SQL Query Log Analysis using Python

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CSCI-29 Final Project Fall 2020

Background

- Millions of Query in Database Logging System (Teradata)
- DBAs are busy in fixing performance issue
- Existing day to day issue with SQL joins etc.
- New features (including AI/ML) are available in database
- Performance concern of using these feature (if not done properly)
- Hard to do analysis of Queries Logs by SQL select etc.
- Whether Customer using OR not using some advance feature/function of database

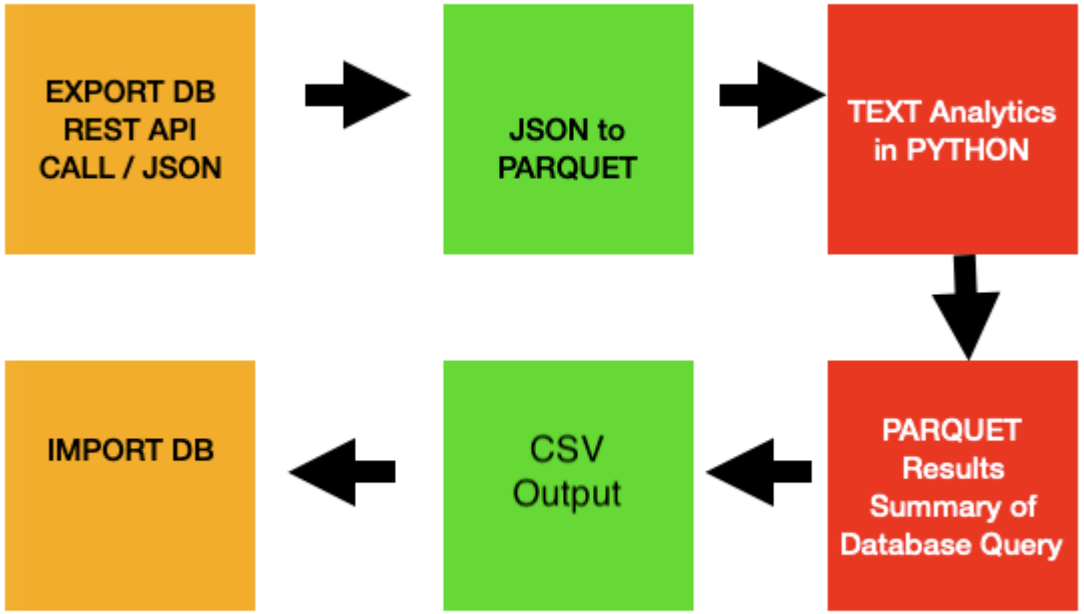
Project Goal

- Extract SQL Logs from Database to Dev environment
- Define search keywords (SQL keyword or advance database functions)
- Perform Text Analytics of SQL Texts from the logs
- Utilize Word2Vec framework and find matches/nearest neighbor in SQL Texts export
- Find top 3 match and create a summary file (csv)
- Upload the summary file to database for daily review through dashboard/reports by DBA

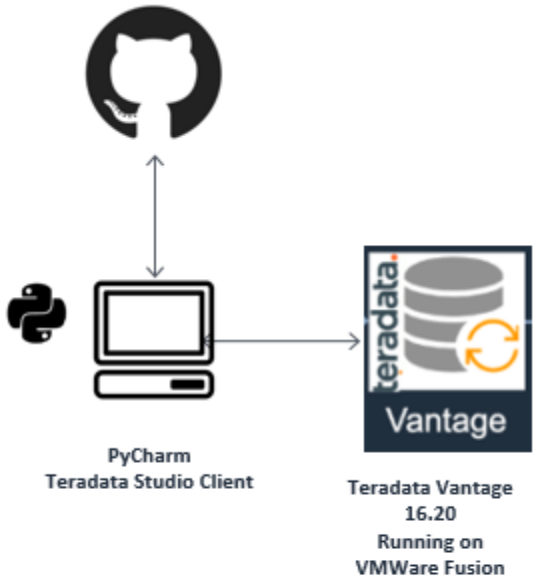
Python Framework Utilized

- Python is chosen since it contains many library to perform text analytics
- **fastapi, pydantic, uvicorn, teradatasql** : Utilized for exporting database SQL Log data in JSON from database using SQL Query
- **luigi, requests**: Utilized to build a wrapper around fast api / rest and produce JSON file
- **json2parquet**: To convert JSON to Parquet format
- **pandas, numpy, atomic_write, word2vec, awscli, csv**: find matches/nearest top 3 neighbor in SQL Texts based on match criteria in env file and generate csv result
- **sqlalchemy**: connecting to database and loading summary csv file

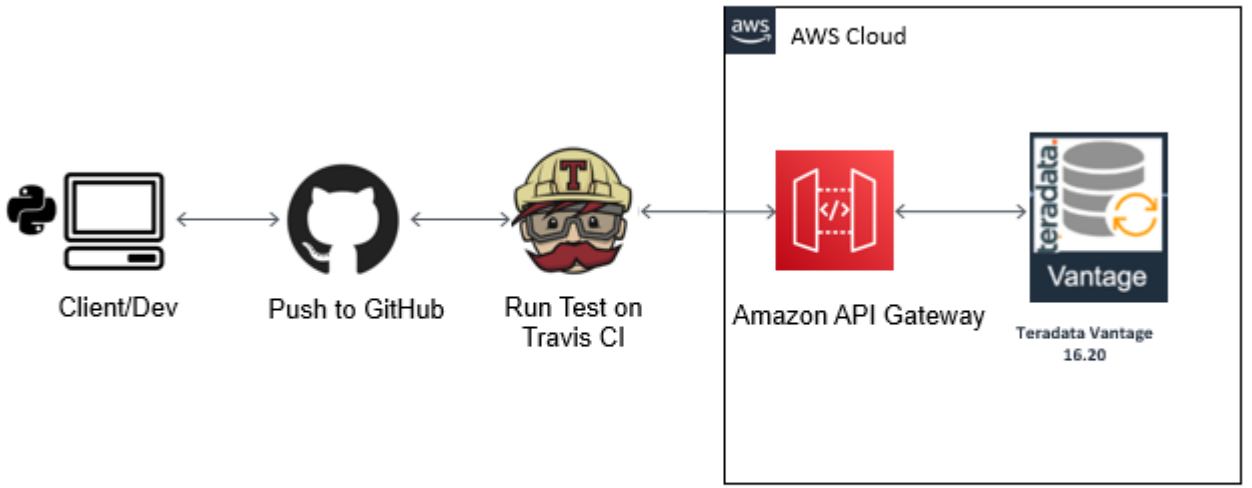
Flow Diagram



Architecture Diagram

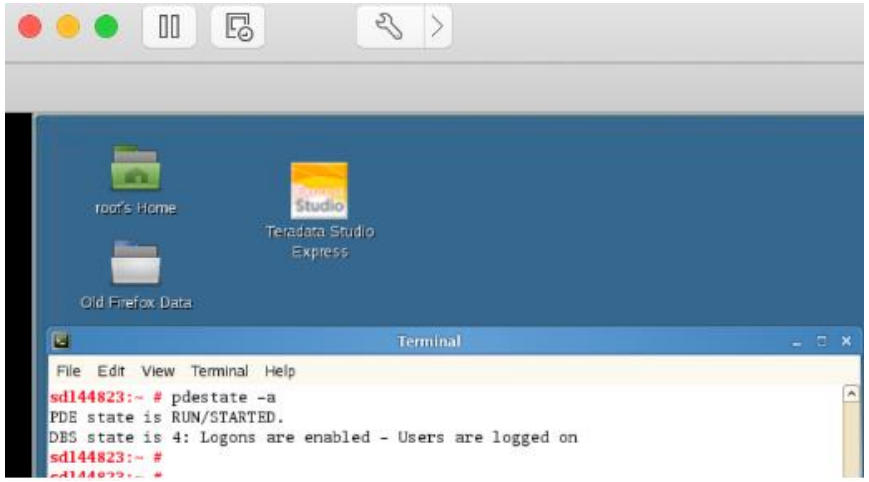


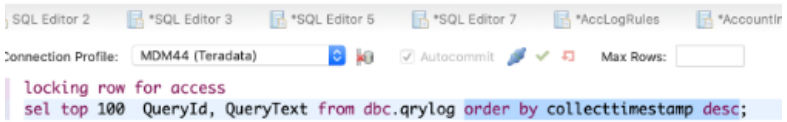
Dev Environment

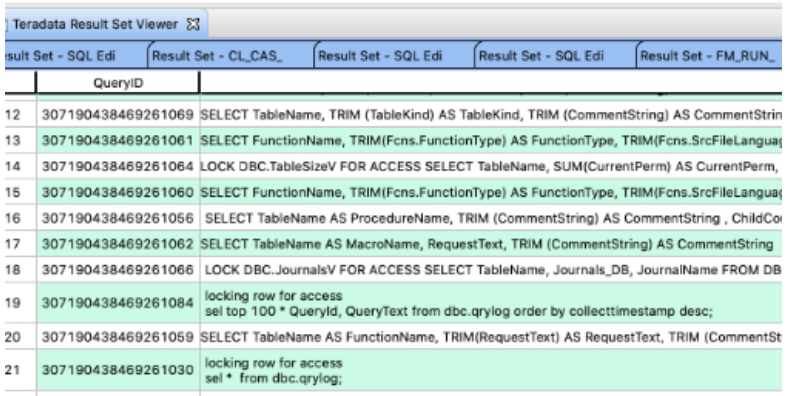


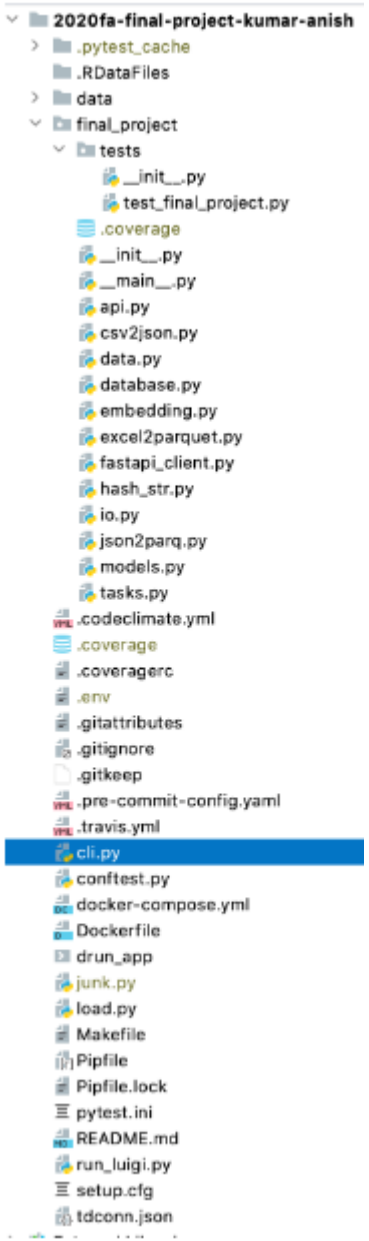
Prod Environment

Dev Env Details / SQL Logs







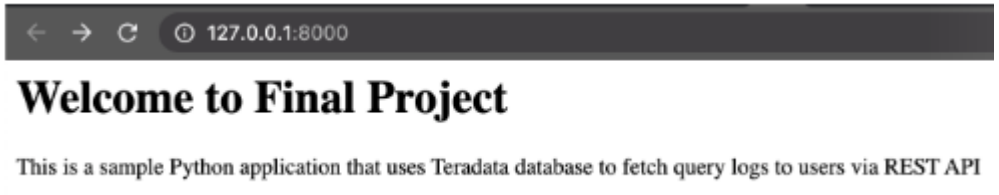


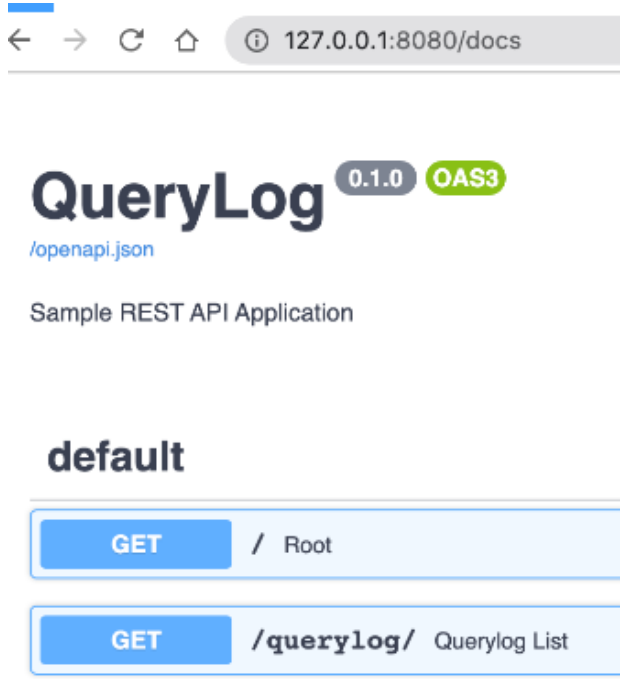
Design

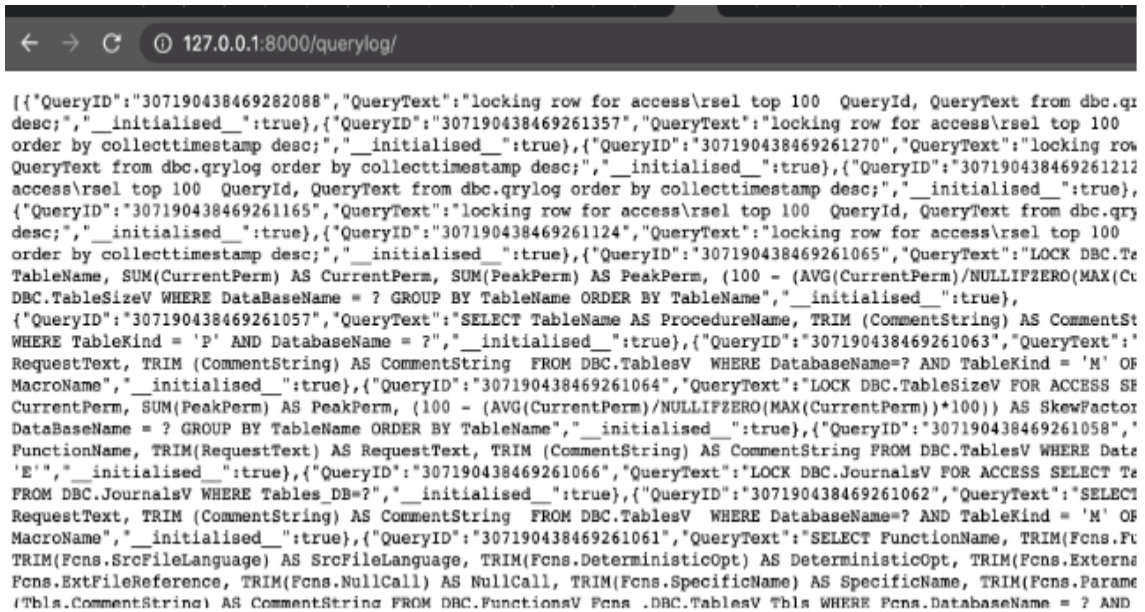
- **api.py** (FastAPI/ uvicorn implementation) EXPORT FROM DB USING REST API CALL /API Output: JSON HTTP GET REQUEST is /querylog/ which execute query to fetch top 100 recent database query logs Below is the Query details
- **fastapi_client.py** Use for testing the rest service
- **tasks.py** Luigi task which calls rest api and gives output of JSON file. /data/query_logs.json
- **json2parq.py** Converts JSON to PARQUET
- **excel2parq.py** Converts Excel to PARQUET
- **data.py** loads numpy array and words.txt along with SQL Query Text parquet file (Code Reuse)
- **cli.py** SQL LOG TEXT Analytics (Word2Vec) in PYTHON Input numpy array, Words.txt & SQL Log / Output CSV summary (Code Modified)
- **embedding.py** (Code reuse by cli.py)
- **database.py** sqlalchemy database session management (using env variable DB_CONN)
- **models.py** sqlalchemy model for database table insert
- **load.py** Write CSV result summary to Teradata database (QUERYRESULT table)

Project in Action – FastAPI, uvicorn

```
(2020fa-final-project-kumar-anish) ka@ak-imac 2020fa-final-project-kumar-anish % python final_project/api.py
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:     Started reloader process [41437] using statreload
INFO:     Started server process [41443]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
```








```
INFO:     Uvicorn running on http://127.0.0.1:8000 (Press CTRL+C to quit)
INFO:     Started reloader process [45437] using statreload
INFO:     Started server process [45439]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
INFO:     127.0.0.1:61295 - "GET / HTTP/1.1" 200 OK
INFO:     127.0.0.1:61295 - "GET /favicon.ico HTTP/1.1" 404 Not Found
INFO:     127.0.0.1:61311 - "GET /querylog HTTP/1.1" 307 Temporary Redirect
SELECT TOP 100 QueryId
       , QueryText
FROM dbc.qrylog
ORDER BY collecttimestamp desc
INFO:     127.0.0.1:61311 - "GET /querylog/ HTTP/1.1" 200 OK
```

Luigi, Text Analytics, Load & Results

```
(2020fa-final-project-kumar-anish) ka@ak-imac 2020fa-final-project-kumar-anish % python run_luigi.py
DEBUG: Checking if SQLLogsToJSON() is complete
INFO: Informed scheduler that task   SQLLogsToJSON__99914b932b   has status   PENDING
INFO: Done scheduling tasks
INFO: Running Worker with 1 processes
DEBUG: Asking scheduler for work...
DEBUG: Pending tasks: 1
INFO: [pid 41519] Worker Worker(salt=332335116, workers=1, host=ak-imac.local, username=ka, pid=41519
INFO: [pid 41519] Worker Worker(salt=332335116, workers=1, host=ak-imac.local, username=ka, pid=41519
DEBUG: 1 running tasks, waiting for next task to finish
INFO: Informed scheduler that task   SQLLogsToJSON__99914b932b   has status   DONE
DEBUG: Asking scheduler for work...
DEBUG: Done
DEBUG: There are no more tasks to run at this time
INFO: Worker Worker(salt=332335116, workers=1, host=ak-imac.local, username=ka, pid=41519) was stoppe
INFO:
===== Luigi Execution Summary =====

Scheduled 1 tasks of which:
* 1 ran successfully:
    - 1 SQLLogsToJSON()

This progress looks :) because there were no failed tasks or missing dependencies

===== Luigi Execution Summary =====
```

```
(2020fa-final-project-kumar-anish) ka@ak-imac 2020fa-final-project-kumar-anish % python load.py
loading csv results to database - start...
loading csv results to database - done...
(2020fa-final-project-kumar-anish) ka@ak-imac 2020fa-final-project-kumar-anish %
```

```
(2020fa-final-project-kumar-anish) ka@ak-imac 2020fa-final-project-kumar-anish % python cli.py
my_matched_sql_keywords_text:
NULLIFZERO SUM AVG TRIM FunctionName


top 3 matched with high scores / shorted distance sql texts:

id          : 17
distance    : 0.42183478726013184
QueryText text:
SELECT FunctionName, TRIM(Fcns.FunctionType) AS FunctionType, TRIM(Fcns.SrcFileLanguage) AS Src
s.ExtFileReference, TRIM(Fcns.NullCall) AS NullCall, TRIM(Fcns.SpecificName) AS SpecificName, T
Fcns ,DBC.TablesV Tbls WHERE Fcns.DatabaseName = ? AND Fcns.RoutineKind = 'R'  AND Fcns.Specifi


id          : 16
distance    : 0.42183478726013184
QueryText text:
SELECT FunctionName, TRIM(Fcns.FunctionType) AS FunctionType, TRIM(Fcns.SrcFileLanguage) AS Src
s.ExtFileReference, TRIM(Fcns.NullCall) AS NullCall, TRIM(Fcns.SpecificName) AS SpecificName, T
Fcns ,DBC.TablesV Tbls WHERE Fcns.DatabaseName = ? AND Fcns.RoutineKind = 'R'  AND Fcns.Specifi


id          : 31
distance    : 0.4315459132194519
QueryText text:
LOCK DBC.TableSizeV FOR ACCESS SELECT TableName, SUM(CurrentPerm) AS CurrentPerm, SUM(PeakPerm)
 WHERE DataBaseName = ? GROUP BY TableName ORDER BY TableName


(2020fa-final-project-kumar-anish) ka@ak-imac 2020fa-final-project-kumar-anish %
```

```
sel * from QUERYRESULT;
```

Teradata Result Set Viewer

Result Set - SQL Editor (1) | Result Set - SQL Editor 1 (1)

	QUERYID	MATCHSCORE
1	307190438469261061	0.42183470726013184
2	307190438469260990	0.4315459132194519
3	307190438469261060	0.42183470726013184

Reference

GitHub Repo:

https://github.com/csci-e-29/2020fa-final-project-kumar-anish

Fast API:

https://fastapi.tiangolo.com/

json2parquet:

https://pypi.org/project/json2parquet/