

# Amin Mahjoub

Electrical Engineer, Microsoft Surface — Seattle, WA  
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## RESEARCH INTERESTS

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Hardware-software co-design; Hardware-accelerated ML; Silicon design; Machine learning for vision and robotics; Image processing and computational imaging; Multi-agent robotics and cooperative autonomy; Embedded and real-time systems.

## EDUCATION

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**University of Southern California (USC)**, Los Angeles, CA  
*Master & Bachelor of Science in Electrical and Computer Engineering*

Aug 2019 – May 2023  
GPA: M.S. 3.66 & B.S. 3.77

## PROJECTS & RESEARCH EXPERIENCE

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### Defogging Benchmark for Autonomous Driving (WACV 2026 Submission)

*Lead Researcher*

Los Angeles, CA  
2024 – 2025

- Designed and conducted a large-scale empirical benchmark evaluating classical filters, transformer-based models, chained preprocessing pipelines, and Vision-Language Model (VLM) image editing for fog removal on the Foggy Cityscapes dataset.
- Built a full evaluation pipeline for **object detection (mAP)** and **panoptic segmentation (PQ/RQ/SQ)** using YOLOv11 and Mask2Former to quantify downstream perception performance.
- Developed a VLM-as-a-judge qualitative scoring rubric for visibility restoration, boundary clarity, detectability, and scene/object consistency; achieved **strong correlation with mAP** ( $r = 0.94$ ) confirming alignment with quantitative metrics.
- Engineered a **chain-of-thought (CoT) defogging prompt**, improving object visibility, local contrast, and boundary sharpness across diverse fog densities.
- Evaluated 54+ defogging pipelines and identified cases where preprocessing improves detection/segmentation and where domain gaps cause degradation.

### Lensless Imaging via Iterative ADMM & Deep ADMM

*Lead Developer & Researcher*

USC Course Project  
2023

- Developed a physics-informed lensless imaging pipeline reconstructing images from coded diffraction patterns using wave optics constraints.
- Implemented iterative **ADMM** for solving the inverse imaging problem with model-based priors, improving stability and convergence.
- Built a **Deep / Learned ADMM** unrolled architecture, enabling data-driven refinement of proximal operators.
- Benchmarked ADMM, Deep ADMM, CNN-denoisers, and U-Net reconstruction networks, achieving improvements in PSNR and perceptual sharpness under noisy conditions.
- Repository: [github.com/mmahjoub5/EE592\\_FinalProject](https://github.com/mmahjoub5/EE592_FinalProject).

### JobHuntTool — AI-Powered Job Search & Interview Assistant

*Lead Developer & Project Lead*

Hackathon Project  
2025

- Designed an AI-driven job application Agent using CrewAI that automatically parses job descriptions, extracts semantic embeddings, and generates structured insights for interview preparation.
- Built a Chrome extension and backend pipeline enabling automated job extraction, RAG-based querying, and smart surfacing of relevant past experience from a user database.
- Implemented embedding storage, similarity search, and Google Sheets integration for automated job tracking and resume-to-job alignment.
- Developed fast prototypes under hackathon constraints and deployed a fully functional end-to-end system; released open-source: [github.com/Leon753/JobHuntTool](https://github.com/Leon753/JobHuntTool).

### LLM-Driven Task Manager for Robot Arm Control

*Designer & Developer*

Personal Project  
2024 – Present

- Built a distributed control framework where an **LLM acts as the high-level planner** for a robot arm, producing a sequence of natural-language actions that the system parses and executes.
- Implemented modules for world-state tracking, task decomposition, and action execution, enabling the arm to update its internal state and adjust commands dynamically.

- Developed a simulation environment to validate LLM-generated action sequences, test state updates, and evaluate task execution under different scenarios.
- Released the project as open-source: [github.com/mmahjoub5/Multi\\_Agent\\_Goal\\_Manager](https://github.com/mmahjoub5/Multi_Agent_Goal_Manager).

## PUBLICATIONS

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Aryashad, A., Razmara, P., Mahjoub, A., Azizi, S., Salmani, M., & Firouzkouhi, A. (2025). *From Filters to VLMS: Benchmarking Defogging Methods through Object Detection and Segmentation Performance*. Submitted to WACV 2026 Workshop.

## PATENTS

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Mahjoub, A., et al. (2025). *Systems and Methods for Automated Music-Level Generation from Sheet Music*. WO2025024205A2. Co-inventor; designed DSP pipelines and MusicXML-based automatic level-generation engine.

## SELECTED COURSES

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### Machine Learning, Vision, and Robotics

- Learning and Control for Safety-Critical Robotic Systems
- Computational Methods for Inverse Problems
- Introduction to Artificial Intelligence
- Mathematics of High-Dimensional Data

### Signal Processing and Systems

- Introduction to Digital Signal Processing

### Probability, Optimization, and Applied Math

- Probability for Electrical and Computer Engineers
- Linear Algebra for Engineering

### Digital Design and Computer Architecture

- VLSI Design System (In Progress)
- Parallel Computer Architecture (In Progress)
- Introduction to Operating Systems (Audit)
- Introduction to Digital Circuits
- Software Design for Electrical Engineers

## RESEARCH & ENGINEERING EXPERIENCE

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### Microsoft — Electrical Engineer, Seattle, WA

Aug 2023 – Present

- Led end-to-end electrical development for Microsoft Surface, including architecture, prototyping, validation, and mass production of 500K+ units annually.
- Designed high-speed digital and mixed-signal PCB systems (10+ layers) integrating SoCs, GPUs, DDR, NVMe, 5G, and advanced camera subsystems.
- Collaborated with cross-functional RF, ME, firmware, and manufacturing teams to refine system architecture and debug complex system interactions.
- Performed high-speed signal integrity analysis (PCIe Gen4, USB 3.2, MIPI, DDR), reducing prototype iterations by 30%.
- Developed RTOS/HAL firmware for ARM MCUs, improving system responsiveness and power management.
- Modeled AC/DC power rails and switching stages, validating load behavior under worst-case operating conditions.
- Built LTSpice simulations for motor drivers, power converters, and mixed-signal blocks.

### Notey's World — Software Engineer, Los Angeles, CA

Feb 2022 – Oct 2023

- Built real-time pitch and chord detection audio engine (4 ms latency) using Harmonic Product Spectrum.
- Designed analytics pipelines and data-driven features; deployed backend with Firebase NoSQL.

## SKILLS

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**Machine Learning & AI:** PyTorch, CUDA, ADMM Optimization, CNN/UNet Models, Vision-Language Evaluation,

**Software & Engineering:** Python, C/C++, Docker, Linux, CI/CD, Google Sheets API, Backend Pipelines.

**Hardware & Embedded Systems:** High-Speed Digital Design (PCIe, USB, MIPI, DDR), Mixed-Signal Circuits, Signal/Power Integrity, ARM RTOS/HAL Firmware ,LTSpice.