

# ANDREW RUKANGU

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## SUMMARY

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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 “Situating 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

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### Ph.D., Electrical & Computer Engineering · University of Georgia

Expected July 2026

*Dissertation: From Robots to Realities: Engineering Extended Reality for Learning and Collaboration*

Advisor: Dr. Kyle Johnsen

Selected Graduate Coursework: VR/AR User Interface Design, Principles of Cyberphysical Systems, Multi-Robot Systems, Nonlinear Control Systems, Optimization Theory & Engineering Applications, Multiphysics Modelling & Simulation, Design of Experiments, Advanced Biomedical Imaging

### 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

## RESEARCH EXPERIENCE

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### XR Research Assistant · Virtual Experiences Lab · University of Georgia

Aug 2017 - Present

- **MR vs. Desktop A/B Study - UR10 Robotics Training:** 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 vs. desktop NPS +36.4; coined “Situating Isomorphism” theoretical framework. App published on Meta App Store.
- **Collaborative MR Sketching - Drawn Together:** 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  $\alpha=0.76$  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.

### 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, replacing a fully manual workflow.

- **Real-Time Data Acquisition:** Implemented a LabVIEW RT CDAQ system to monitor and cancel secondary harmonics in microscopic membrane currents, enabling precision electrophysiology measurements.

## TEACHING EXPERIENCE

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### Instructor of Record · College of Engineering · University of Georgia

Jan 2023 - May 2024

- **INFO 2000: Informatics I (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). Developed flipped-classroom model with pre-recorded video lectures and project-based in-class activities.
- **Undergraduate Mentorship:** Mentored 10+ undergraduates through research projects, contributing to placements at graduate programs and major tech companies.

### Guest Lecturer · ELEE 2045: Programming Applications in Electrical Engineering

2025 - 2026

- Delivered 5 guest lectures (~75 min each) on embedded systems programming using the M5Stack platform across multiple semesters, covering real-time sensor interfacing and microcontroller applications.

### Teaching Assistant · University of Georgia

2017

- **Sensors and Transducers:** Supported lab instruction and grading for undergraduate course on sensor technologies and signal conditioning.
- **Circuits:** Assisted with lab sessions and student support for introductory circuits course.

### Teaching Assistant · INFO 8000: Informatics Foundations · University of Georgia

- Supported graduate-level instruction in informatics foundations, including grading, office hours, and course material development.

## PUBLICATIONS

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162 total citations (Google Scholar)

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.
6. Rukangu A., Mattingly K., Franzluebbbers 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. Rukangu A., Morelock J., Johnsen K., Moyaki D. "Virtual and Physical Robots in Engineering Education: A Study on Motivation and Learning with Augmented Reality." ASEE Computers in Education Journal, 2025.
8. Dunmoye I., Rukangu A., May D., Das R.P. "An Exploratory Study of Social Presence and Cognitive Engagement in a Collaborative VR Learning Environment." Computers & Education: X Reality, 2024.
9. Bowers B., Rukangu A., Johnsen K. "Making It Simple: Expanding Access and Lowering Barriers to Novel Interaction Devices for VR and AR." IEEE VRW, 2020.
10. Rukangu A., Tuttle A., Franzluebbbers A., Johnsen K. "V-Rod: Floor Interaction in VR." ACM Symposium on Spatial User Interaction (SUI), 2019.

## SELECTED CONFERENCE PRESENTATIONS

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- "Drawn Together: A Collocated Mixed Reality Sketching and Annotation Experience." Demo, IEEE VR, Saint-Malo, France, 2025.
- "Virtual Reality For Robot Control and Programming in Undergraduate Engineering Courses." Oral presentation, ASEE Annual Conference, Baltimore, MD, 2023.
- "Virtual Reality for Remote Controlled Robotics in Engineering Education." Demo, IEEE VR Workshop, Lisbon, Portugal, 2021.
- "Virtual Family Room: Bridging the Physical Distance with Virtual Reality." Oral presentation, I/ITSEC, Orlando, FL, 2020.

- "V-Rod: Floor Interaction in VR." Demo, ACM Symposium on Spatial User Interaction (SUI), New Orleans, LA, 2019.

## PROFESSIONAL SERVICE

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### Peer Reviewer

- Computers & Education (Elsevier)
- ACM Symposium on Virtual Reality Software and Technology (VRST)
- IEEE Conference on Virtual Reality and 3D User Interfaces (IEEE VR)
- IEEE International Symposium on Mixed and Augmented Reality (ISMAR)
- American Society for Engineering Education (ASEE) Annual Conference

## PROFESSIONAL MEMBERSHIPS

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- IEEE (Institute of Electrical and Electronics Engineers), Student Member

## TECHNICAL SKILLS

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- **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-Subjects Experimental Design, Mixed-Methods (Quant + Qual), Inter-rater reliability (IRR), Network Proxemics (Louvain), Pearson/Regression Analysis, Qualitative Thematic Coding, Image & Signal Processing

## AWARDS & RECOGNITION

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- Dean's Engineering Education Fellowship, University of Georgia
- Best Paper, I/ITSEC Simulation Committee, 2020
- Best Overall Paper, ASEE Computers in Education Division, 2023
- Best Poster, UGA ECE Expo
- Outstanding Teaching Assistant Award, University of Georgia
- 2 Published XR Applications on Meta App Store

## LEADERSHIP & SERVICE

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- **Founder**, African Graduate Student Forum (AGSF) at UGA
- **Vice President**, UGA Engineering Graduate Club (2016-2017)
- **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)

## REFERENCES

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### Dr. Kyle Johnsen (Dissertation Advisor)

Professor, School of Electrical and Computer Engineering, University of Georgia  
kjohnsen@uga.edu

### Dr. John R. Morelock

Assistant Professor of Practice, Engineering Education Transformations Institute, University of Georgia  
jmorelock@uga.edu

### Dr. John M. Mativo

Josiah Meigs Distinguished Teaching Professor, Workforce Education & College of Engineering, University of Georgia  
jmativo@uga.edu