Final Assignment Models Predictors

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1. Problem definition.

Mobile robotics is a popular solution for exploration of hostile environments (such as toxic or radioactive environments) where a direct human intervention is not possible. In this project it is asked that each team implements a robotic explorer and simulates 3 different environments.

- 1.1 A total of 3 different environments needs to be simulated. Each environment needs to provide at least 3 conditions that can be sensed by the robot.
- 1.1.2 The robot needs to be able of moving from one environment to another.
- 1.1.3 Configuration of the environments (order) must be interchangeable.
- 1.1.4 The robot needs to acquire 3 or more sensor signals that can be use as predictors for supervised algorithms.

1.1 Controlled environments.

- Hot Room.
- Cold Room.
- Toxic Room.

1.1.2 Robot characteristics.

The main features of our robot are as follows:

- MCU Arduino.
- Micromotors DC.
- PCB.
- Battery LIPO 7.4V 300mAh.
- Driver motor TB6612FNG.
- Bluetooth HC06.

1.1.3 Configuration enviroments.

The configuration of our 3 environments will be placed in cascade form one after the other, where our robot will take 50 samples for each environment, each of them will be made of cardboard boxes and conditioned for each situation mentioned.

1.1.4 Configuration Sensors.

Our robot has 3 analog sensors:

- Sensor for air quality measurement MQ135.
- Sensor Humidity DHT11.
- Sensor Temperature LM35(DHT11).

The prediction methods will be as follows :

- KNN.
- Logistic regression.
- Decision tree.
- Lasso regression.

2. Arduino code program.

```
#include "DHT.h"

#define DHTPIN 12     // Pin where the sensor is connected

#define DHTTYPE DHT11   // Uncomment if using DHT 11

// Define the analog pin for sensor input
const int gasSensorPin = A0;

// Define variables
float gasResistance;
float gasPPM;

DHT dht(DHTPIN, DHTTYPE);

void setup() {
  Serial.begin(9600);
  Serial.print("Humidity,Temperature,PPM");
  Serial.print('\n');
  dht.begin();
}

void loop() {
  delay(2000);

  // Read humidity and temperature from the DHT sensor
  float h = dht.readHumidity(); // Read humidity
  float t = dht.readTemperature(); // Read temperature in Celsius
  float f = dht.readTemperature(true); // Read temperature in Fahrenheit

  // Send the readings via the serial port
  Serial.print(h);
  Serial.print(",");
  Serial.print(t);
  Serial.print(",");
  Serial.print(gasPPM);
  Serial.print('\n');

  // Read the gas sensor value
  int sensorValue = analogRead(gasSensorPin);

  // Calculate the gas resistance (in kilohms)
  gasResistance = ((1023.0 * 10.0) / sensorValue) - 10.0;

  // Use the gas resistance to estimate the gas concentration in parts per million (PPM)
```

```
  gasPPM = pow(10, ((log10(gasResistance) - 2.5651) / -0.4615));

  // Delay before the next reading
  delay(2000);
}
```

3. Methods for prediction.

```
library(tidyverse)
```