1. Initial Setup

```
!pip install -q -U google-genai
!pip install -q -U google-generativeai
!pip install -q -U google-cloud-aiplatform google-cloud-bigquery-storage-v1beta1 ipywidgets
!pip install -q -U google-cloud-bigquery[ipywidgets]
```

```
[ ] # Core Python libraries (built-in)
import os
import sys
import datetime
import uuid
import logging
import traceback
import time
import pprint

# Data Processing
import numpy as np
import pandas as pd
import pyarrow as pa
import pyarrow.parquet as pq

# Google Cloud Platform SDKs
import google.cloud.bigquery
import google.cloud.bigquery_storage_v1beta1
import google.cloud.aiplatform
import google.cloud.storage

# Google Generative AI SDK
import google.generativeai as genai

# Utilities for Jupyter/Colab
import ipywidgets
import IPython.display
from IPython.display import display, HTML, Markdown, Image
```

2. Environment Variables

2.1 Project Setup

```
# Project ID for Google Cloud.
PROJECT_ID = "bigquery-public-data"

# Location for BigQuery.
LOCATION = "US"

# Gemini API Key.
GEMINI_API_KEY = "YOUR_GEMINI_API_KEY"
```

2.2 Model Configuration

```
# Gemini model to use.
GEMINI_MODEL_NAME = "gemini-2.5-pro-preview-05-06"

# Temperature for Gemini model.
TEMPERATURE = 0.0

# Maximum output tokens.
MAX_OUTPUT_TOKENS = 65536

# Top-P sampling.
TOP_P = 1.0

# Top-K sampling.
TOP_K = 32

# Number of candidates.
CANDIDATE_COUNT = 1

# Stop sequences.
STOP_SEQUENCES = ["STOP"]
```

2.3 Dataset Configuration

```
# Dataset to use.
DATASET_ID = "thelocal_restaurants_reviews"

# Table to use.
TABLE_ID = "yelp_review_text"

# Full table reference.
FULL_TABLE_REFERENCE = f"{PROJECT_ID}.{DATASET_ID}.{TABLE_ID}"
```

3. Initialization

3.1 Initialize Clients

```
# Initialize BigQuery client.
bq_client = google.cloud.bigquery.Client(project=PROJECT_ID, location=LOCATION)

# Initialize BigQuery Storage client.
bqs_client = google.cloud.bigquery_storage_v1beta1.BigQueryStorageClient()

# Initialize Google Cloud Storage client.
gcs_client = google.cloud.storage.Client(project=PROJECT_ID)

# Configure Gemini API.
genai.configure(api_key=GEMINI_API_KEY)

# Initialize Gemini model.
gemini_model = genai.GenerativeModel(GEMINI_MODEL_NAME)

# Initialize Vertex AI.
google.cloud.aiplatform.init(project=PROJECT_ID, location=LOCATION)
```

3.2 Verify Connections

```
[ ] # Test BigQuery.
print("BigQuery client initialized.")
print("Datasets:")
for dataset in bq_client.list_datasets():
    print(f"  {dataset.dataset_id}")

# Test Gemini.
print("\nGemini model initialized.")
print(f"Model: {gemini_model.model_name}")

# Test Vertex AI.
print("\nVertex AI initialized.")
print(f"Project: {PROJECT_ID}")
print(f"Location: {LOCATION}")
```

```
BigQuery client initialized.
Datasets:
  bigquery_ml_preprocessed_data
  chicago_crime_arrests
  chicago_crime_beat_boundaries
  chicago_crime_community_boundaries
  chicago_crime_ward_boundaries
  chicago_crime_zip_boundaries
  chicago_crime_zip_demographics
  chicago_crime_zip_housing
  chicago_crime_zip_income
  chicago_crime_zip_population
  chicago_crime_zip_poverty
  chicago_crime_zip_unemployment
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