## Step 4: SQL Query Design & Analysis

This step focused on deriving meaningful insights from the stored asteroid data using SQL queries.

### 🛠️Method Used:

- Connected to SQLite database with `sqlite3`.
- Defined `show_query()` function to execute SQL and display result in pandas DataFrame.

```
import sqlite3
import pandas as pd

# Connect to your database
connection = sqlite3.connect('Asteroid_Data.db')
cursor = connection.cursor()

def show_query(query):
    df = pd.read_sql_query(query, connection)
    display(df)
```

### 🔍SQL Query 1 :

```
query1 = '''
SELECT neo_reference_id, COUNT(*) AS approach_count
FROM close_approach
GROUP BY neo_reference_id
ORDER BY approach_count DESC
'''
show_query(query1)
# Count how many times each asteroid has approached Earth
```

### 📊Analytical Queries (15 Queries ): using the same method I addressed remaining 14 queries.

1. Count how many times each asteroid has approached Earth
2. Average velocity of each asteroid over multiple approaches
3. List top 10 fastest asteroids
4. Find potentially hazardous asteroids that have approached Earth more than 3 times
5. Find the month with the most asteroid approaches
6. Get the asteroid with the fastest ever approach speed
7. Sort asteroids by maximum estimated diameter (descending)
8. Track if an asteroid's closest approach is getting nearer over time
9. Display name, date, and miss distance of closest approach for each asteroid
10. List asteroids that approached Earth with velocity > 50,000 km/h

11. Count how many approaches happened per month
12. Find asteroid with the highest brightness (lowest magnitude value)
13. Get number of hazardous vs non-hazardous asteroids
14. Find asteroids that passed closer than the Moon (miss distance < 1 LD)
15. Find asteroids that came within 0.05 AU

### Bonus Queries (5 Additional):

Extended the analysis by writing 5 bonus queries to explore hidden patterns in the data such as:

- Seasonal trends in asteroid approaches
- Orbiting body distributions (e.g., Earth vs others)
- Approach frequency grouped by asteroid size
- Relationship between brightness and velocity
- Top 5 most frequently appearing NEOs

## 🔗Outcome:

Successfully gained analytical insights from the database using advanced SQL queries. These insights formed the foundation for creating an interactive and insightful Streamlit dashboard in Step 5.