



HADI AL SHMAISSANI

PORTFOLIO

Electrical & Computer Engineering Student, American University of Beirut
Projects, Awards, Training, and Coursework

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Projects

A selection of the systems I've built, from hackathon prototypes to ongoing research and self-directed hardware work. Every project here started from a real problem, usually one someone in Lebanon or the region is dealing with right now, not from a framework I wanted to try.

3ayn, AI Assistive App for the Blind & Low Vision *Amazon Industry Program, Team Amazbytes, 2026*

MediaPipe, PyTorch, Java, Computer Vision

3ayn is an assistive app built for blind and low vision users, developed as part of the Amazon Industry Program 5.0 Bootcamp with IEEE Women in Engineering AUB. I own the social intent detection module: real time gesture and interaction detection built with MediaPipe and PyTorch that powers proactive, Arabic first social narration.

- Built real time gesture and interaction detection with MediaPipe and PyTorch.
- Designed the confidence gating logic that decides whether the app should interrupt the user at all, so narration only fires when it's actually useful.
- Enabled voice commands including speak, watch, read, find, and who, in Arabic first phrasing suited to the app's primary users.

WhatsApp Fire Reporting System *1st Place, Student Track, EU funded AI4Purpose Hackathon (MEDAIGENCY), 2026*

n8n, Twilio, FastAPI, Webhooks

Built during Lebanon's EU funded AI4Purpose Hackathon, this system won first place in the Student Track. It's an end to end, multi turn stateful chatbot for reporting wildfires over WhatsApp, built on n8n with Twilio integration, feeding into a FastAPI dispatch coordinator I built for the responder side. A witness who answers three minutes late still has to land in the right conversation step, so the flow was built to survive delays and dropped threads, not just the happy path.

- Built a multi turn, stateful WhatsApp conversation flow on n8n with Twilio integration.
- Implemented a FastAPI dispatch coordinator and a geocoding webhook that a teammate's reporting workflow consumes directly.
- Work continues under MEDAIGENCY, taking the winning build from hackathon prototype into an ongoing, actively developed tool.

ByteMed, AI Clinical Triage Pipeline *Harvard HSIL Hackathon, Team Byte, 2026*

FastAPI, Gemini, Python

ByteMed is a clinical triage pipeline built at the Harvard HSIL Hackathon, seventh edition, on the theme of building high value health systems with AI. It combines a FastAPI backend with Gemini vision models to reorder an emergency queue by likelihood of deterioration. The model contributes evidence, but a hard rule keeps it from ever moving a patient down the queue, so the system can help prioritize without being allowed to under triage anyone.

- Built a FastAPI backend integrated with Gemini vision models to assess incoming cases.
- Designed the rule layer that constrains what the model is allowed to decide, letting it surface evidence while a deterministic rule protects against the worst failure mode.

AI Driven SOC Pipeline, Raw Logs to Actionable Intel *Technologia x 42 Beirut, Lebanon's First Agentic AI & Cybersecurity Hackathon, 2025*

n8n, LLM / Gemini, Webhooks, Security Automation

Built at Lebanon's first Agentic AI and Cybersecurity Hackathon, this pipeline turns raw security logs into actionable threat intelligence for a SOC team, orchestrated entirely on n8n. Log ingestion, IP enrichment, and LLM generated incident reports all have to keep working even when an enrichment API times out, since a dropped call can't be allowed to swallow a real security event.

- Built an automated pipeline turning raw security logs into structured, actionable threat intelligence.
- Orchestrated log ingestion, IP enrichment, and LLM generated incident reports for the SOC team.
- Designed failure handling so a timed out enrichment call degrades gracefully instead of dropping the underlying security event.

Low Cost Acoustic Water Leak Localizer *Stars of Science, R&D Concept Applicant, 2026*

Acoustic Sensing, On Device ML, Embedded Systems

An R&D concept submitted to Stars of Science: an affordable acoustic leak localization device tuned specifically for plastic pipes, a case where the correlators utilities already own tend to underperform. On device machine learning removes the need for a specialist operator to interpret results, aiming the design squarely at non revenue water loss, a real and costly problem across the region.

- Designed an acoustic sensing approach tuned for plastic pipe, where conventional cross correlators lose accuracy.
- Built the on device ML layer so results are interpretable without a specialist operator on site.
- Sized the whole approach around the maths, the power budget, and the physical sensor constraining each other, the same discipline behind the Arduino fire detector below.

Dual Issue RISC V CPU *Personal / Coursework Project, 2026*

Verilog, RISC-V, Pipelining, Verification

Starting from a 5 stage pipelined RISC V processor, I extended it to issue two instructions per cycle in Verilog. The extension came to 727 lines of RTL, with six explicit issue rules governing when dual issue is and isn't safe, and seven testbench cases each written specifically to force one rule to fire.

- Extended a 5 stage pipelined RISC V processor to dual issue in Verilog, 727 lines of RTL.
- Defined six issue rules covering hazard and resource conflicts between the two issued instructions.
- Wrote seven targeted testbench cases, each constructed to force exactly one issue rule to trigger, for real verification coverage rather than a single smoke test.

Driver Aggressiveness Index *Undergraduate Research, AUB, under Prof. Naseem Daher, Jan 2026, Present*

PyTorch, SUMO, ROS2, Reinforcement Learning

My ongoing undergraduate research, part of a multi year Vertically Integrated Project on context aware, learning driven autonomous ground vehicles for developing countries. The core question is how to model driver aggressiveness in a way that generalizes to road conditions research groups elsewhere don't usually have to design for.

- Built and evaluated deep learning models in PyTorch for driver aggressiveness modelling.
- Ran traffic simulations in SUMO and integrated the pipeline with ROS2.
- Reformulated the RL exploration bonuses and reward weighting with principled, citation backed alternatives rather than off the shelf defaults.

Arduino Fire Detection Home Automation *National Science Fair, Winner, 2016 & 2018*

Where the tinkering started. An Arduino based system that detects fires and reports them, monitored through a mobile app, built well before any of the ML or hackathon work above. It won the National Science Fair twice, once for the original detector and again two years later with the mobile monitoring layer added. Ten years later I'm still building sensing hardware whose entire job is to tell someone something urgent.

Awards & Honors

1st Place, Student Track, EU funded AI4Purpose Hackathon

MEDAIGENCY, January 30 to February 1, 2026. Won the Student Track with the WhatsApp fire reporting system, then joined the MEDAIGENCY project in February to carry the winning build into ongoing development. The hackathon focused on AI powered solutions for health emergency preparedness and response across the EU funded program.

Dean's Honor List, Every Term

MSFEA, American University of Beirut, every term since 2024. Maintained alongside a cumulative GPA of 4.0 out of 4.0.

30% Merit Scholarship

Awarded on early admissions criteria at entry to AUB in 2024, and held across the full period of study since.

National Science Fair, Winner, Twice

2016 and 2018, both for an Arduino based fire detection home automation system, with the second win adding mobile app monitoring. This is where the hands on engineering habit started, roughly ten years before the acoustic leak localizer applied the same sensing and embedded discipline to a very different problem.

Stars of Science, R&D Concept Applicant

2026, for the Low Cost Acoustic Water Leak Localizer, an on device ML approach to locating buried leaks in plastic pipe, a case where the correlators utilities already own tend to fail.

Workshops & Training

Industry Program 5.0 Bootcamp

A three day bootcamp with IEEE Women in Engineering AUB and the Amazon WiE community, May 2026, the program behind the 3ayn assistive app project above.

Harvard HSIL Hackathon, Seventh Edition

Building High Value Health Systems, Leveraging AI, Beirut hub, April 2026, competing as part of a five member team, Team Byte, on the ByteMed clinical triage pipeline.

Build It Weekend 8.0

A three day hardware build event with the IEEE AUB Student Branch, AUB Robotics Club, Beirut Electro City, and Cube 3D, March 2026.

Hack The Box & Chimera Cybersecurity Training

Hands on, practical cybersecurity training completed ahead of Lebanon's first Agentic AI and Cybersecurity Hackathon, where the AI driven SOC pipeline above was built.

AWS Cloud Workshops & IEEE Technical Workshops

Ongoing participation through IEEE Women in Engineering AUB sessions and general IEEE technical workshops, alongside peer course support sessions for EECE 230 and EECE 490.

Relevant Coursework

Coursework toward the B.E. in Electrical & Computer Engineering at AUB, concentrating in Artificial Intelligence and Control & Robotics. Cumulative GPA 4.0 out of 4.0 across 46 courses in 8 terms.

AI & Machine Learning

- EECE 490, Introduction to Machine Learning, covering supervised and unsupervised learning, reinforcement learning, Bayesian networks, hidden Markov models, support vector machines, and deep learning.

Systems & Hardware

- EECE 460 & 460L, Control Systems and Laboratory, modeling and design of closed loop analog control systems.
- EECE 340, Signals and Systems, continuous and discrete time signals and systems, sampling, and the z transform.
- EECE 321 & 321L, Computer Organization and Laboratory, microprocessor organization including a VHDL single cycle MIPS core design project.
- EECE 320, Digital Systems Design, combinational and sequential design in VHDL, including two implemented VHDL projects.
- EECE 311 & EECE 310 / 310L, Electronic Circuits and Electronics, BJT and MOSFET amplifiers, SPICE simulation, and digital CMOS circuits.

Software & Algorithms

- EECE 330, Data Structures and Algorithms, sorting, searching, indexing, and core data structures including trees, heaps, and graphs.
- EECE 230, Introduction to Computation and Programming, structured and object oriented programming fundamentals.

Mathematics & Statistics

- MATH 210, Introduction to Analysis, real numbers, sequences, continuity, and Riemann integration.
- MATH 218, Elementary Linear Algebra with Applications, vector spaces, eigenvalues and eigenvectors, and least squares approximation.
- STAT 230, Introduction to Probability and Random Variables, distributions, estimation, and hypothesis testing.
- MATH 211, Discrete Mathematics, logic, induction, recurrence relations, and graph theory.
- MATH 202, Differential Equations, first order and linear differential equations, series solutions, and the Laplace transform.