Zeli Ma

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Department of Computer Science, Whiting School of Engineering, Johns Hopkins University

RESEARCH INTERESTS

I am broadly interested in Machine Learning and Artificial Intelligence, especially their integration with software systems and intelligent automation. My focus lies in exploring how data-driven models and efficient system design can enhance learning performance, scalability, and decision-making in real world applications. I am also keen to apply AI techniques to domains such as computer vision, interactive environments, where intelligence meets system-level engineering.

EDUCATION

Johns Hopkins University Sep. 2025—May. 2027(*Expected*)
M.S.E in computer science

Shanghai Institute of Technology Sep. 2020—Mar. 2025
Bachelor of Engineering in Software Engineering
CGPA: 4.0/5.0 (**Average Score:** 90%; **Rank:** 1/408)

HONORS AND AWARDS

National Scholarship 2023
Shanghai Institute of Technology

Outstanding Student 2024
Shanghai Institute of Technology

University-Level First-class Scholarship 2023&2024
Shanghai Institute of Technology

RESEARCH EXPERIENCE

Johns Hopkins University, ARCADE Lab | Baltimore, MD, USA Jan. 2026—Present
Graduate Research Assistant
Advisor: Prof. *Mathias Unberath*, Ph.D. *Blanca Inigo Romillo*

- Developed a Monte Carlo-based path planning pipeline for pedicle screw placement across the full thoracolumbar spine (T1–L5), processing 742 patient CT-derived mesh models and generating 23,000+ validated trajectories with 99% success rate
- Engineered region-adaptive constraints for 4 anatomical zones to address varying pedicle morphology, and implemented a surface normal-based endplate filter that eliminated 100% of superior/inferior surface violations
- Built automated batch processing infrastructure with mesh quality control, EDT-based clearance computation, and FCSV output for 3D Slicer visualization and validation

Action-Conditioned Intraoperative X-ray View Prediction Mar. 2026—Present

Conditional diffusion model for surgical view planning under C-arm guidance

- Built an observation prediction module for closed-loop surgical view planning: given a current fluoroscopy image and a candidate 6-DoF C-arm motion, a conditional diffusion model (DDPM training / DDIM inference) predicts the X-ray at the resulting viewpoint as a visual preview for a downstream VLM (MedGemma)
- Constructed a DRR training dataset from 827 CT volumes using DeepDRR, sampling 100 poses per case (5 vertebra centers × 20 angles spanning AP/lateral/oblique) and filtering ~1,500 training pairs per case by angular and translation distance thresholds
- Designed a U-Net backbone with cross-attention for source image conditioning and AdaGroupNorm for injecting a 9-D relative pose embedding (6D rotation + 3D translation)
- Trained with DDPM training / DDIM inference using mixed-precision (fp16) on an RTX 3090

PROFESSIONAL EXPERIENCE

***Qingdao Haier* Technology Co., Ltd** Mar. 2024—Aug. 2024

Intern at Software Development Department

- Utilized Redis to optimize the system performance bottlenecks under high concurrency; reduced the database visits by approximately 40% and minimized the overall response time
- Designed and developed a batch-processing mechanism to minimize memory consumption
- Optimized database query statements, avoided complex nested queries and full table scanning, and added indexes to improve database query performance in high-concurrency scenarios
- Implemented a delayed double-deletion strategy, as opposed to the asynchronous listening and reliable message-deletion strategy

***Qingdao Haier* Technology Co., Ltd** Jul. 2023—Oct. 2023

Intern at Software Development Department

- Ensured high availability of the user experience cloud platform and resolved performance crashes; designed the *app* using the *SpringBoot* and utilized *PostgreSQL* for data storage and table creation
- Used *Profiler* to specify code and performance bottlenecks; Implemented strategies such as algorithm optimization and reduction of database access frequency
- Leveraged *Alibaba Cloud's Prometheus* service to evaluate memory utilization patterns, specifying the primary causes such as excessive object creation, memory leaks, and large object presence
- Adopted the *Object Pool Technology* to create common objects beforehand, batch-processed big data to reduce memory utilization, and used *Bitmap* to compress user information data structures

***iFLYTEK* Co., Ltd.** Dec. 2022—Jan. 2023

Intern at Software Development Department

Developed a domain-specific speech recognition pipeline for hydrology and water conservancy engineering.

- Collected and processed fieldwork data, extracting key clauses and terms from technical specifications through custom text-segmentation scripts.
- Built a speech synthesis corpus using Tacotron2_CSMSC, generating multi-timbre audio and aligning text–audio pairs into training, validation, and test datasets.
- Trained and evaluated multiple ASR architectures—DeepSpeech2, Transformer, Conformer, and iFlytek's open-platform model—on the domain corpus.
- Selected 10–25 top-performing checkpoints based on validation loss and combined them into an optimal averaged model.
- Achieved a 30% improvement in recognition accuracy, reaching a >99% success rate on domain-specific evaluation data.

EXTRACURRICULAR ACTIVITIES

Blogger/Content Creator, Bilibili.com Jun. 2020—Present

- Wrote and updated 50+ articles associated with music and acquired 5,000+ followers
- Planned and produced 30+ videos during the annual celebration of *ilem*, which received 70,000+ views on the *Bilibili* video playback web platform

Volunteer*, Oak Bay* Community, *Tangshan* City, *Hebei* Province Jun. 2022

- Responsible for the recycling trash of 1,000+ residents across four buildings
- Developed a *WeChat* mini-program with an attractive UI and a friendly operational logic to support our community in information registration
- Ensured the order of the daily nucleic acid testing sites

SKILLS

Programming languages: *C/C++, Python, Java, C#*
Development software: *Unity, SpringBoot, Redis, Vue*
Operating System: *CentOS, Debian, Ubuntu, Microsoft Windows, Mac OS*
Others: *Microsoft Office*
Standardized Tests: TOEFL 109 (R30/L30/S22/W27), GRE 320 (V152/Q168 + 3.5)