Lab: Generative AI for Querying Databases

Skills Network

Estimated Effort: 30 mins

Introduction

Processed data saved in a database table can be accessed, based on your requirements, using queries. Because queries are an essential part of any data professional's workflow, writing *efficient* queries is a necessary skillset. In this lab, you will learn how you can leverage Generative AI platforms to create optimized queries for your data, provided you can give the model enough context.

Objective(s)

By the end of this lab, you'll be able to prompt a Generative AI model to create efficient queries for your data set.

About generative AI classroom lab

▶ Click here

Notes:

1. The prompts used in this lab are for your reference only. You can create your own prompts and generate responses using generative AI.
2. Since AI-generated outputs are dynamic, you may receive different responses even though you've used the same prompt from this lab.

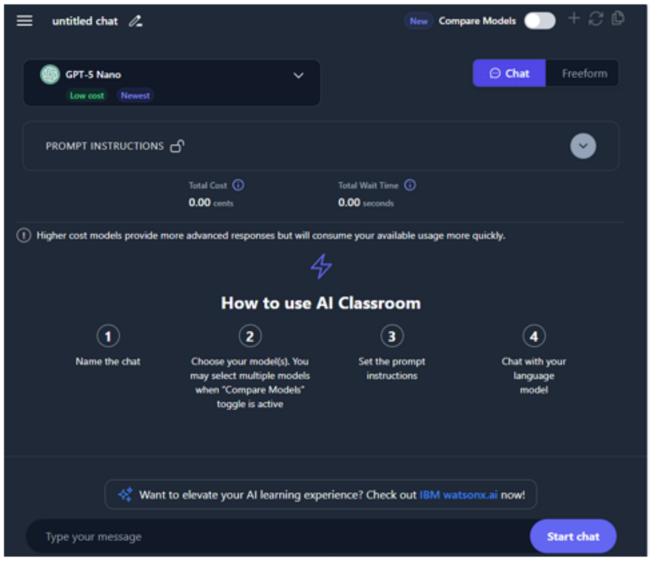
The data set

For the purpose of this lab, you are making use of the Heart Disease Data set from the UCI ML library, available publically under the CCA 4.0 International license.

You can download the data set and run the queries generated in this lab using any SQL querying system.

Giving the context

You might note that there is a section named `Prompt Instructions` on the Generative AI interface.



Higher cost models provide more advanced responses but will consume your available usage more quickly.

How to use AI Classroom

1 Name the chat

2 Choose your model(s). You may select multiple models when "Compare Models" toggle is active

3 Set the prompt instructions

4 Chat with your language model

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If you provide the model with the description of your data, you can generate efficient and readily usable queries for fetching the data based on your requirements.

Paste the following text in the prompt instructions to give the model the appropriate context for the data.

```
We have a Heart Disease prediction dataset with a single table which has the following attributes.
1. age - age in years
2. gender- gender (1 = male; 0 = female)
3. cp - chest pain type
        -- Value 1: typical angina
        -- Value 2: atypical angina
        -- Value 3: non-anginal pain
        -- Value 4: asymptomatic
4. trestbps - resting blood pressure (in mm Hg on admission to the hospital)
5. chol - serum cholestoral in mg/dl
6. fbs - (fasting blood sugar > 120 mg/dl)  (1 = true; 0 = false)
```

```
7. restecg - resting electrocardiographic results
        -- Value 0: normal
        -- Value 1: having ST-T wave abnormality (T wave inversions and/or ST elevation or depression of > 0.05 mV)
        -- Value 2: showing probable or definite left ventricular hypertrophy by Estes' criteria
8. thalach - maximum heart rate achieved
9. exang - exercise induced angina (1 = yes; 0 = no)
10. oldpeak - ST depression induced by exercise relative to rest
11. slope - the slope of the peak exercise ST segment
        -- Value 1: upsloping
        -- Value 2: flat
        -- Value 3: downsloping
12. ca - number of major vessels (0-3) colored by flourosopy
13. thal - 3 = normal; 6 = fixed defect; 7 = reversable defect
14. num (the predicted attribute) - diagnosis of heart disease (angiographic disease status)
        -- Value 0: < 50% diameter narrowing
        -- Value 1: > 50% diameter narrowing
```

The model will now have enough context to generate SQL queries for your prompts.

> Note: The prompt instructions are editable only until the first prompt is executed. Thereafter, you cannot change the instructions. If a mistake occurs and you want to start over, you can generate a fresh chat and add the correct prompt instructions before generating the SQL queries.

Prompts for Data Querying

Age Distribution

Consider the following prompt.

```
Write an SQL query to find the minimum, maximum, and average age of patients in the dataset.
```

You can expect to the see the following query in response.

```
SELECT
    MIN(age) AS min_age,
    MAX(age) AS max_age,
    AVG(age) AS avg_age
FROM heart_disease_prediction_dataset;
```

Gender Analysis

Consider the following prompt.

```
Write and SQL query to count the number of male and female patients in the dataset.
```

You can expect to the see the following query in response.

```
SELECT
  SUM(CASE WHEN gender = 1 THEN 1 ELSE 0 END) AS male_count,
  SUM(CASE WHEN gender = 0 THEN 1 ELSE 0 END) AS female_count
FROM heart_disease_prediction_dataset;
```

Chest Pain Type Frequency

Consider the following prompt.

```
Write an SQL query to determine the frequency of each type of chest pain (typical angina, atypical angina, non-anginal pain, asymptomatic) among pati
```

You can expect the following query to be generated.

```
SELECT
  CASE cp
    WHEN 1 THEN 'typical_angina'
    WHEN 2 THEN 'atypical_angina'
    WHEN 3 THEN 'non_anginal_pain'
    WHEN 4 THEN 'asymptomatic'
    ELSE 'unknown'
  END AS chest_pain_type,
  COUNT(*) AS frequency
FROM your_table_name
GROUP BY
  CASE cp
    WHEN 1 THEN 'typical_angina'
    WHEN 2 THEN 'atypical_angina'
    WHEN 3 THEN 'non_anginal_pain'
    WHEN 4 THEN 'asymptomatic'
    ELSE 'unknown'
  END
ORDER BY frequency DESC;
```

Age Group Analysis and Target Variable

Consider the following prompt.

```
Write an SQL query to investigate the distribution of the target variable (presence or absence of heart disease) within different age groups (e.g., 2
```

You can expect the following output.

```
SELECT
  CASE
    WHEN age IS NULL THEN 'Unknown'
    WHEN age >= 20 AND age < 30 THEN '20-29'
    WHEN age >= 30 AND age < 40 THEN '30-39'
    WHEN age >= 40 AND age < 50 THEN '40-49'
    WHEN age >= 50 AND age < 60 THEN '50-59'
    WHEN age >= 60 AND age < 70 THEN '60-69'
    WHEN age >= 70 AND age < 80 THEN '70-79'
    ELSE '80+'
  END AS age_group,
  num AS heart_disease_status,
  COUNT(*) AS count
FROM your_table_name
GROUP BY
  CASE
    WHEN age IS NULL THEN 'Unknown'
    WHEN age >= 20 AND age < 30 THEN '20-29'
    WHEN age >= 30 AND age < 40 THEN '30-39'
    WHEN age >= 40 AND age < 50 THEN '40-49'
    WHEN age >= 50 AND age < 60 THEN '50-59'
    WHEN age >= 60 AND age < 70 THEN '60-69'
    WHEN age >= 70 AND age < 80 THEN '70-79'
    ELSE '80+'
  END,
  num
ORDER BY age_group, heart_disease_status;
```

Practice Prompts

Try to generate queries for the data set for the following prompts:

1. Cholesterol Range:

```
Find the range of cholesterol levels among patients (minimum, maximum).
```

2. Age Range and Gender Analysis:

```
Determine the age range (youngest and oldest) for male and female patients separately.
```

3. Age Group Analysis and Target Variable:

```
Investigate the distribution of the target variable (presence or absence of heart disease) within different age groups (e.g., 20-30, 30-40, etc.).
```

4. Maximum Heart Rate by Age Group:

```
Find the maximum heart rate achieved during exercise for different age groups (e.g., 30-40, 40-50, etc.).
```

5. Percentage of Patients with High Blood Sugar:

```
Calculate the percentage of patients with fasting blood sugar greater than 120 mg/dl.
```

6. Ratio of Patients with Resting Electrocardiographic Abnormality:

```
Find the ratio of patients with abnormal resting electrocardiographic results to those with normal results.
```

7. Number of Patients with Reversible Thalassemia:

```
Count the number of patients with reversible thalassemia detected by thallium stress testing.
```

8. Average Age of Patients with Chest Pain:

```
Calculate the average age of patients who experienced chest pain during diagnosis.
```

9. Distribution of Patients by Number of Major Vessels:

```
Investigate the distribution of patients based on the number of major vessels colored by fluoroscopy (0-3).
```

Conclusion

Congratulations on your successful completion of this lab!

You should now be able to use Generative AI to create efficient queries for retrieving relevant information from a database. Please note, that you need to provide the model with a detailed description of the attributes as context, to generate efficient and ready-to-use prompts.

Author(s)

Abhishek Gagneja