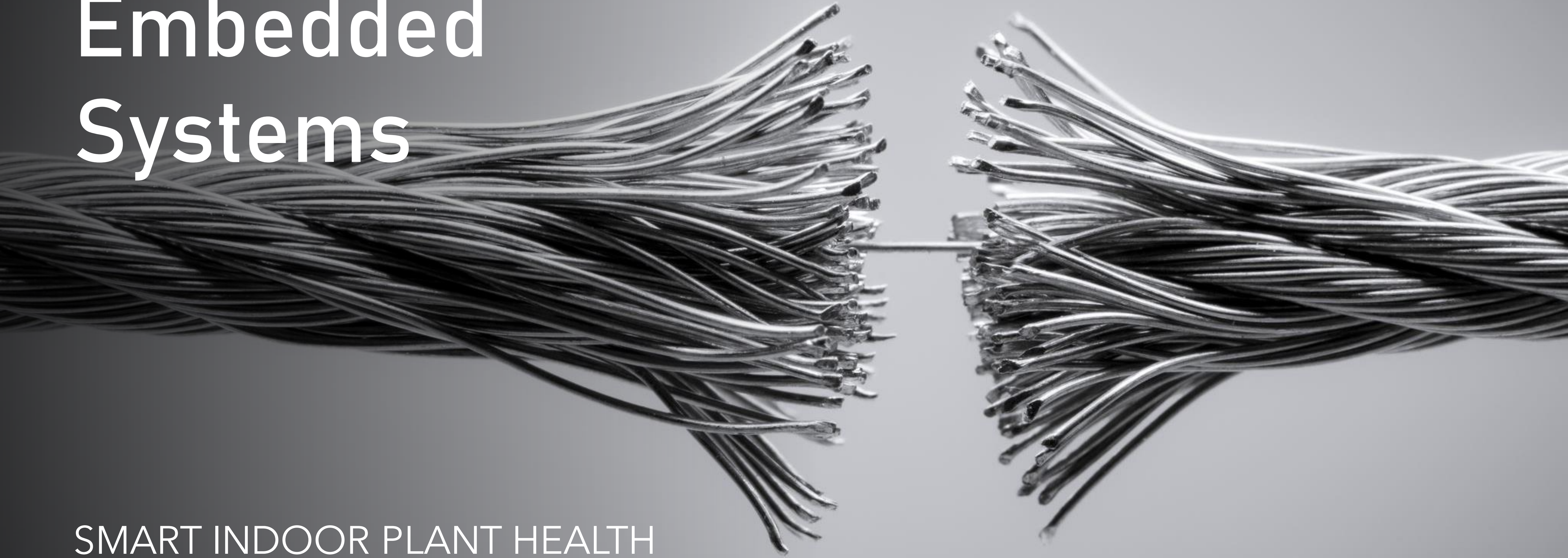
Embedded Systems



SMART INDOOR PLANT HEALTH MONITORING SYSTEM

Team Members:

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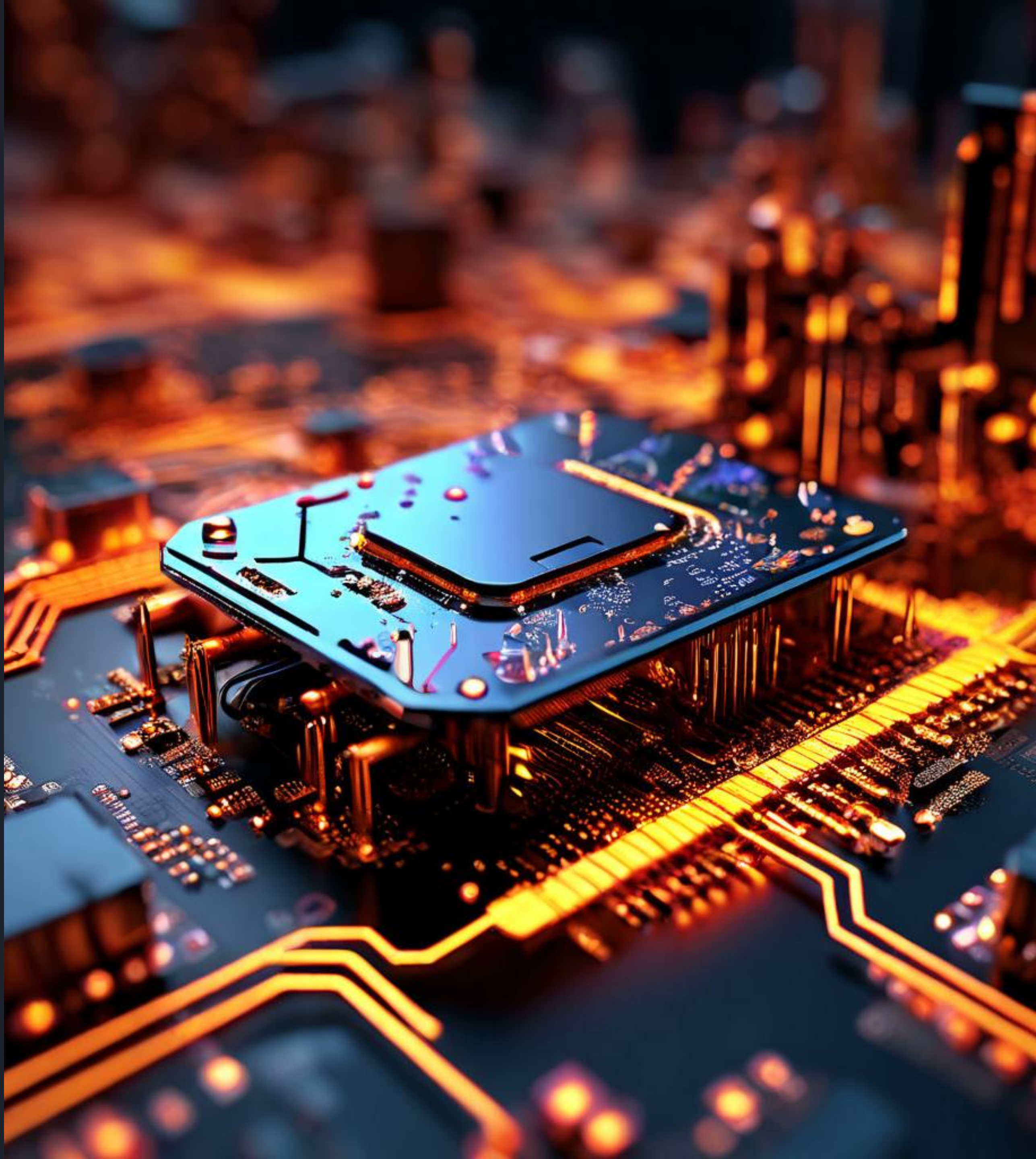
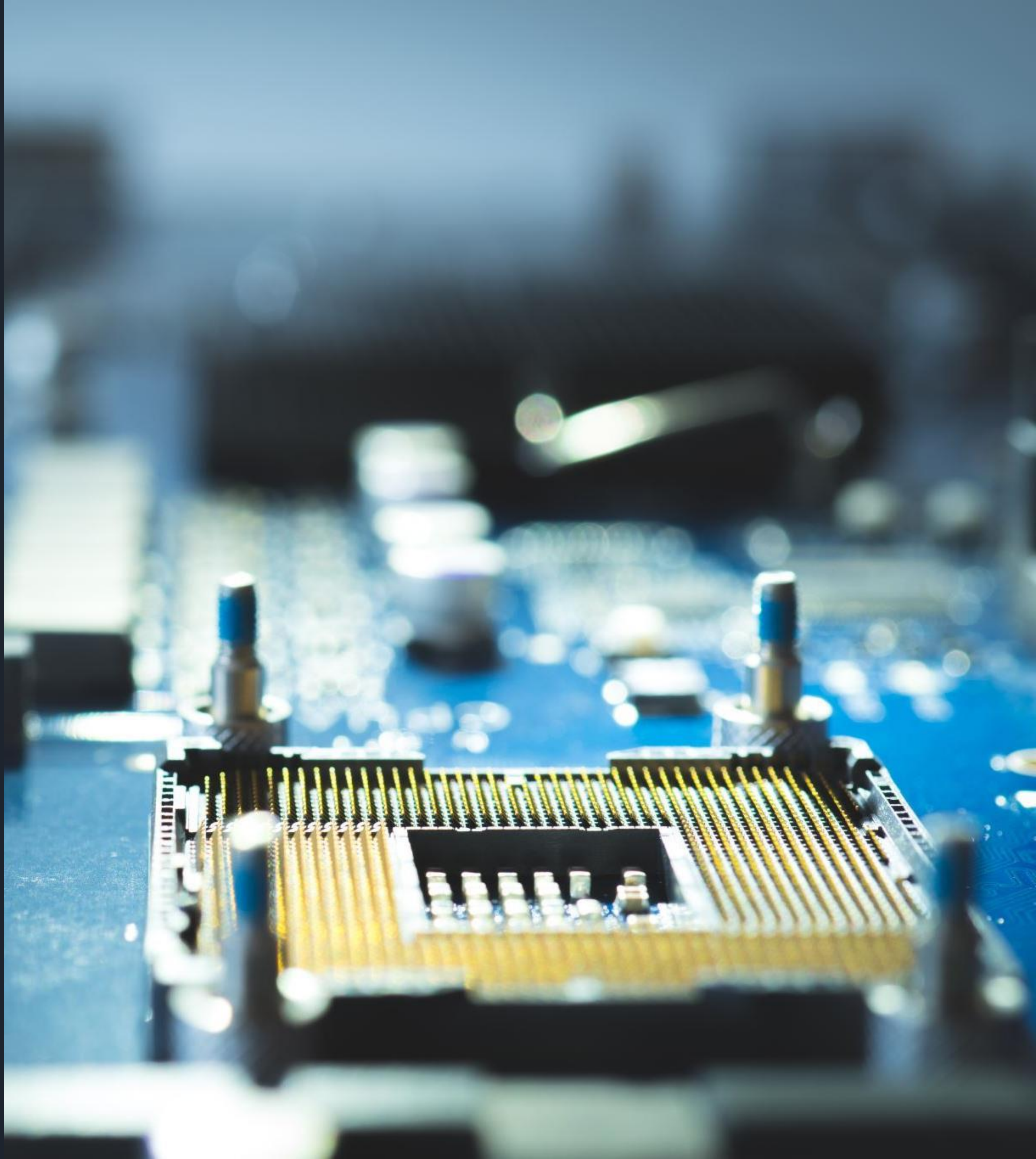


Project Overview

Our indoor plant care system utilizes AI and advanced sensors to monitor plant health in real-time and provide tailored automated care. By analyzing environmental data like temperature, humidity, soil moisture, and light intensity, it optimizes plant growth. With a user-friendly interface, it seamlessly integrates into any indoor space, offering plant enthusiasts an effortless way to ensure their green companions thrive and enhance their living environment.

Components Needed

1. Aduino UNO – R3
2. Temperature Sensor - [TMP36]
3. 250 KΩ Potentiometer
4. MCP23008-based, 32 (0x20) LCD 16 x 2 (I2C)
5. Soil Moisture Sensor
6. Red LED
7. 1 kΩ Resistor
8. DC Motor
9. NPN Transistor (BJT)



Why Arduino UNO – R3?

Originally, the plan involved utilizing a DHT22 sensor for simultaneous humidity and temperature readings. However, due to its **absence in simulations**, an alternative approach was devised. Upon examination of the sensor's operation, it was discovered that it employs a standard temperature sensor for temperature readings and a capacitive sensor for humidity. Through this understanding, simulation was achieved by substituting the DHT22 sensor with a potentiometer for humidity simulation and a temperature sensor for temperature measurement. To put in a line, it is **affordable**, **easily available** and **reliable**.

Project Steps

Hardware Setup – Connect sensors to the arduino and setup waterpump / solenoid valve for irrigation if automated watering is included.

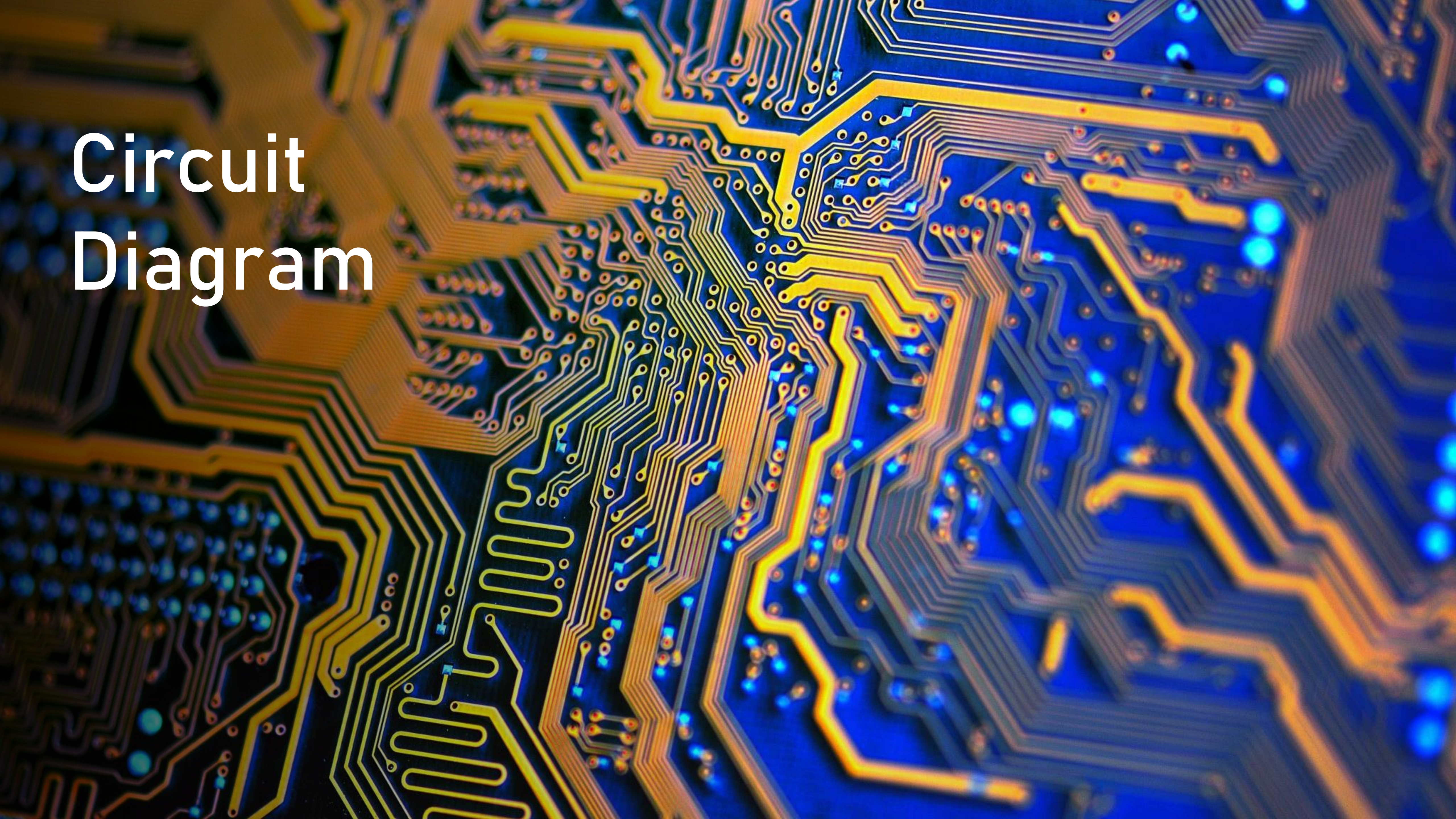
Data Collection – Program to collect data from sensors at regular intervals nd gather data on soil moisture, temperature, humidity and light levels.

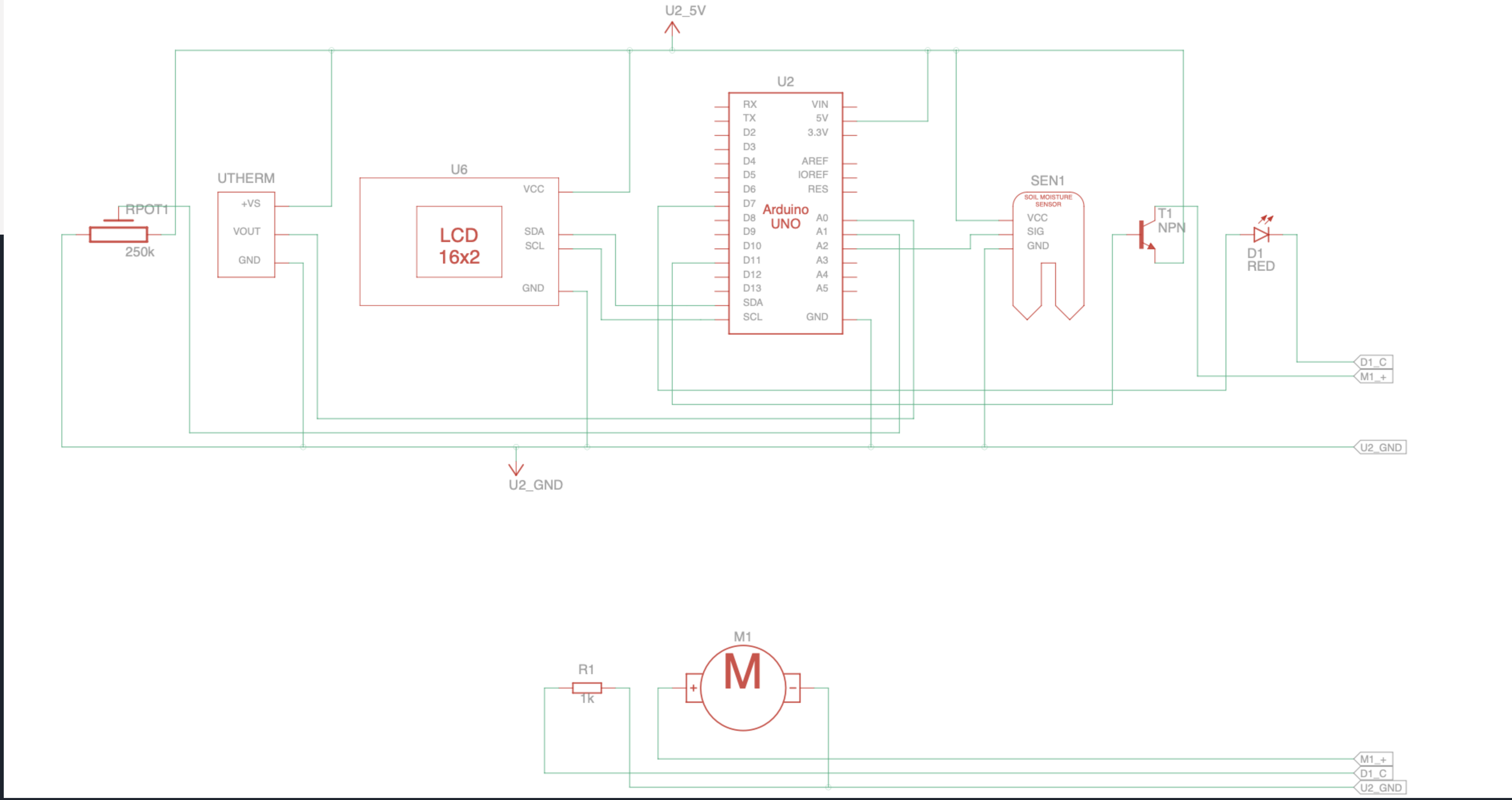
Automation - If automated watering is included, program the **Arduino UNO** to control the water pump/solenoid valve based on AI recommendations. Adjust the RGB LED color to indicate the plant's health status (e.g., green for healthy, red for needing water).

User Interface : Create an intuitive platform showcasing real-time plant data & AI-generated suggestions. Users can monitor environmental conditions and receive automated care advice. Additionally, integrate manual watering controls to allow users to intervene or override AI recommendations as needed, ensuring a seamless and flexible plant care experience.

Testing and Refinement: Test the system with different plant species and environmental conditions. Refine the AI model and system logic based on feedback and performance.

Potential Extensions - The system integrates a camera for visual plant health, voice control via Amazon Alexa or Google Assistant, historical data analysis for predictive care, and seamless home automation integration. Combining IoT, AI, and automation, it offers a practical yet intriguing solution for plant care.


Circuit
Diagram


U2_5V
U2
RX
TX
D2
D3
D4
D5
D6
D7
D8
D9
D10
D11
D12
D13
SDA
SCL
VIN
5V
3.3V
AREF
IOREF
RES
A0
A1
A2
A3
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GND
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UNO
U6
VCC
LCD
16x2
SDA
SCL
GND
UTHERM
+VS
VOUT
GND
RPOT1
250k
SEN1
SOIL MOISTURE
SENSOR
VCC
SIG
GND
T1
NPN
D1
RED
D1_C
M1_+
U2_GND
U2_GND
M1
M
R1
1k
M1_+
D1_C
U2_GND

Conclusion

Innovative Solution: The developed system offers an innovative solution for indoor plant care by leveraging IoT, AI, and automation technologies.

Efficient Monitoring: Through the integration of sensors such as soil moisture, temperature, humidity, and light, the system efficiently monitors the health of indoor plants in real-time.

AI-Driven Analysis: The incorporation of AI-driven analysis enables the system to make informed decisions regarding plant care based on environmental data. This ensures that plants receive optimized care tailored to their specific needs.

Automation: With the option for automated watering and status indication through RGB LEDs, the system provides seamless and efficient plant care without requiring constant manual intervention.

User Interaction: The potential inclusion of a user interface, either through a web interface or mobile app, allows users to easily monitor plant health and receive AI-driven recommendations. Additionally, manual control options empower users to override AI suggestions if necessary.

Conclusion

Scalability and Flexibility: The system's modular design allows for scalability and flexibility, enabling integration with additional features such as a camera module for visual plant health assessment or voice control using services like Amazon Alexa or Google Assistant.

Continuous Improvement: Through testing and refinement, the system can be continuously improved to enhance its performance and accuracy in plant care management.

Technological Advancements: This project showcases the potential of combining IoT, AI, and automation to create smart solutions for everyday tasks, contributing to advancements in technology and improving quality of life.

Future Prospects: With potential extensions such as historical data analysis and integration with home automation systems, the system opens up possibilities for further enhancements and applications in smart home environments.

Overall Impact: By revolutionizing the way indoor plants are nurtured and maintained, this project has the potential to enhance the beauty and air quality of indoor spaces while offering a practical and technologically intriguing solution for plant care.