CSAI 422: Laboratory Assignment 2

Due Date: March 3, 2025 at 23:59
Time Estimate: 2 hours
Points: 100

Overview

Build an exoplanet analysis system using the OpenAI API and NASA's Exoplanet Archive data. Your system will create informative summaries and analyses of exoplanets using LLM capabilities.

Learning Objectives

- Work with the OpenAI Chat API
- Process scientific data for effective prompt engineering
- Implement context-aware analysis using LLMs

Requirements

1. Data Processing (30 points)

- Download Confirmed Planets table from NASA's Exoplanet Archive
- Process essential planetary characteristics:
  - Planet name, host star, orbital period, radius, mass
  - Temperature, discovery year, method

2. Prompt Engineering (40 points)

- Create functions for selecting relevant planetary data
- Implement effective prompt templates for:
  - Individual planet analysis
  - Planet comparisons
- Structure prompts for consistent, scientific responses

3. Analysis System & Error Handling (30 points)

- Implement planet querying and analysis
- Handle missing/invalid data
- Include basic error handling
- Add simple test cases

Required Files

1. `exoplanet_analyzer.py`
2. `test_analyzer.py`
3. `requirements.txt`

Starter Code

```
from openai import OpenAI
import pandas as pd

class ExoplanetAnalyzer:
    def __init__(self):
        self.client = OpenAI()
        self.data = self._load_exoplanet_data()

    def _load_exoplanet_data(self):
        """Download and load NASA Exoplanet Archive data."""
        pass

    def analyze_planet(self, planet_name):
        """Generate analysis for a specific planet."""
        pass

    def _create_analysis_prompt(self, planet_data):
        """Create prompt for planet analysis."""
        pass

    def compare_planets(self, planet_names):
        """Compare multiple planets."""
        pass
```

Grading Criteria

- Working implementation (70%)
- Code quality and organization (20%)
- Error handling (10%)

Tips

- Focus on creating clear, effective prompts
- Consider token limits in prompt design
- Use error handling for missing data
- Keep responses concise and scientific

Submission

Submit your code files to the course submission system by March 3, 2025 at 23:59.