Akash Mallepally

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Education

Virginia Tech (Virginia Polytechnic Institute and State University) Graduation: May 2026
Master's in Computer Engineering

University of Wisconsin-Madison Graduation: December 2023
Bachelor's in Computer Science, History

Relevant Coursework: Optimization, Applied Linear Systems, Industrial Robotics, Natural Language Processing, Deep Reinforcement Learning, Advanced Machine Learning, Computer Vision, Operating Systems, Virtual Reality, Graphics, Data Structures and Algorithms, Object Oriented Programming, Global Health in Africa, History of Science

Skills

Technical Skills: Programming and prototyping in Python, C++, C#, and Java; Machine Learning and Deep Learning using PyTorch and TensorFlow; LLM based systems including prompt engineering, reinforcement learning, and adaptive agents; computer Vision and multimodal perception pipelines; interactive and embodied systems development using Unity and XR toolchains; experimental design, data analysis, and reproducible research workflows.

Work Experience

Graduate Research Assistant (Robot-LLM Humor) July 2025 - Current
Mind Music Machine (tri-M) Lab, Virginia Tech, VA

- Led research on LLM-based humor generation and robot comedy, addressing the challenge of making social robots engaging and contextually funny in real-world interactions
- Formulated and implemented novel RLHF and fine-tuning strategies to personalize humor style and conversational tone, improving model adaptability to individual user preferences
- Engineered dynamic prompt-tuning and context adaptation pipelines that allow multimodal dialogue systems to adjust humor and empathy based on emotional and environmental cues
- Fine-tuned Llama-family models on a custom multimodal humor dataset integrating textual jokes, semantic gestures, and funniness ratings, enhancing robots' expressive language capabilities
- Integrated LLM outputs with a humanoid robot, synchronizing verbal and gestural responses to create expressive, timed, and emotionally aligned humor delivery
- Designed, organized, and conducted user studies to evaluate humor perception, emotional engagement, and trust, yielding insights for personalized robot–human communication

Research Assistant (Biolphilic AR) April 2025 - Current
Myers-Lawson School of Construction, Virginia Tech, VA

- Developed an Android AR application in Unity (C + AR Foundation) that simulated biophilic and non-biophilic environments for older adults, enhancing emotional, cognitive, and physiological engagement during controlled experiments at a senior living community
- Engineered a speech-to-LLM interaction pipeline enabling natural-language navigation and control within the AR interface, simplifying system interaction for elderly users with limited technological familiarity
- Applied and optimized prompt-engineering workflows to generate context-specific biophilic 3D assets through text-to-3D and image-to-3D synthesis, accelerating content creation for personalized immersive environments
- Modeled and animated interactive virtual objects to enhance immersion and memory recall during reminiscence therapy scenarios, contributing to affective engagement and cognitive stimulation
- Experimented with LiDAR-based spatial mapping and implemented cloud anchoring to preserve and reload personalized virtual spaces across sessions, strengthening continuity in longitudinal well-being assessments

Research Assistant (Multimodal Human-Robot Interface) September 2024 - Current

Department of Civil and Environmental Engineering, Virginia Tech, VA

- Researched and developed a scalable, multi-modal, and intelligent Human-Robot interaction framework integrating LLMs, Computer Vision (CV), and Virtual Reality (VR) to boost human-machine collaboration
- Induced intelligence into the VR communication system via YOLO v11 model to analyze the and fine-tuned EfficientNet & CNN models using Python PyTorch framework for user emotion-engagement detection with accuracy of 81% on real-time user facial expressions.
- Programmed a feedback loop-based dynamic prompt engineering system in C# for LLM customization with OpenAI's GPT-4o and Whisper speech recognition system in the application to create a collaborative intelligent system
- Established real-time connection to physical robots via ROS to enable connection between user needs & commands and robot executable tasks
- Successfully increased the scalability of the interaction channel by making the platform robot-neutral and adaptable to any commonly used urban or domestic robot

Research Assistant October - December 2023

People and Robots Lab, UW-Madison, WI

- Aided an Augmented Reality worker-robot interaction study on Unity for deployment on the Microsoft HoloLens2 by developing visual and interactive tools to give usability an expected 50% boost in comparison to fully 2D interaction formats
- Developed functionalities with C# Object Oriented Programming and conducted code reviews to aptly connect UI with robot controls
- Implemented interfaces using a range of 2D & 3D models and Mixed Reality Toolkit's front-end features to create intuitive UIs based on UX requirements analysis

Research Assistant July 2022 - December 2023

Virtual Environments Group - Wisconsin Institute for Discovery, UW-Madison, WI

- Contributed to a cross-functional team in the development of a Virtual Reality educational game in Unity with C# scripting and Firebase debugging to inculcate scientific curiosity about the Earth among children
- Prototyped an in-game survey system by employing OOP principles, 3D interactive UIs and a game data processing pipeline to have estimated 30% increase in player feedback and data collection
- Performed user engagement analysis using Python Pandas library and PyTorch framework to collect & standardize data from surveys and uncover behavioral patterns via Machine Learning and CNN Deep Learning models for innovating VR products

Awards and Recognitions

Korean Studies e-School Best Paper Award February 2023

Nam Center for Korean Studies, University of Michigan

- Researched and critically analyzed the history of the Korean War to participate in a round table discussion about healing techniques used by survivors of war and refugees with an emphasis on food culture

Publications

- **Generative AI and Augmented Reality for Personalized Biophilic Design in Senior Living Environments** (Conditional Acceptance)
  ASCE Construction Research Congress (CRC) 2026
  Authors: Akash Reddy Mallepally, Ruichuan Zhang, Tanyel Bulbul

- **Multimodal Human-Urban Robot Interaction Interface Using Large Language Models, Computer Vision, and Virtual Reality** (Presented)
  ASCE Computing in Civil Engineering(i3CE) 2025, New Orleans, May 2025
  Authors: Akash Reddy Mallepally, Hongrui Yu