Reachsak Ly

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EDUCATION

Virginia Polytechnic Institute and State University   Blacksburg, VA
Doctor of Philosophy in Environmental Design and Planning   *Aug. 2022-Expected May 2025*

Zhejiang University   Hangzhou, China
Bachelor of Engineering in Civil Engineering   *Sept. 2017- July 2021*

PROJECT

AI assistant for smart building using Large Language Model and Small Language model (SLM)   *Feb. 2024 – Present*
- Deployed open-sourced SLMs and LLMs such as Phi-3 mini and LLaMA 3 on Raspberry Pi 5 using llama.cpp.
- Developed SLM-based AI assistant for building appliance control with Raspberry Pi 5, whisper, piper, LLaMA.
- Developed LLM-based AI assistant for smart building appliance control. [Paper]

TwinGPT:Large Language Model-based AI assistant for Digital twin query   *Dec. 2024 - Present*
- Developed AI-based digital twin data query system using LLaMA 3 and Autodesk Tandem.

AI agent for Autonomous Building operation using Large Language Model   *Feb. 2024 - Present*
- Developed LLM-based AI agent for autonomous building operation to enhance occupant comfort. [Paper]

Vision Language Model-based AI agent for Construction Site Progress and Safety Monitoring   *Dec. 2024 - Present*
- Developed Multimodal AI agent using Vision Language Models (VLMs) to autonomously monitor construction site progress and safety conditions.
- Deployed open-sourced Vision Language Models (e.g. MiniCPM-V) locally using llama.cpp.

Vision Language Model-based AI assistant and AI agents and (XR) Extended Reality application   *May. 2024 - Present*
- Deployed open-sourced vision language model (e.g. LLaVA), open-sourced Text-to-speech, and Speech-to-Text model (e.g. Whisper, Piper) onto Microsoft HoloLens 2 with Unity 3D.
- Developed Multimodal AI assistant for XR environment with voice chat and image understanding capabilities.

Data-driven Smart Building Facilities Management using AI Assistant and Digital Twin   *Jan 2024 - Present*
- Leveraged LLM to develop an AI assistant-driven decision support system for analyzing historical IoT and digital twin data to provide visualization, insights, and suggestions to optimize building operation performance.
- Developed digital building twin using Autodesk platform service, IoT sensors, and Raspberry Pi.

Retrieval-Augmented Generation (RAG) Chatbot for Construction Safety using LLM   *Mar. 2024 – Jan. 2025*
- Developed a retrieval-augmented generation (RAG) chatbot using LLaMA 3, Llamaindex, and Vector Database to provide construction personnel construction safety protocols and related building codes.

Decentralized Digital building twin using Public and Private Blockchain network   *Aug. 2022 - Jan. 2025*
- Developed decentralized digital twin and building automation system using Hyperledger Fabric, Ethereum blockchain, Autodesk Platform Service, Autodesk Tandem, and IoT sensors/devices. [Paper]

EXPERIENCE

Graduate Research Assistant, Virginia Tech   *Aug. 2022 - Present*
- Conduct research on emerging technologies such as Blockchain, Deep learning, Large Language Models (LLMs), AR/XR, Digital Twin, and robotics for smart building and built environments.

Graduate Teaching Assistant, Virginia Tech   *Aug. 2022 - Present*
- Course taught: Digital Building Twin, Generative AI in Construction, BIM, Construction Practice and Capstone

Undergraduate Research Assistant, Zhejiang University   *Mar. 2019 - June. 2021*
- Conduct research on Machine Learning applications in Structural health monitoring.
- Develop damage identification and crack segmentation system using Deep Convolutional Neural Networks.

TECHNICAL SKILLS

Language: Python, C#, JavaScript, C++, Java, HTML/CSS, ROS, Solidity and MATLAB
Data Science & Machine Learning: TensorFlow, PyTorch, Scikit-Learn, Pandas, NumPy, Matplotlib, CUDA
Generative AI development tools: Llama.cpp, Llamaindex, Huggingface, Langchain, Unsloth AI, CrewAI, MLX
Development tools/Databases: Docker, Git, MySQL, MongoDB, Qdrant, ChromaDB, RESTful API, Flask, Azure
Skills: Generative AI, Data visualization, Autonomous building system and Digital twin development.

HONORS & AWARDS
- Excellent Award in the International Project Competition in Structural Health Monitoring   UIUC, 2020
- 1st Place in Microsoft Hackathon : Window App Studio Challenge   Microsoft, 2016