

Gaurab Khadka

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Research Interests

I build tools that let people without robotics expertise author and understand the behavior of robot teams, with LLMs composing robot motion while humans stay in control of the plan.

Keywords: end-user robot programming · human-multi-robot interaction · legible robot motion · human oversight of LLM-generated robot behavior

Education

University of Michigan-Flint

M.S. in Computer Science

Aug 2025 - May 2027 (expected)

Flint, MI, USA

- GPA: 4.0/4.0 | PLAYLab
- Thesis: LLM-driven authoring for human-multi-robot collaboration

London Metropolitan University

B.Sc. (Hons) in Computer Networking & IT Security

2020 - 2023

London, UK

Publications & Manuscripts

- [S1] **Gaurab Khadka** and co-author. Full paper on end-user authoring for human-multi-robot collaboration. *Under review; title and venue withheld while review is in progress.*
- [M1] **Gaurab Khadka**, Beverly Dabney, et al. Social web-inspired video to support student attainment of AACN Essentials. *Manuscript in preparation.*
- [M2] **Gaurab Khadka** et al. Accessible AR storytelling for autistic children: tablet-based character authoring and embodied animation from wearable IMUs. *Manuscript in preparation.*

Research Experience

Graduate Student Research Assistant, PLAYLab

University of Michigan-Flint

Aug 2025 - Present

Flint, MI

End-user authoring for human-multi-robot collaboration

Under review

- Identified a key limitation in prior work: expressive robot behaviors had to be re-engineered by hand for every new scenario. Designed the system so novices author robot motions themselves and an LLM reuses them across scenarios.
- Built two authoring methods: sketching paths on a 2D canvas, and physically demonstrating motion with a tracked probe robot.
- Designed an LLM planning stage that turns a plain-English scenario into per-robot motion assignments from the user's own library; invalid output is rejected and regenerated, and users review and edit the plan before any robot moves.
- Built the multi-robot ESP32 fleet and its control server, replacing an initial localization approach too inaccurate to verify authored motion.
- Ran a within-subjects study (N=12, counterbalanced) comparing sketch and demonstration authoring, using think-aloud, SUS, NASA-TLX, and semi-structured interviews.

Expressive robot motion study

Formative study

- Built a 3-robot fleet (~\$30/robot) with seven motion primitives (e.g., Searching, Delivering, Urgent) and camera-based ArUco navigation.
- User study (N=11) showed non-experts could read robot state from motion alone (SUS ≈70), but that behaviors were locked to one scenario and that Urgent and Searching were often confused. These findings motivated the thesis system.

Graduate Student Research Assistant (Part-time)

School of Nursing, University of Michigan-Flint PI: Dr. Beverly Dabney

Jan 2026 - Present

Flint, MI

- Designed an AI-assisted pipeline for short-form educational videos on evidence-based practice: LLM script generation written to the competency each video serves, image prompting, assembly, and delivery through the course LMS. Manuscript in preparation.
- Designed the "Evidence Elevator" device for teaching the hierarchy of evidence.

Accessible AR Storytelling for Autistic Children
NSF REU Site in Digital Accessibility, University of Michigan-Flint

2026 - Present
Flint, MI

- Accessible digital storytelling for autistic middle school students: a simplified tablet GUI for 3D character customization, and embodied animation driven by wearable IMUs, removing the modelling and programming skill barrier that keeps autistic children out of digital storytelling tools.
- Designed the study around three claims: an accessible authoring workflow, creativity and engagement during story creation, and event-driven AR scenes authored without programming. First author on the manuscript in preparation.

Mentoring & Service

Research Mentor, NSF REU Site in Digital Accessibility
University of Michigan-Flint

May - Jul 2026
Flint, MI

- Mentored two NSF REU undergraduate researchers on the AR storytelling project above, including co-design sessions with autistic participants.
- Student Volunteer, ACM Conference on Recommender Systems (RecSys 2026), Minneapolis, MN.

Selected Projects

EventMakAR: AR storytelling with physical robots
PLAYLab, University of Michigan-Flint

2025 - 2026

- Built a browser-based authoring tool from scratch for creating AR stories from four virtual characters and eight physical devices, with no programming required. Every event is typed by whether it crosses between the virtual and physical worlds.
- Exports the exact JSON the existing Unity parser reads, so authored stories run without anyone touching the project. Deployed live at the Super Friday workshop, where students authored and ran their own AR stories with physical robots.

Deepfake Detection Pipeline

2025

Nine-module forensic Python pipeline on ProGAN/BigGAN/CycleGAN datasets; k=20 features optimal for AdaBoost (87.20% mean AUC).

Skills

Research methods	HRI user studies, within-subjects design, think-aloud, SUS, NASA-TLX, semi-structured interviews, qualitative coding, statistical analysis
Robotics	ESP32 / NodeMCU fleets, HTC Vive Tracker (SteamVR), ArUco localization, motion primitive design, multi-robot control
AI & LLMs	LLM planning pipelines (Claude, Gemini APIs), structured output validation
AR	Unity AR Foundation, ARCore, web-based AR interfaces
Programming	Python, JavaScript/React, C#, C++ (Arduino), Java, Git

Other Experience

UX Analyst Intern, BizGees Ltd.
Accessibility testing; worked with developers to resolve usability issues.

May - Jul 2025

QA & IT Support, Danfe Solution Pvt. Ltd.
Resolved technical and security issues; supported firewall, VPN, and vulnerability reporting.

Sep 2022 - Jan 2024

References

Available on request.