Jiarui Hai

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Education

Doctor of Philosophy — Johns Hopkins University
Electrical and Computer Engineering — Aug 2022 – Present
Advisor: Prof. Mounya Elhilali
Researcher Assistant at the Laboratory for Computational Audio Perception

Master of Engineering — Tsinghua University
Civil Engineering — Aug 2020 – Jun 2022
Member of Big Data Program

Bachelor of Science — Tsinghua University
Business Analytics — Aug 2016 – Jun 2020

Bachelor of Engineering — Tsinghua University
Civil Engineering — Aug 2016 – Jun 2020

Research Experience | Audio Generative Models

DPM-TSE: A Diffusion Probabilistic Model for Target Sound Extraction [7] — Apr 2023 – Aug 2023
Johns Hopkins University — Baltimore, USA
Advisor: Prof. Mounya Elhilali | Colllaborator: Helin Wang (JHU)

- Introduced a diffusion probabilistic model based generative method to deal with the target sound extraction task, which aims to extract the sound part of a target sound event class from a mixture audio with multiple sound events.
- Applied a fixed diffusion model to deal with the noise floor issue in the original diffusion method.

Diff-Pitcher: Diffusion-based Singing Voice Pitch Correction [5] — Mar 2023 – May 2023
Johns Hopkins University — Baltimore, USA
Advisor: Prof. Mounya Elhilali

- Designed a diffusion-based pitch correction system which consists of two modules: pitch predictor and pitch controller.
- Explored Diff-Pitcher in score-based and template-based automatic pitch correction applications.

Automatic Rap Music Generation — Jun 2021 – Jan2022
Kwai Inc. — Beijing, China
Advisor: Prof. Zhiyao Duan | University of Rochester

- Collected paired rap and speech data and manually annotated rhythmic patterns for rap songs.
- Developed a speech-to-rap system wtih two components: rhythm alignment and pitch contour transfer.

Research Experience | Multimodal Machine Learning

Boosting Modality Representation for Multimodal Sentiment Analysis [6] — Apr 2023 – Jun 2023
Johns Hopkins University — Baltimore, USA
Advisor: Prof. Mounya Elhilali

- Utilized pre-trained models to improve modality representation for multimodal sentiment analysis.
- Introduced a two-stage training strategy to address overfitting problem in fine-tuning pre-trained models.
- Conducted a comparative study of various fusion methods when using pre-trained feature extractors.

Enhancing Multimodal Clinical Diagnosis Prediction through Hybrid Fusion [9] — May 2022 – Aug 2022
Northwestern University — Online Collaboration
Collaborator: Dr. Jiancheng Ye

- Designed a model for efficiently fusing unstructured text data and structured data for clinical diagnosis.

Multimodal Music Sentiment Analysis Apr 2021 – Jun 2021
Tsinghua University Beijing, China
Advisor: Prof. Xudong Zhang

- Introduced a multimodal music sentiment recognition network based on transformer and gated fusion.

Research Experience | General Machine Learning and Data Science

Covid-19 Vaccination Sentiment Analysis [4] Apr 2021 – Sep 2021
Northwestern University Online Collaboration
Collaborator: Dr. Jiancheng Ye

- Collected and annotated Twitter data related to vaccines and conducted sentiment analysis with the pre-trained BERT model.

Social Network Data Imputation [1] Jul 2021 – Aug 2021
University of Notre Dame Online Program
Advisor: Prof. Zhiyong Johnny Zhang

- Conducted a comprehensive comparison of graph data imputation methods on social network data.

Publications

- 1. Ziqian Xu, **Jiarui Hai**, Yutong Yang, and Zhiyong Zhang. Comparison of Methods for Imputing Social Network Data. Journal of Data Science (2022): 1-20.
- 2. Jiancheng Ye, Zidan Wang, and **Jiarui Hai**. Social networking service, patient-generated health data, and population health informatics: national cross-sectional study of patterns and implications of leveraging digital technologies to support mental health and well-being. Journal of medical Internet research 24, no. 4 (2022): e30898.
- 3. Rui Lu, Baigong Zheng, **Jiarui Hai**, Fei Tao, Zhiyao Duan, and Ji Liu. Progressive Teacher-Student Training Framework for Music Tagging. ICASSP 2022-2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). IEEE, 2022.
- 4. Jiancheng Ye*, **Jiarui Hai***, Zidan Wang, Chumei Wei, and Jiacheng Song. Leveraging natural language processing and geospatial time series model to analyze COVID-19 vaccination sentiment dynamics on Tweets. JAMIA open 6.2 (2023): ooad023. (*Co-first author)
- 5. **Jiarui Hai**, Mounya Elhilali. Diff-Pitcher: Diffusion-based Singing Voice Pitch Correction. 2023 IEEE Workshop on Applications of Signal Processing to Audio and Acoustics (WASPAA). IEEE, 2023.
- 6. **Jiarui Hai***, Yu-jeh Liu* Mounya Elhilali. Boosting Modality Representation with Pre-trained Models and Multi-task Training for Multimodal Sentiment Analysis. 2023 IEEE Automatic Speech Recognition and Understanding Workshop (ASRU). IEEE, 2023. (*Co-first author)
- 7. **Jiarui Hai***, Helin Wang*, Dongchao Yang, Karan Thakkar, Najim Dehak, Mounya Elhilali. DPM-TSE: A Diffusion Probabilistic Model for Target Sound Extraction. ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). IEEE, 2024. (*Co-first author)
- 8. Karan Thakkar, **Jiarui Hai**, Mounya Elhilali. Investigating Self-Supervised Deep Representations for EEG-based Auditory Attention Decoding. ICASSP 2024-2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP). IEEE, 2024.

Pre-prints

- 9. Jiancheng Ye*, **Jiarui Hai***, Jiacheng Song, Zidan Wang. Multimodal Data Hybrid Fusion and Natural Language Processing for Clinical Prediction Models. medRxiv, 2023. (*Co-first author)

Extracurricular Activities

Rap/HipHop Association Aug 2018 – Jun 2022
Tsinghua University Beijing, China
Honor President

- Featured in a rap song on a Chinese TV show
- Conducted a lecture on music production at Modern Sky, China's leading music company
- Showcased my music on the stage of "Ted X Tsinghua 2018"

Skills

Deep Learning Platforms	Pytorch, Tensorflow
Programming Languages	Python, R, C, JavaScript, MySQL, MATLAB
Music Skills	Composition, Production, Mixing, Recording

Awards

Top New Producer **(1%)**	BeatsHome Hip-hop Production Contest	*2021*
Excellent student **(10%)**	Tsinghua University	*2018*
Excellence in Literature and Art **(5%)**	Tsinghua University	*2017&2018&2019*