

Two small, colorful, faceted geometric shapes, one orange and one purple, positioned above the title.

Voice-Controlled Robot in Darija

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INTRODUCTION

Our project is a robot that can be controlled by voice commands, specifically using Moroccan Darija. This innovative robot responds to human words, allowing for seamless and intuitive interaction.

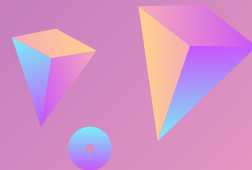
Choosing this language comes from our hope to see our country someday as a leader in AI, and we assume that this is the first step to start with.

The product potential



Fields	Challenges	Robot potential
Healthcare	Difficulty assisting elderly or disabled individuals with mobility or daily tasks. Limited availability of caregivers.	The robot can be voice-controlled to assist with simple tasks like fetching items or guiding individuals.
Warehousing	Inefficiency in transporting small loads manually. Need for cost-effective automation.	The robot can move and transport goods efficiently by following simple voice commands, reducing manual labor.
Home automation	Expensive smart-home solutions for task automation. Limited accessibility for elderly or non-tech-savvy individuals.	The robot serves as an affordable, voice-controlled assistant for tasks like carrying items or monitoring spaces..

The product potential



Fields	Challenges	Robot potential
Agriculture	High labor costs for simple tasks like inspecting fields or moving small tools.	The robot can navigate fields to perform tasks directed via voice commands, reducing dependency on manual labor.
Education	Lack of engaging tools for STEM education. Difficulties in teaching practical programming and robotics.	Students can interact with the robot to learn programming, machine learning, and robotics in a hands-on way.

Process sequencing diagram



User interface

record the user voice
send the command
voice/text



AI model

receive the command voice,
return the command text



Electronic devices

receive the command text
send the command signal



the Motor

receive the signal, move



Processing the voice command



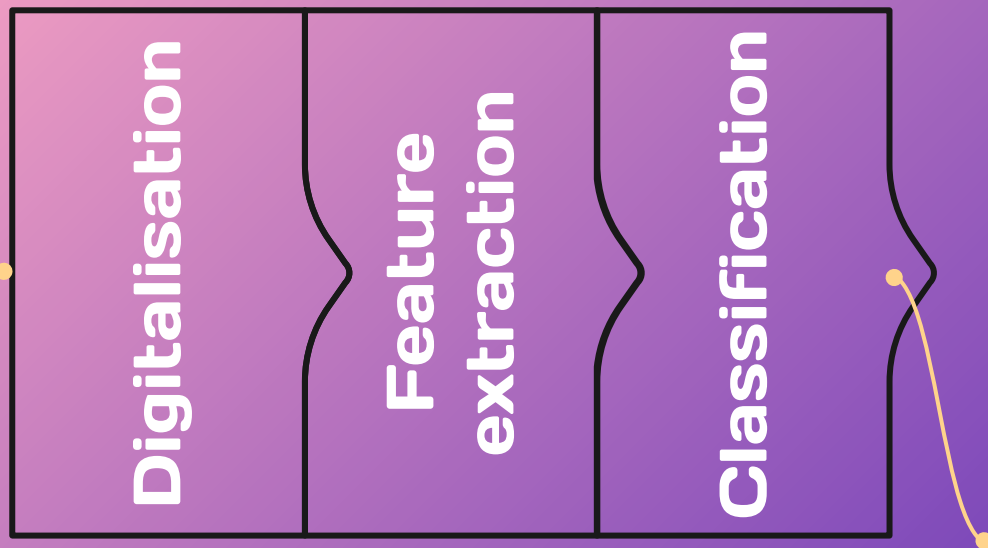
We decided to use Teachable Machine to build our model.

Teachable Machine is a tool developed by Google that uses machine learning to recognize patterns of specific voice commands and convert them into text.



Processing the voice command

Input
Voice



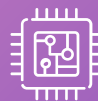
Output
Text

Web application to raspberry



Web application

After receiving the response from the model in the cloud, it sends the command text to the raspberry.



Raspberry

Due to a network card, the raspberry can connect to the network and receive the command text.

Web application to raspberry



the connection

to connect them, we use a web socket.

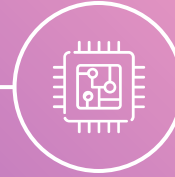
WebSocket: A real-time protocol that allows the Raspberry Pi to continuously listen for incoming commands like "left," "right," "forward," or "backward", and also allows the Web interface to continuously listen for incoming signals like "invalid command received" .





Raspberry Pi to Arduino card

**Raspberry
Pi**



Arduino card

after receiving the
command text, send it to
the arduino

turn the command text into
a signal command

We will rely on the serial communication , a method of
transmitting data one bit at a time over a physical
connection (UART cable),to send the command as a plain
string through the cable

Signal processing and Motion control

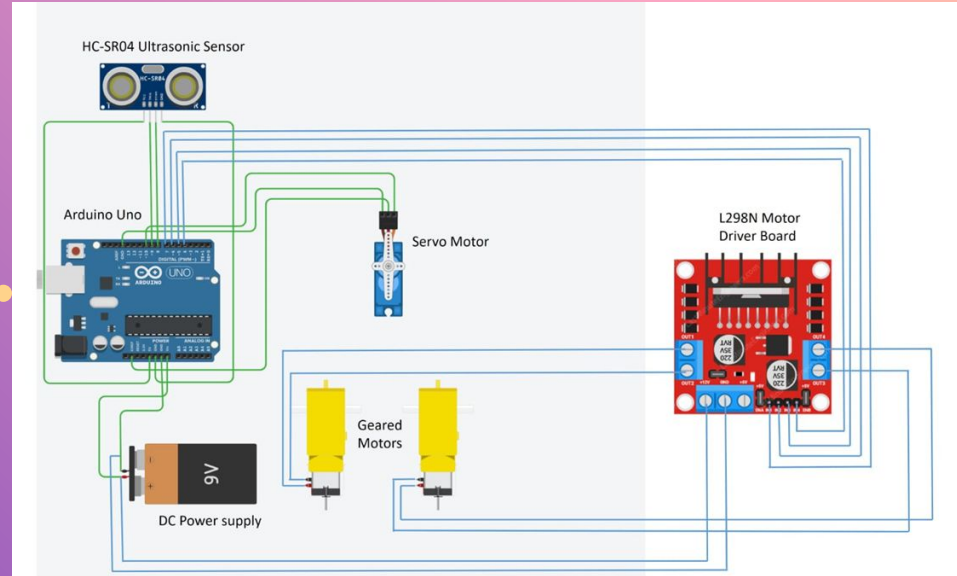
Arduino card Motor drivers DC Motors



- Motor driver uses PWM signals for speed control and an H-Bridge circuit to
- control motor direction, enabling precise and efficient movement of the DC motor.

Prototype conception

Raspberry Pi



Limitation to deal with



Cost efficiency

using a raspberry is expansive in some use cases



Accuracy

In some cases, the accuracy must be high and the AI model should make no mistake



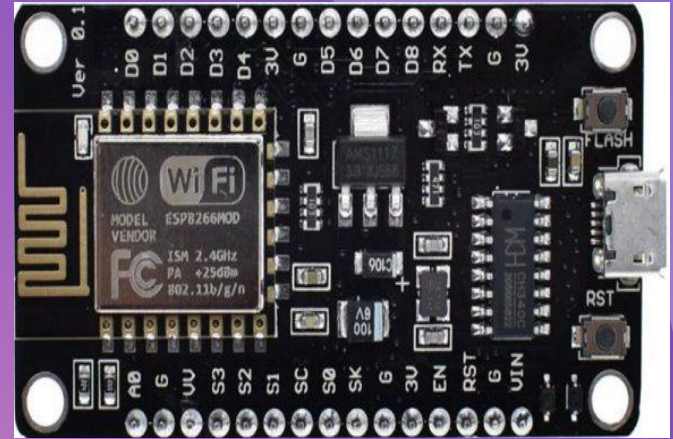
Training

talking Darija needs a large dataset tot train the AI model



Reducing cost

Instead of using a Raspberry Pi card linked to an Arduino card, we can consider various alternatives based on the robot's usage. For domestic purposes, a normal Wi-Fi microchip or a Bluetooth microchip is sufficient. Generally, using a Wifi card like NodeMCU will reduce the cost and weight of the robot, and substitute the usage of a raspberry card, making it simpler to build, easier to purchase, and faster to operate.



Accuracy

The problem of accuracy is critical, especially when used in domains like healthcare or in factories, thus we will use a simple mechanism to increase the systems' accuracy. the process rely on making multiple prediction for the same input, since the model is not determine, each time a random input is generated, working under the assumption that given an infinite amount of prediction made on the same input, the percent of the correct answer will reach hundred percent. therefore, by analysing the different predictions we may increase the system accuracy, though it delays the response but this delay is going to be neglected with servers with high performance





Training

We will base our solution on the process used to address the accuracy problem. By comparing system predictions with correct commands, we can train the model effectively. If the answer is wrong, repeated user commands provide additional useful data. But we still ignore how to use this data to upgrade our model. As a solution, we'll use another **AI model** to learn how to train the base model based on current and previous predictions.



The global process

the first model
predict the
command



the second
model produce
training data

the first model
train on data
generated by
the second

the second model
train on long term
performance of the
first model

