LLM-GUIDED CHILLER FAULT DETECTION AND DIAGNOSIS SYSTEM

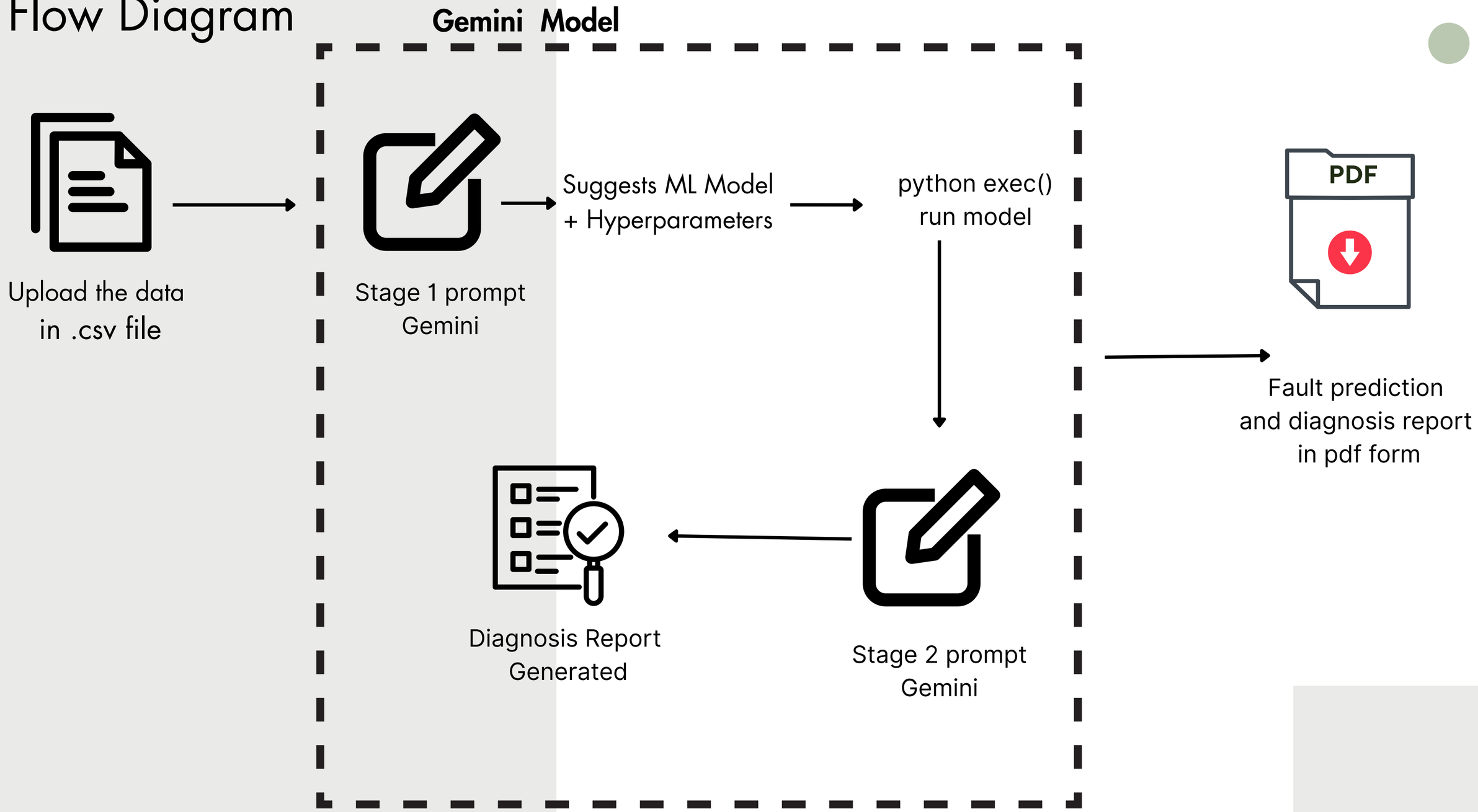
Introduction

- Chillers are critical in HVAC for industrial/commercial buildings
- Manual fault detection is time-consuming and error-prone

Automating fault detection using:

- *Gemini 1.5 Flash (LLM)* → for model recommendation, hyperparameters, and diagnosis
- *ML Models (RF, CNN,LSTM etc.)* → for training and prediction

Flow Diagram



LLM Prompt Design & Responsibilities

Stage 1 Prompt
- Model Code Generator

- Analyze shape, data types
- Classify as time-series or static
- Recommend ML model:
  - **For time-series**: CNN, TCN, LSTM, GRU, or TemporalConv from TensorFlow/Keras
  - **For static**: RandomForest, GradientBoosting, or SVM.
- GridSearchCV` (for sklearn) for hyperparameters
- **Output**: Fully runnable code

Stage 2 Prompt
– Diagnosis Generator

Input:

- Model type, score, features, sample data, predicted fault

Output:

- Detailed technical fault report

Fault Diagnosis Report includes:

- Fault Prediction
- Important Features/Sensors
- Confidence Level
- Recommended Technician Actions
- Conclusion