ANDREW RUKANGU

Athens, GA | (762) 499-5146 | andrewrukangu@gmail.com | rukangu.com | Google Scholar

SUMMARY

Extended Reality (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

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

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 "Situated 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 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.
- **Virtual Family Room Field Deployment:** Shipped VR headsets to 22 military families for a remote research study (I/ITSEC 2020 Best Paper); authored step-by-step installation manuals and provided live video-call technical support across time zones, enabling non-technical users to independently set up and operate the system in their homes.

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. Authored technical manuals including an end-to-end AR tutorial for Meta Quest deployment, and 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

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 5+ 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 lab support, and office hours.

PUBLICATIONS

162 total citations (Google Scholar)

1. Rukangu A., Morelock J., Yoder M., Morkos B., Johnsen K. *"Immersion, Interaction, and Confidence: A Mixed-Methods Comparison of Mixed Reality and Desktop Interfaces for Robot Programming."* Under review (ISMAR).
2. Rukangu A., Ni Y., Baldwin J., Shah P., Ahn S.J., Johnsen K. *"Multimodal Representations of Dynamic Creative Processes During a Collaborative Mixed-Reality Sketching Task."* Under review (Computers in Human Behavior).
3. 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.
4. 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.
5. 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.**
6. Rukangu A., Tuttle A., Johnsen K. *"Virtual Reality for Remote Controlled Robotics in Engineering Education."* IEEE VR Workshop (IEEE VRW), 2021.
7. 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.**
8. Rukangu A., Tuttle A., Franzluebbers A., Johnsen K. *"V-Rod: Floor Interaction in VR."* ACM Symposium on Spatial User Interaction (SUI), 2019.
9. 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.
10. Baldwin J., Rukangu A., Johnsen K., Ahn S.J., *"Using Virtual Reality to Connect Military Families Together: A Diary Study with the Virtual Family Room."* I/ITSEC, 2023
11. 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.
12. Chaurasia A., Rukangu A., Philen M., Seidel G., Freeman E. *"Evaluation of Bending Modulus of Lipid Bilayers using Undulation and Orientation Analysis."* Physical Review E, 2018

SELECTED CONFERENCE PRESENTATIONS

- "Drawn Together: A Collocated Mixed Reality Sketching and Annotation Experience." Demo presentation, 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." Poster presentation, 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 presentation, ACM Symposium on Spatial User Interaction (SUI), New Orleans, LA, 2019.

PROFESSIONAL SERVICE

Conference Organization

- **IEEE VR 2020 (Online), Operations Team**: Part of a 6-person student team that ran the backend operations for the first major academic conference to go fully online due to COVID-19 (2000+ attendees). Managed live video production via OBS/Zoom/Twitch/YouTube re-broadcast, monitored infrastructure across all five conference days, and provided technical support. Conference was chaired by Dr. Kyle Johnsen.
- **ACM SUI 2019, Student Volunteer**. ACM Symposium on Spatial User Interaction, New Orleans, LA.

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

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

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-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

- 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, 2023
- Outstanding Teaching Assistant Award, University of Georgia
- 2 Published XR Applications on Meta App Store

LEADERSHIP & SERVICE

- **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 with Chess and Community and Boys and Girls Club, VR Day Facilitator at a special-needs school, Undergraduate Mentor
- **Athletics:** Semi-professional soccer: Tandaza FC, Kenya (2013-2015); Athens FC, USA (2024). UGA Club Soccer, represented university at national tournaments (finalist)

- **Graduate Fitness Group Organizer:** Founded and led a summer fitness group for UGA graduate students. Designed full-body workout programs (running progressions, plyometrics, strength circuits) drawn from semi-pro soccer training, and adapted exercises for participants with varying fitness levels to ensure inclusive participation.

REFERENCES

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