

This document will give you comprehensive about the files uploaded in github as a part of submission. It also covers proposed solution.

Step 1:

- IDE Used: Visual studio and Jupyter notebook inside VS Code
- Create new venv and activate it using python or conda
- Using pip, you can install requirements.txt file (using command: pip install -r requirements.txt)

Step 2: Data Sample files and Data Generation Approach

- Inside your workspace – create two folders:
 - csv_files
 - json_files
- Paste all csv_files and json_files inside their respective folders.
- Note: Change the path as per your need in order to open/analyze files
- Json data files:
 - sample_diverse_dataset.json
 - Contains diverse herd information (yak name, age, health and behavior)
 - sample_json.json
 - Contains herd information (yak name, sex, age)
 - sample_order_data.json
 - Contains order information for 100 random customers
 - It shows customer name, order, date
 - sample_stock_data.json
 - Contains 100 stock samples (milk, skins)
 - customer_order_fullfillment_results.json
 - Contains order fulfillment status for 100 customers from sample_order_data.json with corresponding orders in sample_stock_data.json
 - Sample_diverse_dataset_updated.json
 - More features added for behavior analysis
- **CSVs data files:**
 - sample_diverse_dataset.csv – for querying using NLP agent
 - sample_json.csv – for querying using NLP agent
 - sample_order_data.csv – for querying using NLP agent
 - sample_stock_data.csv – for querying using NLP agent
- **Data Creation Approach:**
 - REFERENCE FILE: data_generator.ipynb
 - Based on the sample data provided in the tasks, 100 samples are created randomly for each json.
 - These json files are further utilized for every other tasks – core_functionality, AI models, Behavior analysis

- CSV files are just for NLP Query Agents

Other Python Files

- **core_functionality_solution.ipynb**
 - this file solves core functionality needed for the tasks which includes:
 - Data Preprocessing
 - Stock and Herd Management Functions
 - Order Fulfillment Logic
 - Note: code logics can be referred via comments
- **anomaly_detection.ipynb**
 - ML model for anomaly detection
 - Model Used – Unsupervised Learning ML Model: IsolationForest
 - Reason to choose this model:
 - Effectiveness in Handling Outliers
 - Robustness to Noise and Irregularities
 - Efficient Computation
 - Parameter-Free Approach
 - Handling High-Dimensional Data
 - No Assumptions about Data Distribution
 - Effective in Unsupervised Learning Scenarios
 - **Note:** Testing has been done using inference data
 - **Note:** Model has been evaluated on accuracy, false positive rates
- **behavior_analysis.ipynb**
 - ML model for behavior analysis
 - **Note:**
 - The provided behavior analysis model attempts to predict yak behavior based on 'Age' and 'Health' attributes. While it's a step toward understanding yak behavior, fulfilling the statement to predict and comprehend their behavior over time requires a more comprehensive approach and more features. These features were not present as a part of the sample data
 - Additional relevant features, such as environment, diet, social interactions, or seasonal changes, might provide more comprehensive insights.
 - Model used: Binary Classification model where yak behavior is analyzed with age and health attributes
 - **Note:** Testing has been done on selecting random data samples from test data and check the model predictions (ground_truth_behavior vs model_predicted_behavior)
- **behavior_analysis_updated.ipynb**
 - New experiments with randomly generated new features to make behavior analysis more robust

- `final_app_agent_nlp.py`
 - In the terminal, type `streamlit run final_app_agent_nlp.py`
 - **Note:** Make sure to use your own OPENAI API KEY from OPENAI
 - a webpage has been created to query different data related csv files
 - Functionality:
 - You can download multiple CSVs at once
 - You can choose on what csv you need to perform query. Accordingly agent will provide you the answers
 - Agents' modules are used instead of chains modules of LangChain. Agents are not rule based models unlike chains where users have to define a set of prompts in order to get answers from their query. Surprisingly, agents handles this straightaway
 - **Note:** You can query any questions from any csv files
 - **Note:** You cannot update any value. I doubt if this functionality exists or not
 - **Note:**
 - My OpenAI free credits are finished, so I am not getting responses back from LLM. Let me fulfill it, I will update it if a demo needs to be shown
 - However, check simple and cool website design to upload and view csvs

Condensed steps for deploying the Yak Shop with AI/ML features on GCP:

Deployment Steps

1. Data Processing:

Google Cloud Storage:

- Upload the JSON file containing herd information to Google Cloud Storage.

Compute Engine:

- Create a Compute Engine instance to run the data processing program.
- Install necessary dependencies and libraries for Python or any preferred programming language.
- Write a script that reads the JSON file path and the elapsed time parameter.
- Use GCP SDKs or libraries to interact with Google Cloud Storage to access the JSON file
- Process the data to simulate changes in the herd after the specified time.

2. Stock and Herd Management:

Google Cloud Functions or App Engine:

- Develop APIs or web services for stock and herd management.
- Utilize Google Cloud Functions or App Engine to host these APIs.
- Connect these services to the processed data obtained from Data Processing step.
- Implement endpoints to calculate and display milk and skin stock after T days.
- Create endpoints to view the herd after T days, including yak details.

3. Order Fulfillment:

Google Cloud Firestore or Cloud SQL:

- Set up a database to manage orders, customer details, and stock availability.
- Create tables/collections to store order details and available stock.
- Develop APIs or services using Cloud Functions or App Engine to handle order requests.
- Implement logic to check stock availability based on incoming orders.
- Return appropriate HTTP status codes and order details based on stock availability.

4. AI/ML Anomaly and Behavior Analysis:

Google Cloud AI Platform:

- Train anomaly detection and behavior analysis models using Google Cloud AI Platform's machine learning services.
- Prepare and preprocess data for training these models.
- Deploy trained models as endpoints on the AI Platform.
- Integrate these endpoints with your Yak Shop application to monitor yak health and behavior.
- Retrieve predictions or analysis results for anomalies and behavioral insights.

Note_1: Throughout these steps, ensure proper authentication, access control, and permissions are set up using GCP IAM (Identity and Access Management) to secure access to resources and services.

Note_2: configure networking and API endpoints appropriately to enable communication between different components of the Yak Shop application on GCP.

Note_3: Always monitor and test the deployed functionalities to ensure they perform as expected and consider using GCP's monitoring and logging services to track application behavior and performance.