Gaurab Khadka

Flint, MI, USA
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MS Computer Science · Human-Robot Interaction · LLM Driven Robot Communication · AR for HRI

Research Interests

Expressive robot communication · LLM-driven robot behavior generation · Augmented reality for human-robot interaction · End-user robot programming · multi-robot fleet systems · Accessibility-centered HRI

EDUCATION

University of Michigan – Flint, MI, USA
Master of Science in Computer & Information Science
GPA: 4.0 (First & second Semester Completed)

- Thesis: Express Bot Universalis; LLM-driven generalized expressive robot communication
- Expected Graduation 2027

London Metropolitan University - BSc Hons in Computer Networking & IT Security (2020–*2023)*

RESEARCH EXPERIENCE

Graduate Student Research Assistant (GSRA) - HRI Lab · *Aug 2025 - Present*
University of Michigan Flint

- Leading development of ExpressBot Universalis, a multi-component thesis system targeting CHI 2027
- Built LLM Scenario Engine with Pydantic schema validation, multi-backend support (Anthropic, Gemini), retry/JSON-repair logic, and five-scenario library with 17 passing unit tests
- Designing browser-based AR dashboard with live overhead video, robot state overlays, LLM narration, and comprehension feedback loop that detects user confusion and triggers LLM regeneration
- Prior work (ExpressBot v1): fleet of three low-cost NodeMCU robots with seven motion primitives (Searching, Delivering, Urgent, etc.), ArUco navigation, N=12 user study (SUS 70.2); currently being prepared for publication

NSF REU Research Mentor - Digital Accessibility Program *May - Jul 2026*
University of Michigan Flint · NSF-funded program

- Mentoring undergraduate researcher on AR-based authoring tool enabling autistic users to program robot and IoT behaviors through spatial storytelling, visual cues, and structured interaction sequences
- Project involves co-design with autistic participants and evaluation of accessibility-centered HRI interaction patterns

Graduate Student Research Assistant (GSRA) - Part Time *Jan 2026 - Present*
University of Michigan Flint (Nursing Department)

- Developed AI-assisted pipeline for producing short educational videos for NUR 316: LLM script generation, AI image prompting, HeyGen assembly, Canvas LMS delivery
- Designed the "Evidence Elevator" concept visualizing evidence hierarchy from expert opinion to meta-analysis

Research Contributor - IMU Postural Stability Study
University of Michigan Flint

- Contributed Python data analysis pipeline, seven publication figures, four statistical tables, and ML classification to a multi-segment IMU signal analysis study for postural stability in older adults

SELECTED PROJECTS

EventMakAR - AR Storytelling Authoring Tool · 2025–2026

- Built EventMakAR from scratch as a standalone single-file HTML/React web app for the Super Friday workshop at University of Michigan Flint
- Generates Events.txt in exact JSON format matching Unity buttonManager.cs parser; device-specific action lists for five robot characters (Spider, Barbarian, Woman, Skeleton, Car)
- Demonstrated live at Super Friday workshop with student participants authoring AR stories using physical robots

Deepfake Detection Pipeline (Semester Project)

- Built a nine-module forensic Python pipeline on ProGAN/BigGAN/CycleGAN datasets
- Key finding: k=20 features optimal for AdaBoost (87.20% mean AUC); delivered 16-slide forensic report.

Web Shield-AI; Explainable ML for Web Filtering

- Developed ML-based classification system for web content filtering
- Implemented human-in-the-loop feedback mechanism for explainable, transparent decisions
- Focused on interpretable AI design connecting to broader human-centered AI principles

CNC Wood Carving Machine - Bachelor's Individual Final Year Project *2022 - 2023*

London Metropolitan University

- Designed and built a functional CNC wood carving machine from scratch including mechanical assembly, motor control, and G-code based path planning
- Demonstrates hands-on experience with embedded systems, motion control, and physical hardware integration

SKILLS

Robotics & HRI: ROS, NodeMCU ESP8266, ArUco navigation, FS90R servos, multi-robot fleet control, motion primitive design, user study design

AI & LLMs: Anthropic Claude API, Google Gemini API, prompt engineering, Pydantic schema validation, JSON-repair

AR & Frontend: AR Foundation (Unity), ARCore, browser-based AR dashboards, React, HTML/CSS/JS

Programming: Python, JavaScript, C#, Java, Bash; PyTorch/TensorFlow (familiar); Git

Research Methods: HRI user studies, mixed methods, SUS/NASA-TLX, qualitative coding, statistical analysis

WORK EXPERIENCE

Assistant Faculty Supervisor (Part-Time)

UM-Flint Recreation Center *Aug 2025 - Present*

- Operations support, incident handling, and customer-facing technical communication

UX Analyst Intern

BizGees Ltd. *May - Jul 2025*

- Conducted accessibility testing and technical issue resolution with developers

QA & IT Support

Danfe Solution Pvt. Ltd. *Sep 2022 - Jan 2024*

- Resolved **50+ weekly technical and security issues**
- Assisted in firewall, VPN, and vulnerability reporting

AWARDS & RECOGNITION

- 4.0 GPA - University of Michigan Flint MS Computer Science
- GSRA Research Funding - University of Michigan Flint
- Google Cybersecurity Professional Certificate
- AWS Academy Cloud Foundations