

JIAHAO JI

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EDUCATION

Nanyang Technological University

Singapore

Visiting Ph.D. in Computer Science

Feb. 2023 - Jan. 2024

Core Work: Spatio-Temporal Data Mining, Traffic Prediction, Self-Supervised Learning

Beihang University

Beijing, China

Ph.D. student in Technology of Computer Application

Sep. 2019 - June 2024

Core Courses: Data Science Foundations, Machine Learning, Principles of Artificial Intelligence

Lund University

Lund, Sweden

Exchange Student of Computer Science

Jan. 2019 - May 2019

Core Courses: Applied Artificial Intelligence

Beihang University

Beijing, China

Bachelor of Computer Science and Technology, GPA: 3.7/4.0

Sep. 2015 - June 2019

Core Courses: Introduction of Data Mining, Principles of Compilers, Operating System

RESEARCH INTEREST

Spatio-Temporal Data Mining, Interpretable Machine Learning, Urban Computing.

PUBLICATIONS

1. **J. Ji**, J. Wang, C. Huang, J. Wu, B. Xu, Z. Wu, J. Zhang and Y. Zheng, "Spatio-temporal self-supervised learning for traffic flow prediction," in *Thirty-seventh AAAI Conference on Artificial Intelligence (AAAI'23)*, 2023. **(CCF A)**
2. J. Wang, **J. Ji**, Z. Jiang, and L. Sun, "Traffic flow prediction based on spatiotemporal potential energy fields," *IEEE Transactions on Knowledge and Data Engineering (TKDE'22)*, 2022. **(IF=9.235, CCF A)**
3. **J. Ji**, J. Wang, J. Wu, B. Han, J. Zhang, and Y. Zheng, "Precision CityShield against hazardous chemicals threats via location mining and self-supervised learning," in *Proceedings of the 28th ACM SIGKDD Conference on Knowledge Discovery and Data Mining (KDD'22)*, 2022, pp. 3072-3080. **(CCF A)**
4. **J. Ji**, J. Wang, Z. Jiang, Jiawei Jiang, Hu Zhanng, "STDEN: Towards physics-guided neural networks for traffic flow prediction," in *Thirty-Sixth AAAI Conference on Artificial Intelligence (AAAI'22)*, vol. 36, no. 4, pp. 4048-4056, 2022. **(CCF A)**
5. **J. Ji**, J. Wang, Z. Jiang, J. Ma, and H. Zhang, "Interpretable spatiotemporal deep learning model for traffic flow prediction based on potential energy fields," in *IEEE International Conference on Data Mining (ICDM'20)*, 2020, pp. 1076-1081. **(CCF B)**
6. Z. Wu, L. Wu, S. Song, **J. Ji**, B. Zou, Z. Li, and X. He, "DialCSP: A two-stage attention-based model for customer satisfaction prediction in e-commerce customer service," in *Joint European Conference on Machine Learning and Knowledge Discovery in Databases (PKDD'22)*, 2022. **(CCF B)**

RESEARCH EXPERIENCE

Citywide Unknown High-risk Locations Discovery

Mar. 2021 - Aug. 2022

Advisor: Prof. Jingyuan Wang, Proj. Yu Zheng

JD Intelligent Cities Research, Beijing

- Proposed a framework for hazardous chemicals-related locations (HCLs) recognition and HCL risk level classification via location mining and self-supervised learning.
- Devised a vehicle id-aware clustering algorithm to accurately recognize HCLs using transportation trajectory data.
- Designed a pre-training-based HCL representation learning methods for HCL classification, including introducing HCL graph to model HCL relations and designing four self-supervised tasks for pre-training.
- Deployed a system in Nantong, China, which has discovered 173 high-risk Unknown HCLs for the local government and successfully moved the hazardous chemicals management of Nantong to the prevention rather emergency response side.

Interpretable Traffic Flow Prediction under Physical Guidance

July 2019 - Mar. 2021

Advisor: Prof. Jingyuan Wang, Prof. Zhe Jiang

BIGSCity, Beihang University

- Proposed to use latent Spatiotemporal Potential Energy Fields (ST-PEF) to model the physics of urban traffic flow, similar to the gravity field drives water flow.
- Developed a Poly-Tree Decomposition (PTD) algorithm to extract the ST-PEF from the traffic flow graph and conducted theoretical analysis on the proposed algorithm to prove its correctness.
- Designed a Poly-tree Based Graph Attention Network (PB-GAT) to incorporate context information into the original GAT, better capturing spatial dependencies of ST-PEF.
- Incorporated traffic flow theory into neural networks to enhance the interpretability of traffic flow predictions while maintain the prediction accuracy.

Human Mobility Drives Distribution of COVID-19

Apr. 2020 - Nov. 2020

Advisor: Prof. Jingyuan Wang, Prof. Huaiyu Tian

BIGSCity, Beihang University

- Analyzed the mobility pattern of the population using cellular signaling data during the first two months of the epidemic in Wuhan.
- Reconstructed the full transmission dynamics of COVID-19 in Wuhan.
- Simulated the effect of Non-Pharmaceutical Interventions (NPIs) for COVID-19 in Wuhan.
- By applying the study result to the precise prevention and control of Beijing's second wave of epidemic at the street level, the intensity of traffic control decreased from 90% of the first wave of epidemics to 20%.

Uncertainties in Artificial Neural Networks

Oct. 2018 - June 2019

Advisor: Prof. Jingyuan Wang

BIGSCity, Beihang University

- Implemented the Sequential Monte Carlo (SMC) sampling algorithm, optimized the SMC algorithm, and obtained nearly 22 times' speedup ratio.
- Developed an algorithm that uses Gaussian mixture distribution to approximate the posterior distribution of parameters in neural networks according to variational inference method.
- Conducted uncertainty analysis on a 3-layer neural network about air quality prediction in KDD Cup 18.

AI Identification of Thyroid Tumors in Ultrasound Images

Nov. 2017 - May 2018

Advisor: Prof. Jingyuan Wang

BIGSCity, Beihang University

- Used the transfer learning to make up for the lack of data sample.
- Finetuned each layer of GoogleNet and obtained an accuracy of 0.85.
- Conducted sensitivity analysis on the tumor images to interpret the model prediction.
- Obtained the second prize in the 27th "Fengru Cup" Competition out of 176 teams.

PROJECTS

- COVID-19 Platform** | *Platform of risk assessment and trend prediction.* Mar. 2020 - May 2020
- Designed the layout, content and display of the weather section and lead a 5-person student team to complete it.
 - Participated in the design of meteorological risk assessment model for epidemics, and verified its correctness through historical data.
 - Responsible for the monitoring and maintenance of the weather module, including exceptions of the model and the page display.
- CCF BDCI** | *Precisely locate the store where the user is located in the mall.* Oct. 2017 - Dec. 2017
- Conducted visualization and feature extraction of user behavior and store information.
 - Used LightGBM for multi-classification to construct candidate sets.
 - Expanded the dataset according to the candidate sets and then performed binary classification.
 - Obtained an accuracy of 0.9075 and a rank of top 4% in nearly 3,000 teams.

HONORS & AWARDS

CETC The 14TH Research Institute Glarun Scholarship: 2022, 2020
Scholarships for Postgraduate Studies: the First Prize, 2022, 2021, 2020, 2019
Huawei Scholarship: 2021
CASC Scholarship: 2020
Outstanding Freshman Scholarship: 2019
National Encouragement Scholarship: 2018, 2017, 2016
Innovation and Entrepreneurship Scholarship of the MIIT: 2018
ASC18 - ASC Student Supercomputer Challenge: the First Prize, 2018
COMAP's Mathematical Contest in Modeling: Meritorious Winner, 2018
The 27th "FengRu Cup" Scientific and Technological Invention Competition: the Second Prize, 2018
Merit Student of Beihang University: 2020, 2018, 2017

TECHNICAL SKILLS

Languages: Python, R, JavaScript
Frameworks: PyTorch, ECharts
Developer Tools: Git, VS Code, QGIS, RStudio
Libraries: Pandas, Matplotlib, GeoPandas, NumPy