Arun Krishna Vajjala

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EDUCATION

PhD in Computer Science — Aug 2021 - Oct 2025 (Expected Graduation)
George Mason University - Advised by Dr. Kevin Moran — *Fairfax, VA*

M.S. & B.S. in Computer Science — Jan 2021 & Jan 2020
George Mason University — *Fairfax, VA*

SUMMARY

PhD candidate specializing in AI agents, large language models, and human-computer interaction. Expert in developing multi-agent systems, LLM-powered developer tools, and generative AI applications. Proven track record of deploying production-ready AI systems at scale with experience spanning research and product development at Apple and Microsoft, making me uniquely positioned for roles bridging research with product. Research published at top-tier venues (ICSE, FSE, UIST) focuses on AI-driven productivity and UI design through agents and LLM orchestration.

WORK EXPERIENCE

Apple — Seattle, WA
Machine Learning Research Intern – Advised by Dr. Jeff Nichols, Dr. Amanda Swearngin, and Dr. Titus Barik Feb 2025-Present

- **Real-Time UI Prototyping with Vision and Language Models:**
  * Designed Squiggle, a multi-agent system that turns live whiteboard sketches and speech into functional iOS apps using OpenCV, GPT-4, and SwiftUI via Apple's Model Context Protocol (MCP server). Uses a multi-agent orchestrator to coordinate live input and code generation to build working apps. Cut wireframe prototyping time by $\approx 80\%$.
  * Built an integrated pipeline for interpreting conversations and sketch updates, linking natural language and visual input to inferred UI intents and auto-generating SwiftUI code. Utilizes a series of sub-agents to produce and verify code.
  * Built ScreenStorm, a tool for exploring UI design alternatives using a multi-agent framework coordinated via structured intent schemas defined in Pydantic. The system orchestrates layout decisions, prompt generation, and design system reuse, allowing users to control iterative regeneration through direct manipulation and MCP servers, improved UI Ideation time by $\approx 58\%$.

Microsoft Research (MSR) — Redmond, WA
Research Intern - Advised by Dr. Christian Bird, Dr. Nicole Forsgren, and Dr. Rob Deline — *June 2024 - August 2024*

- **Improving Build Triage with Large Language Models:**
  * Developed a system using GPT-4 to automatically cluster and explain software build failures, integrating OpenAI embeddings with K-means grouping to surface common failure modes. Fine-tuned GPT-4 model using previous failures
  * Integrated Azure Kusto queries and real-time data pipelines to support retrieval-augmented generation (RAG), helping developers get context-aware explanations of deployment errors.
  * Built a full-stack tool with a Flask backend, React frontend, and Node.js microservices to enable fast, scalable debugging support by unifying failure reports and build data in a single interface.
  * Rolled out the system to live developer environments, reducing time spent manually diagnosing failures by over 60% and contributing to ongoing productivity tooling at Microsoft

SAGE Research Lab — Fairfax, VA
Graduate Research Assistant - Advised by Dr. Kevin Moran — *May 2021 - Present*

- **FRAME: LLM-Enhanced Multimodal GUI Understanding:**
  * Developed FRAME by combining CLIP, BERT, and Graph Neural Networks with the Rips-Complex topological analysis and Embedding Propagation techniques achieving significant 8-12% performance improvement over state-of-the-art baselines in screen-retrieval tasks
  * Integrated multimodal transformer models with topological data analysis methodologies for structurally-aware GUI embeddings and automated UI testing pipeline development

- **GUIFix: LLM-Powered Accessibility Agent:**
  * Built intelligent agent system using large language models, CLIP visual embeddings, and automated code generation capabilities for comprehensive Android accessibility issue detection and automated repair workflows
  * Designed complex multi-step reasoning chains with prompt engineering workflows for comprehensive visual understanding, static code analysis, and automated code modification with minimal human oversight requirements

- **MotorEase: AI-Powered Accessibility Testing:**
  * Created PyTorch computer vision models with pattern-matching algorithms and static analysis techniques achieving impressive 87% accuracy in motor-impairment accessibility violation detection across diverse mobile applications
  * Integrated multiple AI modalities including computer vision, natural language processing, and static analysis for comprehensive accessibility testing pipeline published at prestigious ICSE 2024 conference with significant research impact

Publications

- J. Wu, A. Swearngin, **A. Krishna Vajjala**, A. Leung, J. Nichols, and T. Barik. "Improving User Interface Generation from Designer Feedback" [**Under Review - A* HCI Conference**]
- **A. Krishna Vajjala**, Aj. Krishna Vajjala, Y. Yan, S. Pothagoni, D. Poshyvanyk, and K. Moran. "FRAME: Enhancing Multimodal GUI Embeddings with Structural Information". [**Under Review - A* SE Conference**]
- **A. Krishna Vajjala**, Aj. Krishna Vajjala, C. Badea, C. Bird, R. Deline, J. Entenmann, N. Forsgren, A. Hramadski, S. Sanyal, O. Surmachev, T. Zimmermann. "Using Large Language Models to Support the Workflow of Differential Testing" In Proceedings of FSE 2025.
- Aj. Krishna Vajjala, **A. Krishna Vajjala**, C. Badea, C. Bird, R. Deline, J. Entenmann, N. Forsgren, A. Hramadski, S. Sanyal, O. Surmachev, T. Zimmermann. "Enhancing Differential Testing: LLM-Powered Automation in Release Engineering" In Proceedings of ICSE 2025.
- **A. Krishna Vajjala**, H. Mansur, J. Jose, and K. Moran. "MOTOREASE: Automated Detection of Motor Impairment Accessibility Issues in Mobile App UIs". In Proceedings of ICSE 2024.
- Aj. Krishna Vajjala, **A. Krishna Vajjala**, Z. Zhu, and D. Rosenblum. "Analyzing the Impact of Domain Similarity: A New Perspective in Cross-Domain Recommendation." In Proceedings of IJCNN 2024.
- **A. Krishna Vajjala** and K. Moran. "Engineering Accessible Software". In Proceedings of ICSME 2023 Doctoral Symposium.
- S. Lin, **A. Krishna Vajjala**, and K. Moran. "SearchAccess: Advancing Accessibility in Android App Design Through A Deep Learning-Powered GUI-Based Search Engine." Journal of Student-Scientists' Research, 2023.

Invited Talks & Presentations

- **Squiggle: Whiteboards to Wireframes** Apple Cross Organizational Work Showcase, May 2025
- **ScreenStorm: The power of control** Apple HCI Organizational Meeting, March 2025
- **User Interface Understanding** Apple HCI Organizational Meeting, February 2025
- **DiffViewer: Infusion of AI/ML in developer workflows to improve productivity** Microsoft Research 2024
- **MotorEase: automated detection of Motor Impairment Issues** ICSE 2024
- **Engineering Accessible Software** ICSME 2023 Doctoral Symposium
- **MIRACLE: Automated Testing in Android Apps** GMU 2022

Mentorship

- **Samar Karanch** (Undergraduate Student) University of Central Florida - FRAME & SearchAccess baseline development and evaluation
- **Sophia Lin** (High School Student) Thomas Jefferson HS - SearchAccess ground truth dataset creation and validation
- **Justin Jose** (High School Student) South Lakes HS - MotorEase ground truth dataset development and annotation
- **Emma Tan** (High School Student) Bishop Moore Catholic High School - MotorEase dataset development and validation

Academic Service

- **Conference Reviewer** UIST 2025, ICSE 2025, MSR 2024, ICSE 2023, SANER 2023, ASE 2022, MSR 2022, SANER 2022

Personal Projects

- **GitChat - LLM-Powered Code Assistant:**
  - Built sophisticated command-line retrieval-augmented generation (RAG) tool with OpenAI API integration, DeepLake Vector Store, and LangChain framework for natural language GitHub codebase querying and comprehensive code analysis workflows
  - Implemented advanced prompt engineering techniques, context optimization algorithms, and intelligent caching systems for rapid large-scale codebase comprehension and enhanced developer productivity across diverse programming languages
- **Diabetic Retinopathy AI Classification:**
  - Developed comprehensive deep learning classification system achieving impressive 97% accuracy on extensive 16GB retinal image dataset using distributed AWS EMR and EC2 infrastructure for scalable healthcare AI applications
- **NYC Taxi Duration Prediction:**
  - Enhanced sophisticated decision tree models with linear regressors achieving remarkable 75% RMSE improvement using PySpark, Hadoop on massive 13GB dataset with distributed computing infrastructure

Technical Skills

- **AI/ML Technologies:** Large Language Models (GPT-4, Claude, Llama), Multi-Agent Systems, Prompt Engineering, LLM Fine-tuning, PyTorch, TensorFlow, CLIP, BERT, Graph Neural Networks, Computer Vision, RAG Systems, Azure OpenAI, Transformers, CUDA, Distributed Computing
- **Programming Languages:** Python, Java, JavaScript, Swift, C/C++, SQL, R, HTML/CSS, TypeScript, Kusto Query Language (KQL), Shell Scripting, MATLAB
- **Platforms & Tools:** AWS (EMR, EC2, S3), Azure (OpenAI, Kusto), Docker, Kubernetes, React, Node.js, Flask, SwiftUI, Git, LangChain, OpenCV, Jenkins, Hadoop, MongoDB, PostgreSQL, Redis

Media Coverage

- **"The Power of Positionality - Why Accessibility? Interview With Kevin Moran and Arun Krishnavajjala"** IEEE Software, 2024