y. Association between meteorological factors and human mobility with mosquito activity risk in Hong Kong. medRxiv (2024). (Submitted)

[2] Zhan C, **Zheng Y**, Shao L, Chen G, Zhang H. (2023). Modeling the spread dynamics of multiple-variant coronavirus disease under public health interventions: A general framework. Information Sciences, 628, 469-487. (JCR **Q1**)

[3] Zhan C, Jiang W, **Zheng Y**, Lu J, Zhang Q. (2023). A data-driven study of active meteorological stations and the factors motivating their establishment. Sustainable Energy Technologies and Assessments, 57, 103147. (JCR **Q1**)

[4] Zhan C, **Zheng Y**, Zhang H, Wen Q. (2021). Random-forest-bagging broad learning system with applications for covid-19 pandemic. IEEE Internet of Things Journal, 8(21), 15906-15918. (JCR **Q1**)

[5] Zhan C, **Zheng Y**, Lai Z, Hao T, Li B. (2021). Identifying epidemic spreading dynamics of COVID-19 by pseudocoevolutionary simulated annealing optimizers. Neural Computing and Applications, 33, 4915-4928. (JCR **Q2**)

[6] **Zheng Y**, Zhen Q, Tan M, Hu H, Zhan C. (2021, November). COVID-19's Impact on the Box Office: Machine Learning and Difference-in-Difference. In 2021 16th International Conference on Intelligent Systems and Knowledge Engineering (ISKE) (pp. 458-463). IEEE.

[7] Li J, **Zheng Y**, Hu H, Lu J, Zhan C. (2021, November). Predicting Video Game Sales Based on Machine Learning and Hybrid Feature Selection Method. In 2021 16th International Conference on Intelligent Systems and Knowledge Engineering (ISKE) (pp. 497-502). IEEE.

[8] Wu S, **Zheng Y**, Lai Z, Wu F, Zhan C. (2019, October). Movie box office prediction based on ensemble learning. In 2019 IEEE Symposium on Product Compliance Engineering-Asia (ISPCE-CN) (pp. 1-4). IEEE.

RESEARCH EXPERIENCE

Ongoing Research: Graph Neural Network for Heterogeneous Epidemic Transmission. Jul 2024 – Present
The pattern of epidemic transmission is heterogeneous due to different factors. This research aimed to build prediction models by combining graph neural networks and physical models to predict epidemic outbreaks in multiple regions.
- Analyzed epidemic heterogeneous transmission based on the dynamic mathematical model in different cities.
- Developed more than ten prediction models as the baseline for epidemic transmission prediction, such as statistical time series models (AR, ARMA, GAR, etc.), deep learning time series models (DCRNN, LSTNet, etc.), graph neural network models (ST-GCN, Cola-GNN, EpiGNN, etc.).
- Proposed a framework combing graph neural networks and physical models for epidemic transmission prediction.

City University of Hong Kong, Electrical and Engineering & Biomedical Sciences Department. Hong Kong, China
Research Assistant Dec 2022 – Jul 2024
Responsibilities include assembling and curating datasets, building mathematical and machine learning models, performing data statistical analysis and literature reviews, writing scientific publications, and grant and government reports.

Modeling Mosquito Activity Risks Based on Statistical Model.
Most mosquito-borne diseases are public health threats. To help monitor and prevent mosquito outbreaks, this research aimed to build prediction models to explore the association between different factors and mosquito activity.
- Developed the mosquito activity prediction models based on the statistical model (Distributed Lag Linear and Non-Linear Models) to explore the effect of human mobility and meteorological lag on mosquito activity prediction.
- Evaluated the model performance based on Step-WAIC and cross-validation and implemented sensitivity analysis for model parameters.

Independent Research: Intervention Evaluation based on Computational Epidemiology. Aug 2021 – Present
The dynamic interaction between virus mutation and human behavior has challenged public health. This research aimed to understand the impact of these factors on transmission and evaluate the impact of interventions on the epidemic.

1) Epidemic Transmission Modeling based on Complex Networks and Dynamic Systems.
- Proposed a network-based epidemiological model (system dynamics model), which considered multiple antibodies of individuals and partial cross-immunity between different viruses, and then was simulated in different theory networks (random networks, scale-free networks, small-world networks, etc.).

2) Epidemic Intervention Evaluation based on Dynamic Systems.
- Proposed an epidemiological framework (based on the dynamic systems model) for simulating the multi-directional mutation process and transmission under the scenario considering multiple variants and massive vaccinations.

- Evaluated single and combined public health interventions, including non-pharmaceutical, pharmaceutical, and vaccine interventions, based on sensitivity analysis.

NanFang College of Sun Yat-Sen University, Electrical and Computer Engineering Department. Guangdong, China
Research Assistant   Mar 2019 - Mar 2022

1) Modeling in Healthcare and Public Health based on Machine Learning and Dynamic Systems.

Epidemic transmission is a complex system influenced by multiple factors. To help humans better prevent and control infectious diseases, this research aimed at quantifying and predicting disease transmission and healthcare resources.

- Constructed and cleaned infectious disease time-series data containing 184 countries and 1241 regions from December 2019 to October 2021, obtained from public health departments and multiple data sources.
- Applied statistical models to quantify the impact of the infectious disease outbreak on the box office and online game players, and machine learning models for their prediction.
- Improved an epidemiological model (dynamic systems model, SEIR) combining intercity migration networks to describe the intercity epidemic transmission and developed an improved method based on the simulated annealing to optimize the model parameters.
- Proposed a novel machine learning model combining ensemble learning and broad learning systems to predict infectious disease prediction.
- Developed machine learning models incorporating explanation (Shapley Value) in healthcare resource prediction.

2) Modeling in Entertainment based on Machine Learning.

Predicting the operating trend of entertainment media helps publishers and investors adjust their strategies promptly to maximize profits. To achieve this aim, this project focuses on analyzing and modelling box office and video game sales.

- Crawled and constructed historical video game sales time-series data from 1970 to 2018, a global movie statistics platform from 1980 to 2017, and Chinese Box office time-series data from 2011 to 2019 based on Web crawlers.
- Applied data manipulation, cleaning, visualization, and correlation analysis.
- Proposed a novel hybrid feature selection method (combined with Random Forest and Correlation Coefficient) to improve the performance of video game sales prediction.
- Developed the box office prediction model based on ensemble learning.

WORK EXPERIENCE

Huangpu Institute of Materials, Industrial Software Development Division   Guangdong, China

Responsibilities include data processing and feature engineering, algorithm model development and optimization, algorithm effect evaluation, technology research and innovation, and cross-departmental collaboration.

1) Technician   Jun 2022 - Nov 2022
- Designed industrial drawing recommendation framework, including collaborative filtering based on drawing similarity matrix, the method based on cluster models and classification models.

2) Intern of algorithm   Mar 2022 - Jun 2022
- Developed blood pressure monitoring model and road condition detection model based on machine learning with sensor data and participated in the research of the stocker controller system requirements.

AWARDS AND PROJECTS

Awards
- Provincial third prize, awarded by China Undergraduate Mathematical Contest in Modeling.   Oct 2021
- Merit award paper in 2019 IEEE International Symposium on Product Compliance Engineering-Asia.   Oct 2019

Funded Projects
- Co-PI, Provincial College Students' Innovative Entrepreneurial Training Plan Program, China (10,000 CNY).   2021
- PI, Provincial College Students' Innovative Entrepreneurial Training Plan Program, China (10,000 CNY).   2019

ACADEMIC ACTIVITIES

Conference experience
- Best volunteer at the International Conference on Neural Computing for Advanced Applications 2021, held in Guangzhou, China, led the volunteers' group in preparation and implementation.   Aug 2021
- Participated and delivered an oral presentation at the 2019 IEEE International Symposium on Product Compliance Engineering-Asia, held in Hong Kong, China.   Oct 2019

Review experience

Internet of Things; Infectious Disease Modelling.

ADDITIONAL INFORMATION

References

Prof. Choujun Zhan: zchoujun2@gmail.com**;** Prof. Haijun Zhan: hjzhang@hit.edu.cn

Programming

Python, R, MATLAB, C, Java, MySQL, Linux, LaTeX.

Language

English (IELTS: 6.0).