ZIHAO LI

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RESEARCH INTERESTS

Cognitive Machine Learning, Knowledge Inference, Data Mining, Spatio-Temporal Graph, Brain-inspired Computing, Reinforcement Learning, Information Retrieval, Geometric Machine Learning, etc. My life-long research goal is to achieve artificial general intelligence that is adaptive, trustworthy, and even with consciousness and creativity.

EDUCATION

Zhejiang University Sep. 2019 – Jun. 2023
Bachelor of Engineering in Electronic and Computer Engineering (double degree) CGPA: 4.0/4.0

University of Illinois at Urbana–Champaign Sep. 2019 – May. 2023
Bachelor of Science in Computer Engineering (double degree) CGPA: 3.94/4.0

All-Courses CGPA Ranking 1/64

PUBLICATIONS

Conference Paper

[Pub1] Z. Qi*, Y. Zhao*, **Z. Li***. Advanced Music Recommendation Model Based on Cross-Shaped Attentionand Cluster Analysis. Accepted by *AIDSCE 2021*. (*: equal contributions) **[Acceptance Notification]**

[Pub2] Z. Li*, Z. Kong*, Y. Song*. Novel Water Allocation Modeling of Colorado River: Water-Electricityand Efficiency-Equity Tradeoffs. Accepted by *CAMMIC 2022*. (*: equal contributions) **[Acceptance Notification]**

[Pub3] Z. Li, J. Xu, B. He, KD. Schewe. Fast and Exact Subgraph Isomorphism Querying: Using Embedding and Searching Techniques. Accepted by *ACAI 2022*. **[Acceptance Notification]**

[Pub4] Z. Li*, D. Fu*, J. He. Everything Evolves in Personalized PageRank. Accepted by *The ACM Web Conference 2023 (**WWW 2023**)*. (*: equal contributions) [To Appear in April 2023]

SELECTED PROJECTS AND RESEARCH

Research Intern at UIUC iSAIL Lab May. 2022 - Oct. 2022
Advisor: Prof. Jingrui He, University of Illinois at Urbana-Champaign

- Completed a research project about PageRank and graph mining. Submitted a paper to *WWW 2023*. This submission has been accepted.

Multi-Agent Reinforcement Learning on Information Overload Feb. 2022 - Present
Advisor: Prof. Lav R. Varshney, University of Illinois at Urbana-Champaign

- Introduced a tax agent (a system component that controls information tax through learning), aiming to mitigate the information overload and improve the efficiency of the entire information system.
- Built simulation and learning environment for two close-to-life scenarios: online advertising and social media, using RLlib and AI-Economist, two frameworks for multi-agent deep reinforcement learning.
- Designed multiple tax policies and conducted large-scale experiments to validate the effectiveness.

Pseudo-time Analysis Based on Deep Learning Approach Oct. 2021 - Present
Advisor: Prof. Zuozhu Liu, Zhejiang University

- Designed and implemented a deep learning network that can return a transition matrix according to the input count matrix which contains the relations of genes and cells. The model can attain over 70% hit rate.
- Introduced deep-learning method into the field of pseudo-time analysis. Trained and tested the model, then visualized the prediction.

Study on Efficient and Accurate Subgraph Isomorphism Mining Mar. 2021 - Oct. 2022
Advisor: Prof. Klaus-Dieter Schewe, Zhejiang University

- Exploited graph embedding and searching into the problem of subgraph isomorphism. At the mean time defined one possible heuristic, which is used to accelerate the computation.

- Proposed an algorithm and one variation of it for subgraph isomorphism querying.

Music Recommendation Model Based on Deep Learning Approach Jun. 2021 - Aug. 2021
Advisor: Mr. Yunfei Zhao, Graduate Student at Stanford University

- Designed a music recommendation system using convolutional token embedding, cross-shaped attension encoder and cluster analysis, starting from the Mel-Spectrumgram of the audios.
- Aimed to solve the cold-start problem of collaborative filtering, which is widely used for now.

Selected Course Projects

Operating System Design | **ECE391: Operating System** Mar. 2022 - May. 2022
Advisor: Prof. Yih-Chun Hu and Zbigniew T. Kalbarczyk, UIUC

- Developed a Linux-like operating system with three other teammates almost from scratch.
- In addition to basic functionalities of OS such as basic device supports, interrupt handlers, memory paging, read-only filesystem, systemcall support, multiple terminals and Round-Robin scheduler, we also implemented many advanced functionalities such as mouse support, graphic user interface, UDP networking and keyboard-piano. Our operating system won 2^{nd} place in the final competition out of 70 teams.

Teaching Assistant Experience

MATH 231 (Calculus II): Integration Skills, Convergence Tests, Power Series, Parametric Curves, Polar Coordinates
MATH 241 (Calculus III): Basic Linear Algebra, Vector Functions, Multivariate Calculus, Vector Fields
MATH 257 (Linear Algebra with Computational Applications): Advanced Linear Algebra
CS/ECE 438 (Communication Networks): Detailed 5-layer Network Model, Wireless Networks, Network Security

Honors and Awards

National Scholarship of China 2022
0.2% of Chinese university students get this award

Zhejiang University Scholarship - First Prize 2022
Top 3% students in Zhejiang University

The Mathematical Contest in Modeling - Meritorious Winner 2022
Top 7% teams in the competition

Provincial Government Scholarship of Zhejiang Province 2021
Top 3% university students in Zhejiang province

Zhejiang University Scholarship - Second Prize 2021
Top 8% students in Zhejiang University

ZJUI Academic Scholarship - Second Prize 2021
Top 3% students in ZJU-UIUC institute

Zhejiang University Scholarship - Third Prize 2020
Top 20% students in Zhejiang University

Chinese Mathematical Olympiad - Bronze Medal 2018
Top 300 in China, top 10 in Hebei Province

Skills

Programming or Marking Languages: Python, C, C++, x86, System Verilog, LC-3, MATLAB, HTML, Markdown
Tools: LaTeX, Git, CUDA, Docker, Linux Machine, SSH, httpd, GitHub Pages, Notion
Frameworks: PyTorch, Gym, RLlib
Languages: Mandarin, English (**TOEFL: 110** Reading: 28, Listening: 30, Speaking: 24, Writing: 28) **[Score Report]** (**GRE: 321 + 4.0** Verbal: 151, Quantative: 170, Analytical Writing: 4.0) **[Score Report]**

Extracurricular Activities

Runner-up of Zhejiang University International Campus Football Cup as the **captain** in year 2021
Champion of Zhejiang University International Campus Football Cup as the **team member** in year 2020, 2019

李子豪

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研究兴趣

机器知识推理, 数据挖掘, 时空图, 类脑计算, 强化学习, 信息检索, 几何深度学习等。研究最终目标为实现自适应, 可信任, 甚至具有机器意识和创造性的通用人工智能。

教育经历

浙江大学 2019.9 - 2023.6

工学学士-电子与计算机工程 (双学位), 获国家奖学金 CGPA: 4.0/4.0

伊利诺伊大学厄巴纳香槟分校 2019.9 - 2023.5

理学学士-计算机工程 (双学位), 所有学年均入选院长名单 CGPA: 3.94/4.0

专业排名 1/64

出版物

Conference Paper

[Pub1] Z. Qi*, Y. Zhao*, **Z. Li***. Advanced Music Recommendation Model Based on Cross-Shaped Attention and Cluster Analysis. Accepted by *AIDSCE 2021*. (*: equal contributions) **[Acceptance Notification]**

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研究经历

UIUC iSAIL 实验室研究实习生 2022.5-2022.10

Advisor: Prof. Jingrui He, University of Illinois at Urbana-Champaign

- 完成一个关于 PageRank 算法和异质时空图挖掘的研究项目。以共同第一作者身份向 WWW 2023 投稿并被接收。

利用多智能体强化学习寻找缓解信息过载的策略 2022.2-目前

Advisor: Prof. Lav R. Varshney, University of Illinois at Urbana-Champaign

- 引入税务智能体 (通过学习控制信息税收的系统组件)，旨在缓解信息过载，同时提高整个信息系统的效率。
- 使用 RLlib 和 AI-Economist 这两种多智能体深度强化学习框架，为在线广告和社交媒体这两种接近生活的场景构建了模拟和学习环境。
- 设计多种税收政策，进行大规模实验验证有效性。

基于深度学习方法的拟时序分析 2021.10-目前

Advisor: Prof. Zuozhu Liu, Zhejiang University

- 设计并实现了一个深度学习网络，该网络可以根据包含基因和细胞关系的输入计数矩阵返回一个转换矩阵。该模型可达到 70% 以上的准确率。
- 这是一个开创性的工作。我们将深度学习方法引入拟时序分析领域。我们训练和测试了模型，并进行了预测结果的可视化。

高效准确的子图同构挖掘研究 2021.3-2022.10

Advisor: Prof. Klaus-Dieter Schewe, Zhejiang University

- 将 graph embedding 和启发式搜索应用于子图同构搜索问题 (NP-hard)。同时定义了一种可能的 Heuristic，用于加速计算。提出了一种同构子图搜索算法及其变体, 用于权衡速度和准确度。

基于深度学习方法的音乐推荐模型 2021.6-2021.8

Advisor: Mr. Yunfei Zhao, Graduate Student at Stanford University

- 设计了一个使用 convolutional token embedding，cross-shaped attension encoder, 聚类分析的和音乐推荐系统，能够根据音频的梅尔频谱图进行推荐。旨在解决目前广泛应用的协同过滤推荐方法的冷启动问题。

实习经历

河北中惠博裕科技有限公司, Mentor: Liming Yin, General Manager 2020.6-2020.8

- 负责定标专家抽取系统开发, 使用开源 Excel 解析工具并设计、开发了一个动态抽取系统页面 (HTML5+CSS)。

杭州奇盾信息技术有限公司, Advisor: Prof. Yan Chen, NWU, IEEE Fellow; Mentor: Yang Hai 2021.6-2021.7

- 协助研发部 Kubernetes 安全监测系统原型开发与部署, 将资源监测工具 Weave Scope, 资产清点工具 Grafana, 日志系统 Kibana 和基线检测 CIS Benchmark 整合为一个完整的安全监测系统并简单地设计了系统页面 (Golang)。

课程设计

操作系统设计 | ECE391: Operating System 2022.3-2022.5

Advisor: Prof. Yih-Chun Hu and Zbigniew T. Kalbarczyk, UIUC

- 几乎从零开始，和其他三个组员共同开发了一个类似 Linux 的操作系统。
- 除了操作系统的基本功能，如基本设备支持、中断处理程序、内存分页、只读文件系统，系统调用支持，多终端和轮询调度程序，我们还实现了许多高级功能，如鼠标支持，图形用户界面 (GUI)，UDP 网络和音响 (并设计了一个键盘钢琴)。根据教授与助教的评判, 我们的操作系统在最终的 70 支队伍中获得了**第二名**。

助教经历

MATH 231 (微积分 II): 积分方法, 收敛检测, 级数, 参数方程, 极坐标
MATH 241 (微积分 III): 基本线性代数, 矢量方程, 多元函数微分, 测度论, 多重积分, 向量场, 曲线曲面积分
MATH 257 (线性代数): 向量空间, 秩, 矩阵的逆, 线性映射, 行列式, 特征值和特征向量, 相似矩阵, 对角化
CS/ECE 438 (通信网络): 五层网络模型 (应用层，传输层，网络层，链路层，物理层), 无线网络, 网络安全

荣誉奖项

- 国家奖学金, 2022 年 10 月
- 浙江大学一等奖学金, 2022 年 10 月
- 美国大学生数学建模竞赛一等奖 (Meritorious Winner), 2021 年 5 月
- 浙江省政府奖学金, 2021 年 10 月
- 浙江大学二等奖学金, 2021 年 10 月
- 全国大学生数学竞赛非数学类一等奖, 2020, 2021 年
- 中国数学奥林匹克铜牌, 2018 年
- 全国高中数学竞赛河北省赛区一等奖, 获第七名入选省队, 2018 年

技术能力

- **编程或标记语言**: Python, C, C++, x86, System Verilog, LC-3, MATLAB, HTML, Markdown
- **工具**: LaTeX, Git, CUDA, Docker, Linux Machine, SSH, httpd, GitHub Pages, Notion
- **框架**: PyTorch, Gym, RLlib
- **语言**: Mandarin, English (**TOEFL: 110** Reading: 28, Listening: 30, Speaking: 24, Writing: 28) **[Score Report]** (**GRE: 321 + 4.0** Verbal: 151, Quantative: 170, Analytical Writing: 4.0) **[Score Report]**

业余活动

- 2021 年浙江大学国际校区新生杯足球比赛亚军，队长
- 2020, 2019 年浙江大学国际校区新生杯足球比赛冠军，主力队员
- GitHub 项目 HowToUIUC 的开发者, 旨在为中国留学生提供在 UIUC 学习和生活上的的一些 tips。
- 曾于学生会宣传部负责校区公众号运营。