ANDREW RUKANGU

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SUMMARY

XR systems researcher and engineer with 8+ years designing, building, and deploying immersive technologies spanning spatial computing, robotics, AI and custom analog instrumentation. Shipped production applications to the Meta App Store; led multi-site industrial XR deployments; introduced the "Situated Isomorphism" design framework; and pioneered a confidence-weighted LLM ensemble pipeline for qualitative data analysis of multimodal behavioral telemetry. Equally at home writing C# in Unity, running parallel LLM inference on HPC, or troubleshooting a live deployment at a client site.

EDUCATION

Ph.D., Electrical & Computer Engineering · University of Georgia — Expected July 2026
Dissertation: From Robots to Realities: Engineering Extended Reality for Learning and Collaboration

M.S., Engineering · University of Georgia — 2017
Thesis: Characterizing Bending Rigidity of DPhPC Giant Unilamellar Vesicles Using Thermal Fluctuation

B.Sc., Mechatronic Engineering · Jomo Kenyatta University of Agriculture and Technology (JKUAT) — 2013
Juja, Kenya

Certificate, Embedded Systems Design · UT Austin (Online) — 2015

TECHNICAL SKILLS

Hardware & Embedded: PCB Design (KiCAD), ARM Cortex-M4/PIC Microcontrollers, RTOS, Analog Electronics, Logic Analyzers, Oscilloscopes, LabVIEW RT CDAQ

Software & Systems: Python, C#, C, SQL, R, MATLAB, Unity, LaTeX, Shell, ROS, Git, Linux, Flask/SocketIO, WebRTC, vLLM, Ollama, Meta Quest SDK, Android, Autodesk Inventor, SSH Server Admin, HPC

AI / LLM: Local open-weight LLM deployment, LLM-assisted QDA, Confidence-weighted ensemble design, Prompt engineering (CoT reasoning, few-shot, role prompting)

Research Methods: HCI/UX, A/B Comparative Usability Testing, Within- and Between-Subjects Experimental Design, Mixed-Methods (Quant + Qual), Inter rater reliability (IRR), Network Proxemics, Qualitative Thematic Coding, Image & Signal Processing

ENGINEERING PROJECTS & RESEARCH EXPERIENCE

XR Research Assistant · Virtual Experiences Lab - University of Georgia — Aug 2017 - Present

- **MR vs. Desktop A/B Study - UR10 Robotics Training (Papers 2&4):** Designed and ran a within-subjects mixed-methods study (N=22) comparing a spatially registered MR environment to a desktop simulator for robot programming. XR achieved NPS +86.4 (86.4% promoters, 0% detractors) vs. desktop NPS +36.4; Coined "Situated Isomorphism" theoretical framework. App on Meta App Store; combined XR robotics education papers have ~58 citations.
- **Collaborative MR Sketching - Drawn Together (Papers 1 & 3):** Co-developed and deployed a multi-user collocated MR sketching platform (Unity, WebRTC, Flask, SocketIO) across 8 group sessions with N=53 adolescents and up to 12 simultaneous users. Leveraged spatial tracking, open-mic audio, and scene-recording streams to demonstrate the "cohesion-creativity dilemma": an inverse-U relationship between group cohesion and creative output.
- **LLM-Assisted QDA Pipeline:** Built a novel Human-in-the-Loop pipeline deploying a confidence-weighted ensemble of 6 open-weight LLMs (up to 671B parameters) via vLLM on university HPC. Processed 3,932 conversational turns; achieved ensemble Krippendorff's α=0.76 with human expert. Pipeline enables private, scalable thematic analysis of multimodal XR behavioral data.
- **Full-Stack XR Orchestration Platform:** Architected a Flask/SocketIO web dashboard (HTML/CSS/JS, nginx, SQL, WebRTC) managing multiple lab XR applications with real-time multi-headset video streaming, dynamic 3D asset delivery, and remote environment configuration.
- **Custom XR Sensor Input Device:** Instrumented a walking stick with strain gauges and Bluetooth to create a novel VR peripheral enhancing balance and floor interaction; published at ACM SUI.

Georgia AI in Manufacturing Project - Client Outreach & Deployment · UGA Manufacturing Living Lab — 2023 - Present

- **Industrial XR Deployment:** Deployed internet-independent XR systems (Raspberry Pi + travel router) across 5+ external clients (schools, innovation hubs, mobile studios) reaching an estimated 4,800+ learner engagements; Served as primary technical contact for system configuration, expectation alignment, remote troubleshooting, and system upgrades.

- **XR Training Curriculum:** Designed and delivered a 3-hour hands-on XR workshop for 9 industry partners and educators through the Manufacturing Living Lab, enabling independent XR environment deployment from scratch.

Informatics Instructor of Record · College of Engineering - University of Georgia Jan 2023 - May 2024

- **Sole Instructor - INFO 2000 (3 semesters):** Designed and delivered curriculum covering Python, data analysis, visualization, and cloud deployment to ~26 students/semester; consistently high evaluations (4.4/5.0 avg).
- **Undergraduate Mentorship:** Mentored 10+ undergraduates through research projects, contributing to placements at graduate programs and major tech companies.

Graduate Research Assistant · Biomembranes Engineering Lab - University of Georgia Aug 2015 - July 2017

- **Automated Image Analysis:** Built a MATLAB image/signal processing pipeline with gradient-based sphere tracking and error-checking protocols to infer bending rigidity of microscopic liposomes.
- **Real-Time Data Acquisition:** Implemented a LabVIEW RT CDAQ system to monitor and cancel secondary harmonics in microscopic membrane currents, enabling precision electrophysiology measurements.

SELECTED PUBLICATIONS

1. Rukangu A., Bowmar E., Ahn S.J., Morkos B., Johnsen K.. *"Drawn Together: A Collocated Mixed Reality Sketching and Annotation Experience."* IEEE VR 2025 Demo.
2. [Authors blinded]. *"Immersion, Interaction, and Confidence: A Mixed-Methods Comparison of Mixed Reality and Desktop Interfaces for Robot Programming."* Under review (ISMAR).
3. [Authors blinded]. *"Multimodal Representations of Dynamic Creative Processes During a Collaborative Mixed-Reality Sketching Task."* Under review (Computers in Human Behavior).
4. Rukangu A., Morelock J., Johnsen K.. *"Virtual Reality For Robot Control and Programming in Undergraduate Engineering Courses."* ASEE Annual Conference, 2023. **Best Overall Paper - Computers in Education Division**
5. Rukangu A., Tuttle A., Johnsen K.. *"Virtual Reality for Remote Controlled Robotics in Engineering Education."* IEEE VR Workshop (IEEE VRW), 2021. **~58 citations (combined XR robotics education papers)**
6. Rukangu A., Mattingly K., Franzluebbers A., Tuttle A., Ahn S.J., Robinson D., O'Neal C., Johnsen K.. *"Virtual Family Room: Bridging the Physical Distance with Virtual Reality."* I/ITSEC, 2020. **Best Paper - Simulation Committee**
7. Full publication list (162 total citations) available on Google Scholar.

AWARDS & RECOGNITION

Dean's Engineering Education Fellowship · Best Paper - I/ITSEC Simulations (2020) · Best Paper - ASEE Computers in Education (2023) · Best Poster - UGA ECE Expo · Outstanding Teaching Assistant Award · 2 Published XR Apps on Meta App Store

LEADERSHIP & SERVICE

- **Leadership:** Founder African Graduate Student Forum (AGSF) at UGA | VP, UGA Engineering Graduate Club
- **STEM Outreach:** FIRST Robotics Volunteer, TEAMS Robotics Judge, Robotics & Chess Coach, VR Day Facilitator at a special-needs school, Undergraduate Mentor
- **Athletics:** UGA Club Soccer - represented university at national tournaments (finalist)