Zhehan Qu

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EDUCATION

Duke University Aug. 2022 – Present
Ph.D. Student, Computer Science Durham, NC, USA

- **Research Interests**: Augmented/Virtual Reality (User Context Sensing), Machine Learning
- **GPA**: 4.0/4.0

Shanghai Jiao Tong University Sep. 2018 – Jun. 2022
Bachelor, Computer Science and Engineering (IEEE Class) Shanghai, China

- **GPA**: 3.78/4.3, or 88.54/100

RESEARCH EXPERIENCE

User Attention Pattern Detection in Augmented / Virtual Reality July 2023 – Present
Intelligent Interactive Internet of Things Lab Duke University

- Developed a custom **Sudoku** solver app in **Unity** that provides real-time hints, deployed on both AR (Magic Leap 2) and VR (HP Omnicept) headsets. The AR version also includes a python backend for real-time **digit recognition** with **OpenCV** and a **TensorFlow** deep learning model
- Utilized **eye-tracking** data to detect task-detrimental user attention patterns via **machine learning** techniques, e.g. a Transformer for time-series data
- Analyzing differences in **gaze patterns between AR and VR**, and the impact of users' **attention control ability** on their behavior

Federated Learning with Data Augmentation July 2020 – May 2022
Advanced Network Laboratory Shanghai Jiao Tong University

- Focused on **statistical heterogeneity in federated learning (FL)**, aiming to alleviate the problem of **non-IID data**
- Add a data augmentation stage during global training of FL to complement lacking labels on each client to stabilize distribution of data selected each round; locally fine-tune the model before testing on clients
- Select data generator (for data augmentation) and datasets carefully after thorough investigation. Conducted extensive experiments on real-world image and text datasets and achieved satisfactory results

Readability Controlled Open-Domain Question-Answering System on COVID-19 Feb. 2021 – May. 2021
AI+X Project-Based Learning, NLP Program MIT & Touch EdTech

- Build an open-domain **question-answering** (QA) system based on RAG structure, which enables control of the readability of the answer
- Prepend readability scores to sentences to fine-tune BART, the generator part of RAG, following the CTRL manner; modify the retriever of RAG by adding a score of readability match in addition to similarity check
- Manually collect datasets from wikipedia and WHO official websites to build the knowledge base (>3GB) and QA pairs (2000+ entries) dataset

Privacy-Preserving Inference in Crowdsourcing Systems Sept. 2019 – March. 2020
"Participation in Research" Program Shanghai Jiao Tong University

- Worked on a crowdsourcing indoor localization system where privacy of all participants are guaranteed by differential privacy
- Perturb user data to avoid information leakage, while preserving certain degree of accuracy following the idea of differential privacy
- Implementation via java pailiar, full participation of coding

Internship

Gematria Technologies Sept. 2021 – Jan. 2022
Intern London, U.K.

- Remote intern at an NLP startup company
- Worked on processing news articles with various tools related to **Natural Language Processing**, including NER, co-reference resolution, entity linking and sentiment analysis. Aiming at discovering the sentiment of a given topic in news reports in a certain time period, and further exploiting the information for predicting trend in the stock market

Publications

Conference Proceedings

- **[IPSN24]** L. Duan, Y. Chen, **Z. Qu**, M. McGrath, E. Ehmke, M. Gorlatova, BiGuide: A Bi-Level Data Acquisition Guidance for Object Detection on Mobile Devices, To appear in Proceedings of the 23nd International Conference on Information Processing in Sensor Networks (IPSN '24), Hong Kong, China, May 2024. (**21.5% acceptance rate**)

Poster Presentations

- **[IEEEVR24]** R. Byrne, **Z. Qu**, C. Fronk, S. Eom, T. Scargill, M. Gorlatova, AR Simulations in VR: The Case for Environmental Awareness, To appear in Proc. IEEE VR, Mar. 2024.

OTHER PROJECTS

Data Science Winter School 2021 Feb. 2021 – March 2021
Online participant (Remote) Imperial College London

- Learned basics, theories, applications of data science
- Worked on a **brain tumor detection** project, gained good performance on a small dataset (about 4k images) for image classification and segmentation with data augmentation techniques. Performance boosts of 7% and 5% are achieved respectively by our team for classification and segmentation task respectively under my lead

Deployment and Optimization of Neural Network on Ascend Processor

- Deployed *Multinet++* on Ascend Processor, and made it more efficient by changing model architecture and softmax implementation

Supervisor Recommendation System with Graph Neural Network

- Recommend supervisors of specific institution to users according to his/her paper reading history
- Based on *MAGNN*, designed meta paths to train the model

HONORS

Zhiyuan College Honor Scholorship 2019, 2020, 2021

NSF AI Spring School Applied AI Poster Award Mar. 2024
***Z. Qu**, S. Eom, R. Byrne, M. Gorlatova, Eye Tracking-Based Attention Pattern Recognition in Extended Reality* UTSA

SKILLS

Programming Languages: Python, C++, Kotlin, C#
Library and Tools: PyTorch, MRTK, Vuforia