

Hamza Ameer Sulthan Feroze

Project Portfolio - MSc in Artificial Intelligence Application

Summary & Key Links

- LinkedIn: <https://www.linkedin.com/in/hamza-feroze>
- GitHub: <https://github.com/hamz115>

Personal Website

Please check out my personal website for more details on my professional background and projects: <https://www.hamzas.world>

Table of Contents

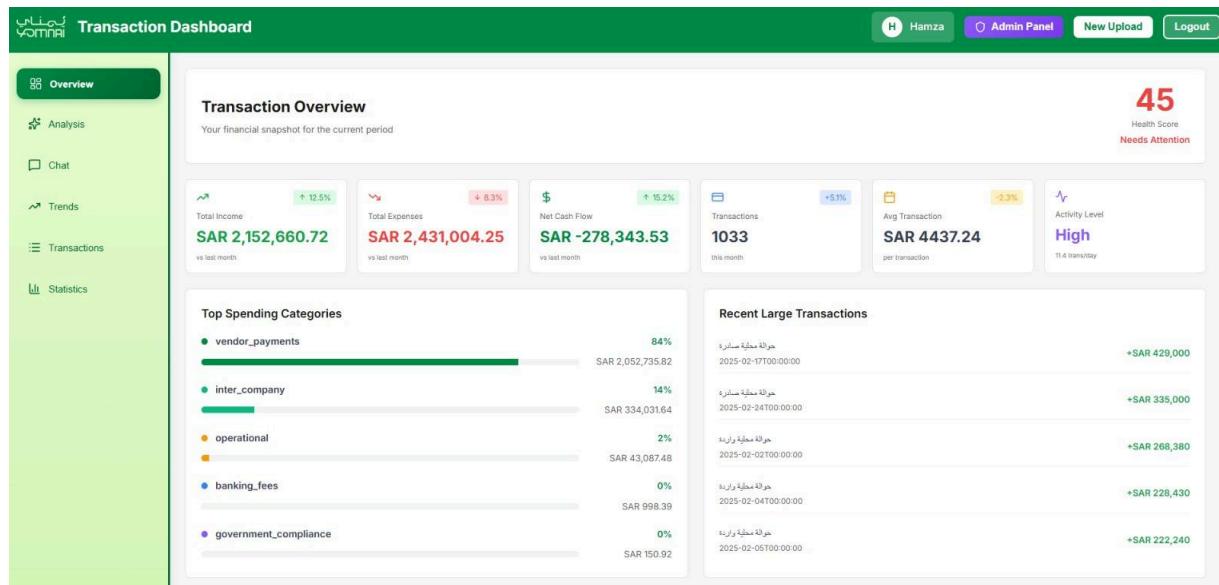
Hamza Ameer Sulthan Feroze.....	1
Project Portfolio - MSc in Artificial Intelligence Application.....	1
Summary & Key Links.....	1
Professional AI & Robotics Projects (IIoT Solutions).....	2
Project 1: Agentic AI Financial Analysis Tool for SMEs.....	2
Project 2: AI Chatbot for Industrial Engineering & Diagnostics.....	3
Project 3: Autonomous Mobile Robot (AMR) & Vision-Based Dispatch.....	5
The Construct Robotics Masterclass: Project Progression.....	6
Checkpoint: Warehouse Robot – Autonomous Navigation & Object Handling.....	6
Checkpoint: UR3e Arm Robot – Vision-Guided Object Manipulation.....	7
Checkpoint: ROSbot XL – PID-Controlled Navigation & Obstacle Avoidance.....	7
Checkpoint: TurtleBot3 – Physical Robot Assembly & Mapping.....	8
Capstone Project: Vision-Guided Robotic Arm Coffee Placement.....	9
Previous Professional Experience: AI Wahah Web Services.....	10
Education & Key Certifications.....	11
Foundational Self-Study.....	11

Professional AI & Robotics Projects (IIoT Solutions)

As an AI Developer at IIoT Solutions, I am responsible for the end-to-end design, development, and deployment of our core AI and automation systems.

Project 1: Agentic AI Financial Analysis Tool for SMEs

- Description:** I am designing and building a sophisticated Agentic AI application to provide in-depth, autonomous financial analysis for Small and Medium-sized Enterprises (SMEs). This system ingests and processes complex bank transactions and financial statements. It uses a team of AI Agents and Retrieval-Augmented Generation (RAG) to identify trends, flag anomalies, and provide actionable insights in a natural language format.
- My Role:** Lead developer for the entire system, from AI architecture to backend and frontend. This includes designing the agentic workflows and RAG pipelines.
- Key Features:**
 - Multi-lingual support, utilizing the "Allam" open-source model for high-fidelity Arabic translations.
 - Architecture designed for future fine-tuning of custom LLMs.
- Technologies:** Python, LangChain (AI Agents, RAG), FastAPI, Open Source LLMs (Deepseek, Qwen), 'Allam', React, Docker.



Transaction List						
ID	Date	Description	Category	Type	Amount (SAR)	Balance (SAR)
workspace_c6c95070688e_0_1740690000.0	28 Feb 2025	رسوم تقطيع ودفع المكونات	operational	Expense	-62.63	156,529.59
workspace_c6c95070688e_1_1740690000.0	28 Feb 2025	رسوم تقطيع ودفع المكونات	operational	Expense	-411.2	156,592.22
workspace_c6c95070688e_2_1740690000.0	28 Feb 2025	رسوم تقطيع ودفع المكونات	operational	Expense	-157.09	157,003.42
workspace_c6c95070688e_3_1740690000.0	28 Feb 2025	رسوم تقطيع ودفع المكونات	operational	Expense	-1,047.37	157,160.51
workspace_c6c95070688e_4_1740690000.0	28 Feb 2025	رسوم تقطيع ودفع المكونات	operational	Expense	-26.72	158,207.88
workspace_c6c95070688e_5_1740690000.0	28 Feb 2025	رسوم تقطيع ودفع المكونات	operational	Expense	-178.29	158,234.6
workspace_c6c95070688e_6_1740690000.0	28 Feb 2025	إيداع ميلادي تقطيع التائج	product_sales	Income	+41,108.97	158,412.89
workspace_c6c95070688e_7_1740690000.0	28 Feb 2025	إيداع ميلادي تقطيع التائج	product_sales	Income	+18,880.2	117,303.92
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workspace_c6c95070688e_10_1740603600.0	27 Feb 2025	الرسوم الشهرية للروابط	banking_fees	Expense	-200	95,046.37

Project 2: AI Chatbot for Industrial Engineering & Diagnostics

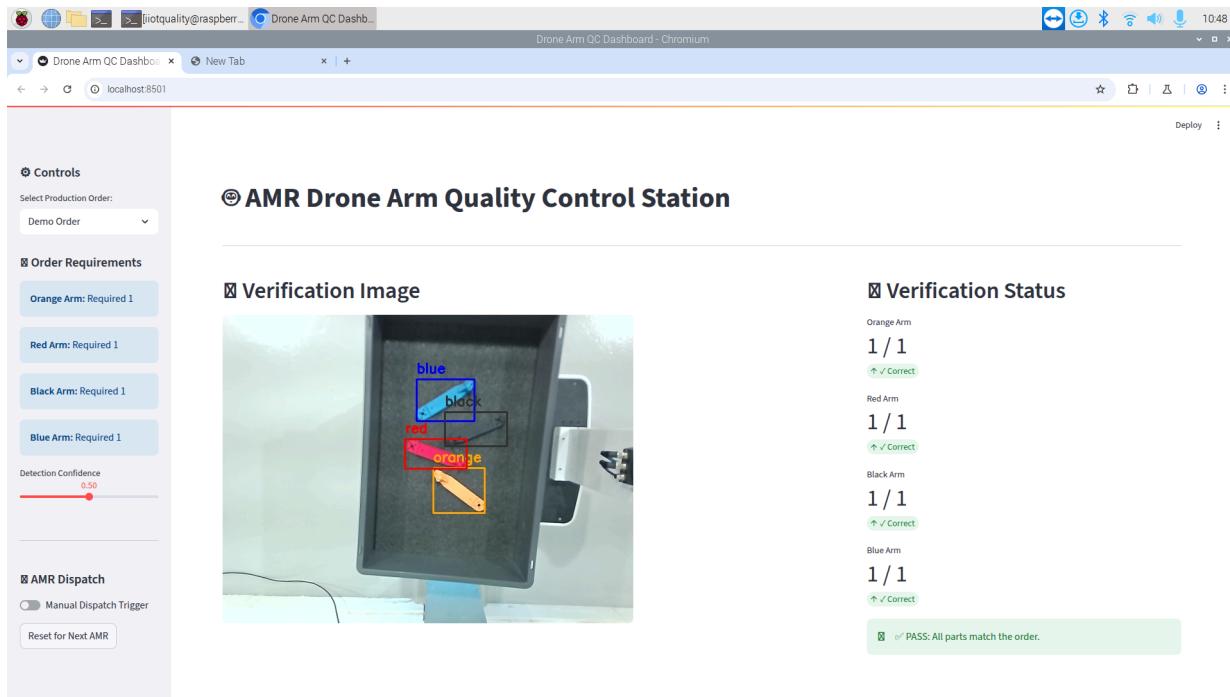
- Description:** I led the development of a full-stack AI chatbot specifically designed for industrial applications. The chatbot's primary purpose is to assist engineers by ingesting and understanding complex machine documentation, including PDFs and technical diagrams. Engineers use it to diagnose faults, understand machine alarms, and get immediate answers to technical questions.
- My Role:** Full-stack development. I built the Python/FastAPI backend and the responsive React frontend.
- Key Features:**
 - Advanced Vision RAG:** The system integrates a Vision RAG pipeline to accurately process and retrieve information from both text and diagrams.
 - Improved Retrieval:** Implemented Anthropic's contextual retrieval strategies for RAG, which significantly improved answer accuracy and relevance compared to standard retrieval methods.
- Technologies:** Python, FastAPI, React, RAG, Anthropic's Retrieval Techniques, LLMs, Computer Vision (CV) libraries, WebSocket.

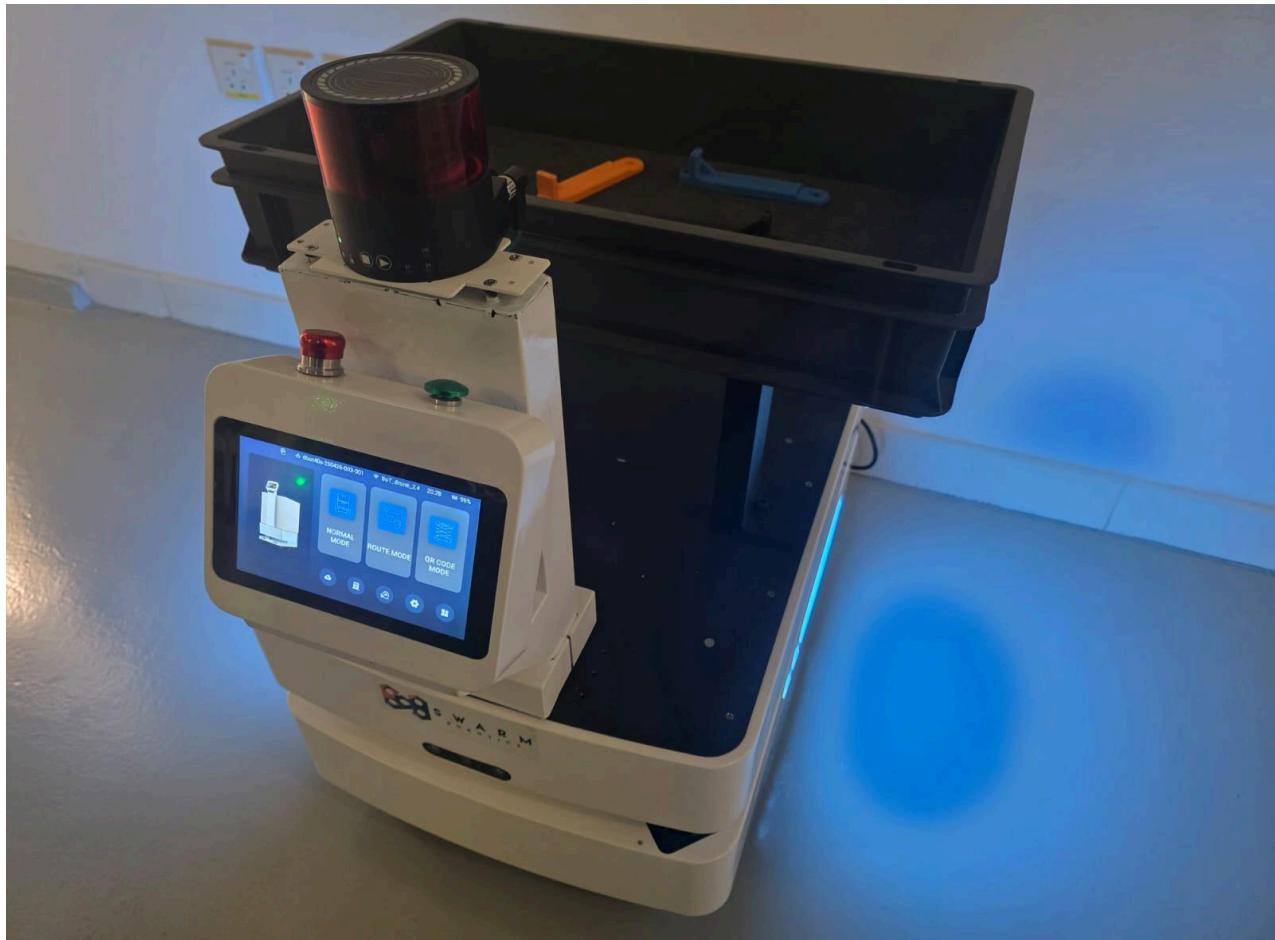
The screenshot shows the iiot solutions platform interface. On the left, there's a sidebar with 'Models' and a search bar for 'DeepSeek'. Below it is a 'Books List' section with a 'Programming.pdf' entry. The main area displays a PDF page from 'Programming.pdf' (Page 68 of 376). The page content is about setting up a machine, specifically defining the operating area and coordinate system. It includes a procedure with three steps and a note about machine manufacturers. On the right, the 'Plant AI Assistant' is active, with a message history and a 'Send a message...' input field.

This screenshot shows the same platform interface as above, but with a different document selected in the sidebar ('Programming.pdf'). The main area now features an 'Interactive Mind Map' tool. It shows a purple button labeled 'Create Interactive Mind Map' and a box explaining that it generates a visual mind map from selected documents. Below this is a text input field with placeholder text: 'Ask me anything about your plant maintenance and electrical systems!'. The rest of the interface, including the AI assistant and message input field, remains the same.

Project 3: Autonomous Mobile Robot (AMR) & Vision-Based Dispatch

- **Description:** I was instrumental in bridging our AI initiatives with our physical robotics operations. I successfully integrated a new Autonomous Mobile Robot (AMR) into our main production line and developed a vision-based dispatch system.
- **My Role:** I was responsible for designing and implementing the full integration.
- **Key Features:**
 - **ROS2 Integration:** Established robust, two-way communication between the robot's onboard ROS2 system and our central factory management software via REST APIs.
 - **AI Vision Dispatch:** Trained and deployed a **YOLO** model for real-time color detection. This model identifies the color of a drone arm at a station, and based on this color, the system autonomously dispatches the AMR to its next correct location.
- **Technologies:** ROS2, Python, REST APIs, Computer Vision (YOLO), PyTorch, Autonomous Mobile Robots (AMR).





The Construct Robotics Masterclass: Project Progression

This masterclass was a comprehensive program involving several checkpoint projects that built upon each other, culminating in a final capstone project. (**Certificate Attached Below**)

Verification Contacts: For verification of my enrollment and project work in the masterclass, you may contact:

- Ricardo Tellez (CEO): rtellez@theconstructsim.com
- Miguel Angel Rodriguez (Robotics Engineer) (Instructor): duckfrost@gmail.com
- The Construct LinkedIn Page: <https://www.linkedin.com/company/the-construct/>

Checkpoint: Warehouse Robot – Autonomous Navigation & Object Handling

- **Description:** Completed a three-phase automation process for the RB-1 warehouse robot, progressing from hardcoded navigation to full autonomy. Initially, the robot followed a predefined path to reach, lift, transport, and drop off a shelf. Next, SLAM-based mapping enabled obstacle detection and path planning. Finally, the robot achieved full autonomy, navigating, picking up, and delivering shelves using its mapped environment.
- **Technologies:** ROS, SLAM, Path Planning, Gazebo.

Checkpoint: UR3e Arm Robot – Vision-Guided Object Manipulation

- **Description:** Completed a two-phase manipulation process for the UR3e robotic arm, improving precision and automation. Initially, the arm used hardcoded joint movements to pick up, rotate, and drop a block. Later, point cloud-based perception allowed dynamic object detection and real-time motion planning for adaptive pick-and-place operations.
- **Technologies:** ROS, MoveIt!, Point Cloud Library (PCL), 3D Perception, Computer Vision (OpenCV).

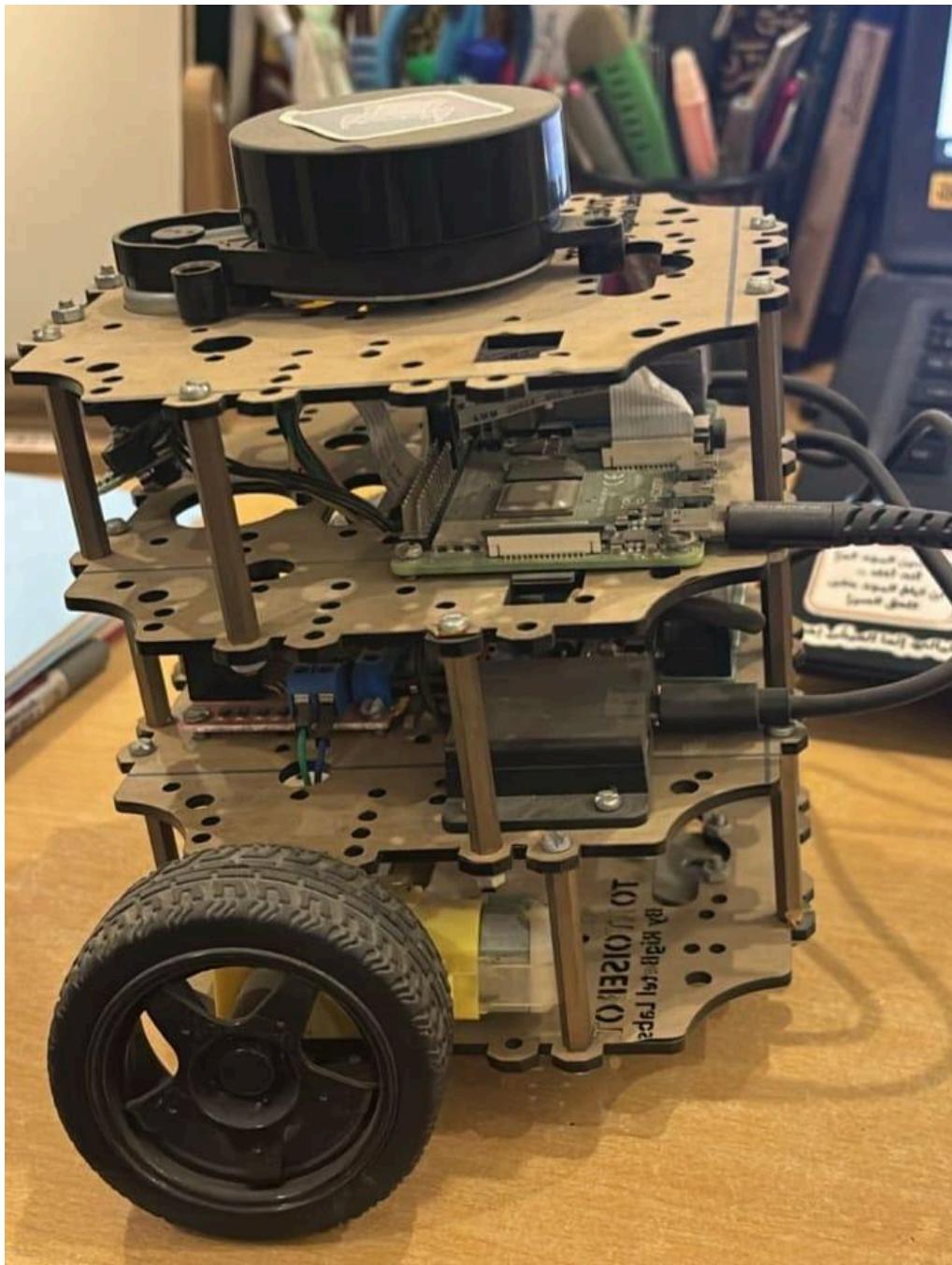
Checkpoint: ROSbot XL – PID-Controlled Navigation & Obstacle Avoidance

- **Description:** Completed an autonomous navigation system for the ROSbot XL, a holonomic four-wheeled robot, using PID control for precise movement adjustments. Programmed the robot to navigate through a maze, detect obstacles using vision-based perception, and dynamically adjust speed and direction for optimized path execution.
- **Technologies:** ROS, Python, PID Control, Computer Vision, Gazebo.



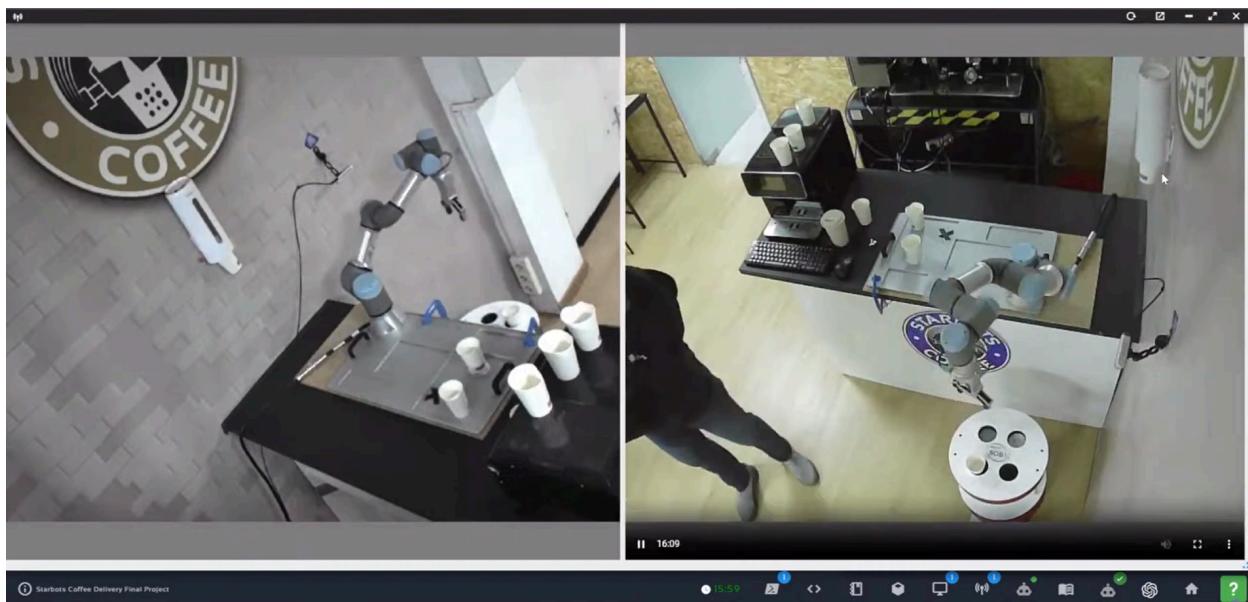
Checkpoint: TurtleBot3 – Physical Robot Assembly & Mapping

- **Description:** Completed the assembly and programming of a physical TurtleBot3 using Raspberry Pi, integrating both ROS1 and ROS2 navigation stacks. Implemented SLAM localization, allowing the robot to autonomously explore, map its environment, and navigate without predefined paths.
- **Technologies:** Hardware Assembly, Raspberry Pi, ROS1, ROS2, SLAM (Gmapping/Cartographer).



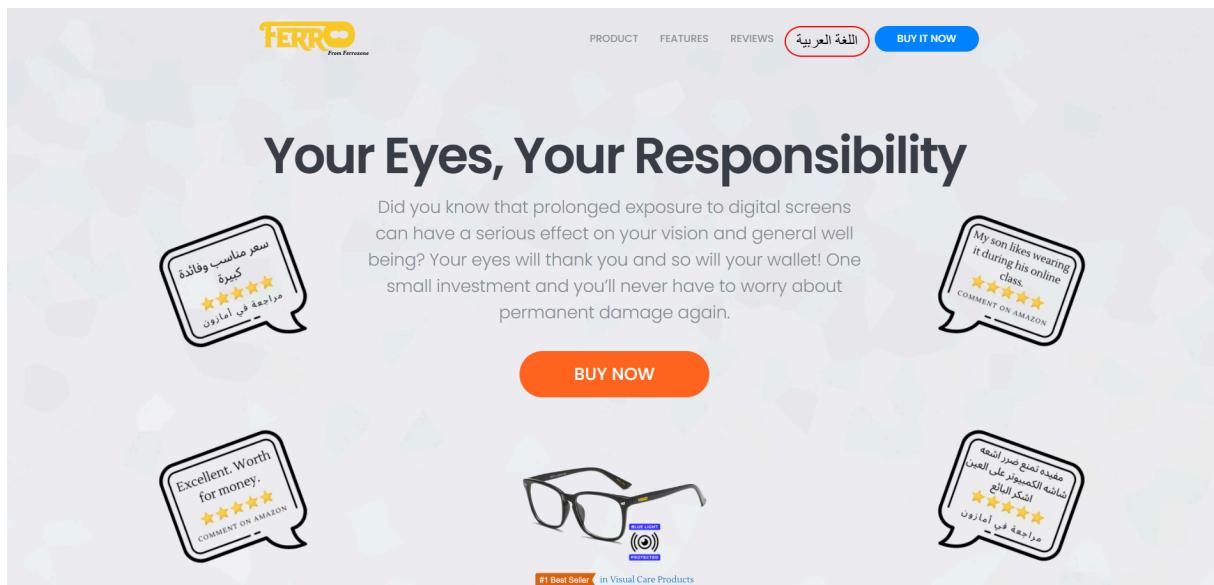
Capstone Project: Vision-Guided Robotic Arm Coffee Placement

- **Description:** This was the final project for the Robotics Masterclass, aiming to create a fully automated coffee delivery system. The project integrated multiple robotics and AI disciplines to solve a real-world automation challenge: building an end-to-end system where a robotic arm can visually identify a designated delivery slot, pick up a coffee cup, and place it accurately and securely.
- **Key Features:**
 - **Real-Time Perception (YOLOv5):** A YOLOv5 model was trained for real-time computer vision to detect the precise "hole" (the designated delivery slot) for cup placement. This allowed the system to identify the target's 3D coordinates from the camera feed accurately.
 - **Precision Motion Planning (MoveIt!):** Implemented the MoveIt! framework to handle all motion planning. This allowed for the generation of smooth, collision-free Cartesian paths, ensuring the UR3e arm moved precisely and safely from the "pick" location to the "place" location without spilling.
 - **Full ROS Integration:** The entire system was orchestrated using ROS. Custom nodes were developed to subscribe to the YOLOv5 perception topics, process the coordinates, and send the goal to the MoveIt! planner, and execute the planned trajectory on the physical UR3e robotic arm.
- **My Role:** I was responsible for the entire development lifecycle, from system design and component integration to programming the perception (YOLOv5), planning (MoveIt!), and control modules.
- **Links:**
 - **YouTube Presentation & Demo:** <https://www.youtube.com/watch?v=kWCi1mnxssY> (Timestamp: 1:33:33)
 - **GitHub Repository:** https://github.com/Hamz115/Starbot_Delivery
- **Technologies:** ROS, MoveIt!, C++, Python, Computer Vision (YOLOv5), PyTorch, UR3e Robotic Arm, Gazebo, RViz.



Previous Professional Experience: Al Wahah Web Services

- **Role:** Web Developer
- **Description:** As a professional web developer, I designed, developed, and deployed multiple frontend websites for various clients. My focus was on creating highly responsive, visually appealing, and user-friendly interfaces, working directly with clients to translate their requirements into a final product.
- **Technologies:** HTML5, CSS3, JavaScript (ES6+), React, Bootstrap.



A screenshot of the Al Maahirat website. The header features a phone number (+447402849810), an email address (aathifa@almaahirat.com), and a navigation menu with links for Home, Courses, and About Us. The background is a light-colored floral pattern. The 'Mission' section contains the tagline 'Nurturing Competent Muslimaat'. The 'Vision' section states 'To create a global sisterhood of content, creative and competent Muslimaat'. To the right is a circular logo for Al Maahirat, depicting an open book with a flame. The 'Our Courses' section lists three courses: 'HEALING HEARTS' (with a thumbnail image of a tree and the text 'Raising hearts to bloom with love'), 'THE MUSLIMAH AWAKENING' (with a thumbnail of a green wreath and the text 'Raising hearts to bloom with faith'), and 'The Blooming Muslimah' (with a thumbnail of a pink rose and the text 'Raising hearts to bloom with love').

Education & Key Certifications

- **Robotics Masterclass** - The Construct
- **The Complete Generative AI Course** - (Udemy)
- **The Complete Web Developer Bootcamp** - (Udemy)
- **Cambridge A-Levels** - Sri Lankan International School Jeddah

Foundational Self-Study

To complement my hands-on project work, I am committed to continuous learning by studying the foundational theory behind modern AI.

- **Build a Large Language Model (From Scratch)** by Sebastian Raschka:
 - Actively studying this text, which provides a deep, code-level understanding of LLM architecture by building a GPT-2 style model from the ground up.
- **AI Engineering for Foundation Models** by Chip Huyen:
 - Currently reading this book to master the principles of building, deploying, and maintaining reliable AI applications in production environments.