Project : Home safety system using LLM Agents

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GitHub link : https://github.com/jmyoanna/Home-safety-system.git

1. Motivation:

The motivation for this project is to develop a fire detection system by utilizing the reasoning capabilities of Large Language Model (LLM) agents, combined with historical sensor data. The aim is to predict fire risks based on previously collected sensor readings such as temperature, smoke level, and gas concentration, without relying on real-time monitoring. This approach will leverage data-driven machine learning models to enhance fire detection accuracy and reliability, while minimizing the need for continuous sensor feeds, thus making it feasible for scenarios with limited computational resources.

2. Design Goals:

Use LLM agents to design a fire detection system that leverages historical sensor data.

Equip the LLM with the necessary tools to autonomously generate a machine learning model for fire risk prediction.

Develop a non-real-time solution using a dataset consisting of sensor readings, allowing for offline processing and analysis.

Ensure the solution is accessible and practical for deployment in environments where live monitoring is not suitable.

3. Deliverables:

Understanding LLM agents: Complete the tutorial on LLM agents.

Basic LLM agent implementation: Implement a basic LLM agent to generate code and reason about the fire detection use case.

Fire Detection System Design: Use the LLM agent to design a fire detection system based on historical sensor data.

Code Output: Generate code to train and test a machine learning model for predicting fire risks based

on existing datasets.

4. System Blocks:

LLM Reasoning Block: The core LLM agent will take in the fire detection requirements and output a model design.

Dataset Retrieval Block: An existing dataset with sensor readings, including temperature, smoke, and gas levels, along with labels for fire occurrences.

Model Training Block: The LLM will generate code to train a machine learning model using the sensor dataset.

Prediction Block: Use the trained model to predict fire risk based on new data from the dataset.

5. Hardware/Software Requirements:

- Hardware:

Laptop or desktop computer with sufficient computational resources.

Alternatively, use Google Colab for training and testing.

- Software:

Python

Libraries for machine learning (e.g., scikit-learn, pandas)

Jupyter Notebook or an equivalent IDE

Google Colab for GPU support if needed

6. Team Members Responsibilities:

Set up the environment, including installing necessary libraries and tools.

Develop scripts for processing sensor data and training models.

Research appropriate machine learning techniques for fire detection.

Document system design, write explanations of the model, and prepare the final project report.

Shared Responsibilities:

Algorithm Design: Collaboratively design algorithms for training and testing the model.

Data Analysis: Work together to analyze the dataset and improve model accuracy.

7. Project Timeline:

Week 1-2: Complete tutorials on LLM agents, set up the development environment, and gather the historical dataset.

Week 3-4: Implement basic LLM agent functionality and generate a machine learning model design using the dataset.

Week 5-6: Train and evaluate the fire detection model. Fine-tune the model based on evaluation metrics.

Week 7: Finalize testing and make improvements to the model.

Week 8: Complete documentation and prepare project deliverables.

8. References:

Langchain tutorial (or equivalent framework tutorial).

https://github.com/robmarkcole/fire-detection-from-images?tab=readme-ov-file

https://arxiv.org/pdf/2303.17580