Generating SQL for SQLite using Ollama, ChromaDB

This notebook runs through the process of using the `vanna` Python package to generate SQL using AI (RAG + LLMs) including connecting to a database and training. If you're not ready to train on your own database, you can still try it using a sample SQLite database.

Which LLM do you want to use?

- OpenAI via Vanna.AI (Recommended)
  Use Vanna.AI for free to generate your queries
- OpenAI
  Use OpenAI with your own API key
- Azure OpenAI
  If you have OpenAI models deployed on Azure
- [Selected] Ollama
  Use Ollama locally for free. Requires additional setup.
- Mistral via Mistral API
  If you have a Mistral API key
- Other LLM
  If you have a different LLM model

Where do you want to store the 'training' data?

- Vanna Hosted Vector DB (Recommended)
  Use Vanna.AIs hosted vector database (pgvector) for free. This is usable across machines with no additional setup.
- [Selected] ChromaDB
  Use ChromaDBs open-source vector database for free locally. No additional setup is necessary -- all database files will be created and stored locally.
- Marqo
  Use Marqo locally for free. Requires additional setup. Or use their hosted option.
- Other VectorDB

Use any other vector database. Requires additional setup.

Setup

!pwd!pip install vanna!pip install 'vanna[chromadb]'!pip install ollama!pip show vanna # 0.5.5, 0.2.1!pip show ollama # 0.2.0

In [1]:
```
import warnings
import re

warnings.filterwarnings('ignore', category=DeprecationWarning, message='^Number of requested results')
# warnings.filterwarnings('ignore', category=DeprecationWarning, message=re.escape(r'^Some regex pattern'),

import os

import re
from time import time

from vanna.ollama import Ollama
from vanna.chromadb.chromadb_vector import ChromaDB_VectorStore
```

In [2]:
```
class MyVanna(ChromaDB_VectorStore, Ollama):
    def __init__(self, config=None):
        ChromaDB_VectorStore.__init__(self, config=config)
        Ollama.__init__(self, config=config)
```

In [3]:
```
file_db = "~/Downloads/chinook.sqlite"
model_name = 'aya'
```

In [4]:
```
config = {
    'model': model_name,   # 'mistral' # "starcoder2"
}
vn = MyVanna(config=config)
```

In [5]:
```
hostname = os.uname().nodename
print("Hostname:", hostname)
```

```
Hostname: ducklover1
```

In [6]:
```
file_db = os.path.abspath(os.path.expanduser(file_db))
vn.connect_to_sqlite(file_db)
```

In [7]:
```
vn.run_sql_is_set
```

Out[7]: True

In [8]:
```
def remove_collections(collection_name=None, ACCEPTED_TYPES = ["sql", "ddl", "documentation"]):
    if not collection_name:
        collections = ACCEPTED_TYPES
    elif isinstance(collection_name, str):
        collections = [collection_name]
    elif isinstance(collection_name, list):
        collections = collection_name
    else:
        print(f"\t{collection_name} is unknown: Skipped")
        return

    for c in collections:
        if not c in ACCEPTED_TYPES:
            print(f"\t{c} is unknown: Skipped")
            continue

        # print(f"vn.remove_collection('{c}')")
        vn.remove_collection(c)
```

In [9]:
```
def strip_brackets(ddl):
    """
    This function removes square brackets from table and column names in a DDL script.

    Args:
        ddl (str): The DDL script containing square brackets.

    Returns:
        str: The DDL script with square brackets removed.
    """
    # Use regular expressions to match and replace square brackets
    pattern = r"\[([^\]]+)]"  # Match any character except ] within square brackets
    return re.sub(pattern, r"\1", ddl)
```

In [10]:
```
if False:
    remove_collections()
```

Training

SQLite sample database

You only need to train once. Do not train again unless you want to add more training data.

In [11]:
```
# show training data
training_data = vn.get_training_data()
training_data
```

Out[11]:

	id	question	content	training_data_type
0	01c4a964-460b-5e1c-af1e-622c8210b835-sql	\n Hint: album quantity is found in invoi...	SELECT i.CustomerId, COUNT(ii.InvoiceLineId) A...	sql
1	03e56919-8e65-58f6-b8b5-803d8078f4b7-sql	\n List all albums and their correspondin...	SELECT a.Title, ar.Name AS ArtistName\nFROM "a...	sql
2	0658ba3d-98ff-51f4-9006-a24f87045858-sql	How many customers are there	SELECT COUNT(*) FROM "customers"	sql
3	0d9348d9-1384-5029-983f-0f4456db33b5-sql	\n Find the top 5 customers who spent th...	SELECT c.CustomerId, SUM(i.Total) AS TotalSpen...	sql
4	0e1a2b7b-d65e-53de-b839-edb7afcf4ab1-sql	\n Hint: album quantity is found in invoi...	SELECT i.CustomerId, COUNT(ii.TrackId) AS Tota...	sql
...	...	...	...	...
19	d654f328-dc36-549e-84c3-06ee0db7e0f7-ddl	None	CREATE TABLE "playlist_track"\r\n(\r\n Play...	ddl
20	d93f0d68-023d-5afb-8121-ba346699d318-ddl	None	CREATE TABLE "customers"\r\n(\r\n CustomerI...	ddl
21	e5879308-329e-543f-a693-0c14e2f9972e-ddl	None	CREATE INDEX IFK_InvoiceLineTrackId ON "invoic...	ddl
22	ea84418b-1a28-59b4-a1f4-2fb674208adc-ddl	None	CREATE TABLE sqlite_sequence(name,seq)	ddl
0	9d2550eb-8e22-54cd-9fad-9e1be65ab03a-doc	None	In the SQLite database invoice means order	documentation

74 rows × 4 columns

In [12]:
```
df_ddl = vn.run_sql("SELECT type, sql FROM sqlite_master WHERE sql is not null")
```

In [13]:
```
df_ddl
```

Out[13]:

	type	sql
0	table	CREATE TABLE "albums"\r\n(\r\n [AlbumId] IN...
1	table	CREATE TABLE sqlite_sequence(name,seq)
2	table	CREATE TABLE "artists"\r\n(\r\n [ArtistId] ...
3	table	CREATE TABLE "customers"\r\n(\r\n [Customer...
4	table	CREATE TABLE "employees"\r\n(\r\n [Employee...
5	table	CREATE TABLE "genres"\r\n(\r\n [GenreId] IN...
6	table	CREATE TABLE "invoices"\r\n(\r\n [InvoiceId...
7	table	CREATE TABLE "invoice_items"\r\n(\r\n [Invo...
8	table	CREATE TABLE "media_types"\r\n(\r\n [MediaT...
9	table	CREATE TABLE "playlists"\r\n(\r\n [Playlist...
10	table	CREATE TABLE "playlist_track"\r\n(\r\n [Pla...
11	table	CREATE TABLE "tracks"\r\n(\r\n [TrackId] IN...
12	index	CREATE INDEX [IFK_AlbumArtistId] ON "albums" (...
13	index	CREATE INDEX [IFK_CustomerSupportRepId] ON "cu...
14	index	CREATE INDEX [IFK_EmployeeReportsTo] ON "emplo...
15	index	CREATE INDEX [IFK_InvoiceCustomerId] ON "invoi...
16	index	CREATE INDEX [IFK_InvoiceLineInvoiceId] ON "in...
17	index	CREATE INDEX [IFK_InvoiceLineTrackId] ON "invo...
18	index	CREATE INDEX [IFK_PlaylistTrackTrackId] ON "pl...
19	index	CREATE INDEX [IFK_TrackAlbumId] ON "tracks" ([...
20	index	CREATE INDEX [IFK_TrackGenreId] ON "tracks" ([...
21	index	CREATE INDEX [IFK_TrackMediaTypeId] ON "tracks...
22	table	CREATE TABLE sqlite_stat1(tbl,idx,stat)

In [14]:
```
if False:
    for ddl in df_ddl['sql'].to_list():
```

```
        ddl = strip_brackets(ddl)
        vn.train(ddl=ddl)
```

In [15]:
```
if False:
    # Sometimes you may want to add documentation about your business terminology or definitions.
    vn.train(documentation="In the SQLite database invoice means order")
```

Asking the AI

Whenever you ask a new question, it will find the 10 most relevant pieces of training data and use it as part of the LLM prompt to generate the SQL.

In [16]:
```
ts_start = time()
```

```
SELECT name FROM sqlite_master WHERE type = 'table';
```

In [17]:
```
vn.ask(question="Can you list all tables in the SQLite database catalog?")
```

```
Add of existing embedding ID: d8a2f948-dffa-5524-a5f9-174cc1a8da73-sql
Add of existing embedding ID: 0658ba3d-98ff-51f4-9006-a24f87045858-sql
Add of existing embedding ID: 127fd4bd-b9af-539d-9313-1d0234d073b7-sql
Add of existing embedding ID: 32b99e7b-31ab-55d8-8431-fb010fa7af85-sql
Add of existing embedding ID: d8a2f948-dffa-5524-a5f9-174cc1a8da73-sql
Add of existing embedding ID: 0658ba3d-98ff-51f4-9006-a24f87045858-sql
Add of existing embedding ID: d8a37163-5ce5-58cd-a316-ea5598d44d27-sql
Add of existing embedding ID: a7185c88-7417-5b75-a52e-4eaef5f9deca-sql
Add of existing embedding ID: 6f22268c-5062-5f11-ba2d-8555f06b409d-sql
Add of existing embedding ID: 49e67df3-a604-51f8-ad01-b8f5a2043eac-sql
Add of existing embedding ID: dd282d7c-a4ef-5e3a-87e0-cb45fac50808-sql
Add of existing embedding ID: aea89953-21b2-55d1-9dda-431ee6033c3d-sql
Add of existing embedding ID: fd25ebba-4066-5a0f-8613-7b1c2ace0339-sql
Add of existing embedding ID: 6bed484b-9a80-57f4-ad89-5f775b5df252-sql
Add of existing embedding ID: f33f8cb6-1b12-5ea7-8d9a-aef8166b9970-sql
Add of existing embedding ID: f626b681-4d8f-563a-beee-1ea759baaa82-sql
Add of existing embedding ID: 127fd4bd-b9af-539d-9313-1d0234d073b7-sql
Add of existing embedding ID: 584873f8-1904-50f1-8f80-7ccf08059264-sql
Add of existing embedding ID: 3013d1b4-feb2-519d-bfb9-114500436e3d-sql
Add of existing embedding ID: d1d70c18-f5d9-5970-a32c-914deeca1087-sql
Add of existing embedding ID: e7c4b3aa-664f-5f87-8b25-449a4482f3fd-sql
Add of existing embedding ID: 9a9c970b-b94c-5f22-b54c-b86921a38b65-sql
Add of existing embedding ID: d8a2f948-dffa-5524-a5f9-174cc1a8da73-sql
Add of existing embedding ID: 0658ba3d-98ff-51f4-9006-a24f87045858-sql
Add of existing embedding ID: d8a37163-5ce5-58cd-a316-ea5598d44d27-sql
Add of existing embedding ID: a7185c88-7417-5b75-a52e-4eaef5f9deca-sql
Add of existing embedding ID: 6f22268c-5062-5f11-ba2d-8555f06b409d-sql
Add of existing embedding ID: 49e67df3-a604-51f8-ad01-b8f5a2043eac-sql
Add of existing embedding ID: dd282d7c-a4ef-5e3a-87e0-cb45fac50808-sql
Add of existing embedding ID: aea89953-21b2-55d1-9dda-431ee6033c3d-sql
Add of existing embedding ID: fd25ebba-4066-5a0f-8613-7b1c2ace0339-sql
Add of existing embedding ID: 6bed484b-9a80-57f4-ad89-5f775b5df252-sql
Add of existing embedding ID: f33f8cb6-1b12-5ea7-8d9a-aef8166b9970-sql
Add of existing embedding ID: f626b681-4d8f-563a-beee-1ea759baaa82-sql
Add of existing embedding ID: 127fd4bd-b9af-539d-9313-1d0234d073b7-sql
Add of existing embedding ID: 584873f8-1904-50f1-8f80-7ccf08059264-sql
Add of existing embedding ID: 3013d1b4-feb2-519d-bfb9-114500436e3d-sql
Add of existing embedding ID: e7c4b3aa-664f-5f87-8b25-449a4482f3fd-sql
Add of existing embedding ID: d8a2f948-dffa-5524-a5f9-174cc1a8da73-sql
Add of existing embedding ID: a7185c88-7417-5b75-a52e-4eaef5f9deca-sql
Add of existing embedding ID: 6f22268c-5062-5f11-ba2d-8555f06b409d-sql
Add of existing embedding ID: 49e67df3-a604-51f8-ad01-b8f5a2043eac-sql
```

```
Add of existing embedding ID: 49e67df3-a604-51f8-ad01-b8f5a2043eac-sql
Add of existing embedding ID: 5b0b32a6-7f1d-544f-8c5b-9448cbc635ac-sql
Add of existing embedding ID: 584873f8-1904-50f1-8f80-7ccf08059264-sql
Add of existing embedding ID: 0e1a2b7b-d65e-53de-b839-edb7afcf4ab1-sql
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "media_types"\r\n(\r\n   MediaTypeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "artists"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': 'Can you list all tables in the SQLite database catalog?'}, {'role': 'assistant', 'content': "SELECT name FROM sqlite_master WHERE type='table'"}, {'role': 'user', 'content': 'Can you list all tables in the SQLite database catalog?'}, {'role': 'assistant', 'content': " SELECT name FROM sqlite_master WHERE type='table'"}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the to

```
p 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Nam
e, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "t
racks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'use
r', 'content': '  \n    List all albums and their corresponding artist names  \n'}, {'role': 'assistant',
'content': 'SELECT a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.Arti
stId = ar.ArtistId'}, {'role': 'user', 'content': '  \n     List all customers from Canada and their email
addresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, c.Email, SUM(i.Total) AS TotalSpent
\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSp
ent DESC\nLIMIT 1'}, {'role': 'user', 'content': '  \n     List all customers from Canada and their email a
ddresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.Email, c.Country\nFROM "customers" c\nWHERE c.Cou
ntry = \'Canada\''}, {'role': 'user', 'content': '  \n    List all genres and the number of tracks in each
genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres"
g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'rol
e': 'user', 'content': '  \n    List all albums and their corresponding artist names  \n'}, {'role': 'assis
tant', 'content': 'SELECT a.Title, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId
= ar.ArtistId\n-------------------------'}, {'role': 'user', 'content': '  \n     Find the customer who bou
ght the most albums in total quantity (across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT
c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.C
ustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbu
ms DESC\nLIMIT 1'}, {'role': 'user', 'content': 'Can you list all tables in the SQLite database catalog?'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE TABLE sqlite_sequence(na
me,seq)\n\nCREATE TABLE \"playlists\"\r\n(\r\n    PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r
\n    Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"genres\"\r\n(\r\n    GenreId INTEGER PRIMARY KEY AUTOINCREM
ENT NOT NULL,\r\n    Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"tracks\"\r\n(\r\n    TrackId INTEGER PRIMARY
KEY AUTOINCREMENT NOT NULL,\r\n    Name NVARCHAR(200)  NOT NULL,\r\n    AlbumId INTEGER,\r\n    MediaTypeId
INTEGER  NOT NULL,\r\n    GenreId INTEGER,\r\n    Composer NVARCHAR(220),\r\n    Milliseconds INTEGER  NOT
NULL,\r\n    Bytes INTEGER,\r\n    UnitPrice NUMERIC(10,2)  NOT NULL,\r\n    FOREIGN KEY (AlbumId) REFERENC
ES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (GenreId) REFER
ENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (MediaTypeI
d) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE
TABLE \"media_types\"\r\n(\r\n    MediaTypeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    Name NVARC
HAR(120)\r\n)\n\nCREATE TABLE \"artists\"\r\n(\r\n    ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n    Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n    InvoiceLineId INTEGER PRIMA
RY KEY AUTOINCREMENT NOT NULL,\r\n    InvoiceId INTEGER  NOT NULL,\r\n    TrackId INTEGER  NOT NULL,\r\n
UnitPrice NUMERIC(10,2)  NOT NULL,\r\n    Quantity INTEGER  NOT NULL,\r\n    FOREIGN KEY (InvoiceId) REFERE
```

NCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order \n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": "Can you list all tables in the SQLite database catalog?"}, {"role": "assistant", "content": "SELECT name FROM sqlite_master WHERE type='table'"}, {"role": "user", "content": "Can you list all tables in the SQLite database catalog?"}, {"role": "assistant", "content": " SELECT name FROM sqlite_master WHERE type='table'"}, {"role": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   List all albums and their corresponding artist names \n"}, {"role": "assistant", "content": "SELECT a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.ArtistId"}, {"role": "user", "content": " \n   List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, c.Email, SUM(i.Total) AS TotalSpent\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 1"}, {"role": "user", "content": " \n List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.Email, c.Country\nFROM \"customers\" c\nWHERE c.Country = 'Canada'"}, {"role": "user", "content": " \n   List all genres and the number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all albums and their corresponding artist names \n"}, {"role": "assistant", "content": "SELECT a.Title, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.ArtistId\n-------------------------"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all inv

```
oices): \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": "Can you list all tables in the SQLite database catalog?"}]
```

```
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Insert of existing embedding ID: d8a2f948-dffa-5524-a5f9-174cc1a8da73-sql
```

```
Ollama Response:
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SELECT name FROM sqlite_master WHERE type='table'
SELECT name FROM sqlite_master WHERE type='table'
              name
0            albums
1   sqlite_sequence
2           artists
3         customers
4         employees
5            genres
6          invoices
7     invoice_items
8       media_types
9         playlists
10   playlist_track
11           tracks
12     sqlite_stat1
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: 'Can you list all tables in the SQLite database catalog?'\n\nThe
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is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n name    object\ndtyp
e: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of t
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rame, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the cod
e."}]
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='name')\n\n# Add a title to the chart\nfig.update_layout(title='Tables in SQLite Database')\n\n# Display t
he chart\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 19912562254, 'load_dura
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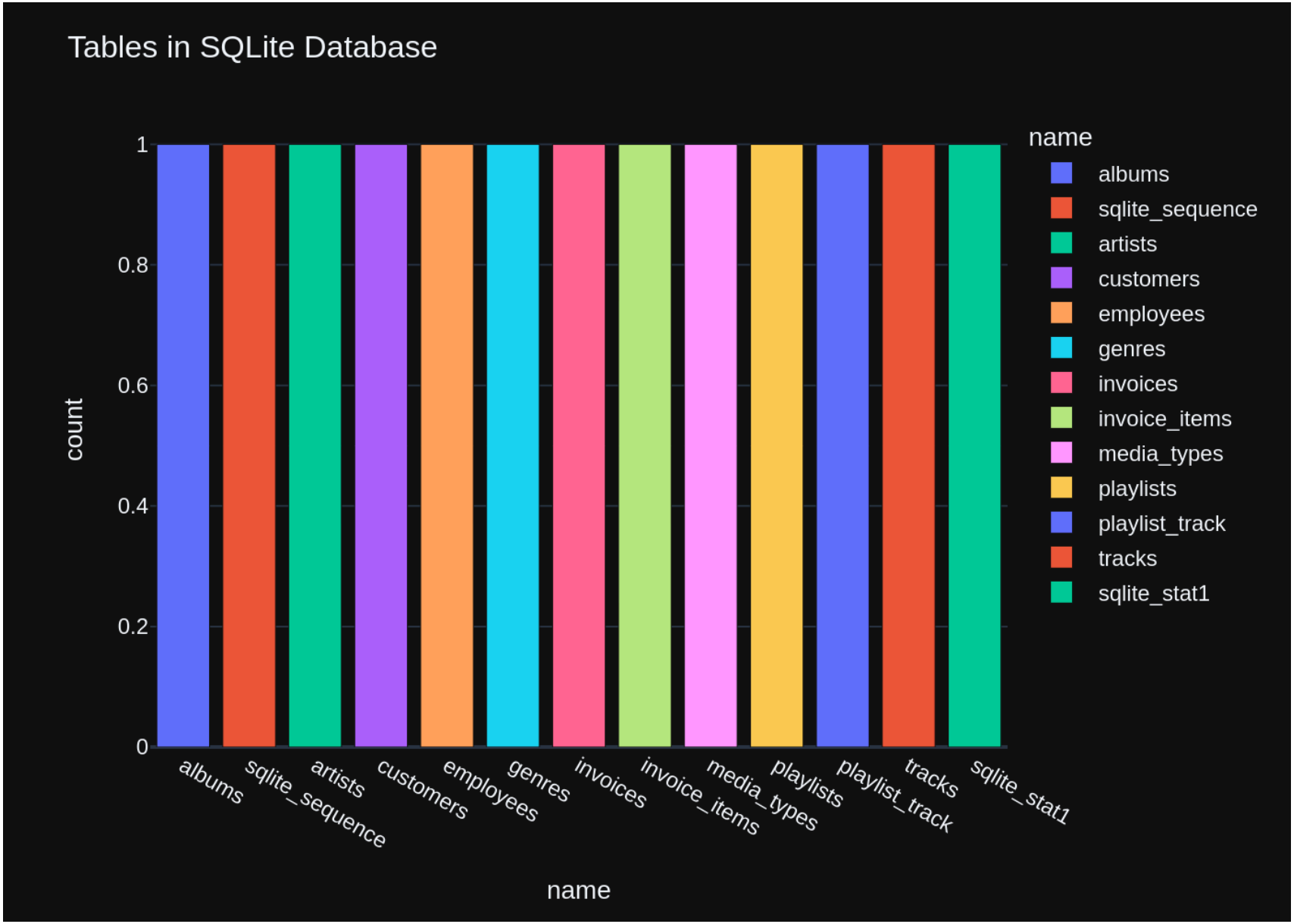
Tables in SQLite Database
count
1
0.8
0.6
0.4
0.2
0
albums
sqlite_sequence
artists
customers
employees
genres
invoices
invoice_items
media_types
playlists
playlist_track
tracks
sqlite_stat1
name
name
albums
sqlite_sequence
artists
customers
employees
genres
invoices
invoice_items
media_types
playlists
playlist_track
tracks
sqlite_stat1

```
Out[17]: ("SELECT name FROM sqlite_master WHERE type='table'",
                    name
          0           albums
          1   sqlite_sequence
          2          artists
          3        customers
          4        employees
          5           genres
          6         invoices
          7     invoice_items
          8       media_types
          9         playlists
          10   playlist_track
          11          tracks
          12    sqlite_stat1,
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```

```
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```

```
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```

```
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    }))
```

In [18]:
```
vn.ask(question="which table stores customer's orders")
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "media_types"\r\n(\r\n   MediaTypeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total)

AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId
\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Fin
d the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on inv
oices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'conte
nt': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.Custom
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an be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role':
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with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOf
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\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "custom
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5'}, {'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity
(across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS To
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UP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'cont
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Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo

rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   Billin
gAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCou
ntry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NO
T NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceI
d) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (Tra
ckId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"customers\"\r\n(\r\n   Custom
erId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName N
VARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(4
0),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NV
ARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n
FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO A
CTION\r\n)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(3
0),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR
(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode N
VARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN
KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)
\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE \"playlists\"\r\n(\r\n   PlaylistId INTEGER PRI
MARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE sqlite_stat1(tbl,idx,stat)
\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NV
ARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artist
s\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n
(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack
PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId)
\r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackI
d) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"media_types\"\r\n(\r\n   MediaTy
peId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context
\n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is su
fficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided
context is almost sufficient but requires knowledge of a specific string in a particular column, please gen
erate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comme
nt saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be gen
erated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered befor
e, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Fin
d the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on inv
oices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "conte
nt": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.Custo
merId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------

"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM \"invoices\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------------------"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": "which table stores customer's orders"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:34:31.47155993Z', 'message': {'role': 'assistant', 'content': 'The "invoices" table in the database stores information about customer orders. Each row in the "invoices" table represents an order placed by a customer and contains details such as the invoice ID, customer ID, invoice date, billing address, total amount, etc. The "invoices" table is linked to other tables, such as "customers," "invoice_items," and "tracks," to provide a comprehensive view of the ordering process and associated data.'}, 'done_reason': 'stop', 'done': True, 'total_duration': 98193343043, 'load_duration': 672875, 'prompt_eval_count': 1962, 'prompt_eval_duration': 77828715000, 'eval_count': 94, 'eval_duration':

```
19645820000}
The "invoices" table in the database stores information about customer orders. Each row in the "invoices" t
able represents an order placed by a customer and contains details such as the invoice ID, customer ID, inv
oice date, billing address, total amount, etc. The "invoices" table is linked to other tables, such as "cus
tomers," "invoice_items," and "tracks," to provide a comprehensive view of the ordering process and associa
ted data.
The "invoices" table in the database stores information about customer orders. Each row in the "invoices" t
able represents an order placed by a customer and contains details such as the invoice ID, customer ID, inv
oice date, billing address, total amount, etc. The "invoices" table is linked to other tables, such as "cus
tomers," "invoice_items," and "tracks," to provide a comprehensive view of the ordering process and associa
ted data.
Couldn't run sql:  Execution failed on sql 'The "invoices" table in the database stores information about c
ustomer orders. Each row in the "invoices" table represents an order placed by a customer and contains deta
ils such as the invoice ID, customer ID, invoice date, billing address, total amount, etc. The "invoices" t
able is linked to other tables, such as "customers," "invoice_items," and "tracks," to provide a comprehens
ive view of the ordering process and associated data.': near "The": syntax error
```

In [19]:
```
vn.ask(question="How many customers are there")
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------'}, {'role': 'user', 'content': 'How many customers are there'}, {'role': 'assistant', 'content': 'SELECT COUNT(*) FROM "customers"'}, {'role': 'user', 'content': 'How many customers are there'}, {'role': 'assistant', 'content': 'SELECT COUNT(*) AS TotalCustomers FROM "customers"'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spe

nt the most money overall, \n \n Hint: order total can be found on invoices table, calculation usin
g invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SU
M(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.
CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n------------------------'}, {'role': 'user', 'content': '
\n Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerI
d, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerI
d\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n Fin
d the top 5 customers who spent the most money overall, \n \n Hint: order total can be found on inv
oices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'conte
nt': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.Custom
erId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'conte
nt': ' \n Find the top 5 customers who spent the most money overall, \n \n Hint: order total c
an be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role':
'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoice
s" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role':
'user', 'content': ' \n Find the customer who bought the most albums in total quantity (across all inv
oices): \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM
"customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = i
i.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n
Get the total number of invoices for each customer\n'}, {'role': 'assistant', 'content': 'SELECT c.Customer
Id, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.Customer
Id\nGROUP BY c.CustomerId'}, {'role': 'user', 'content': 'what are the top 5 countries that customers come
from?'}, {'role': 'assistant', 'content': 'SELECT c.Country, COUNT(*) AS TotalCustomers\nFROM "customers" c
\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT 5'}, {'role': 'user', 'content': 'How many custom
ers are there'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n CustomerId INTEGER NOT NULL,\r\n InvoiceDate DATETIME NOT NULL,\r\n Billin
gAddress NVARCHAR(70),\r\n BillingCity NVARCHAR(40),\r\n BillingState NVARCHAR(40),\r\n BillingCou
ntry NVARCHAR(40),\r\n BillingPostalCode NVARCHAR(10),\r\n Total NUMERIC(10,2) NOT NULL,\r\n FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\nCREATE TABLE \"customers
\"\r\n(\r\n CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n FirstName NVARCHAR(40) NOT NU
LL,\r\n LastName NVARCHAR(20) NOT NULL,\r\n Company NVARCHAR(80),\r\n Address NVARCHAR(70),\r\n
City NVARCHAR(40),\r\n State NVARCHAR(40),\r\n Country NVARCHAR(40),\r\n PostalCode NVARCHAR(1
0),\r\n Phone NVARCHAR(24),\r\n Fax NVARCHAR(24),\r\n Email NVARCHAR(60) NOT NULL,\r\n Support

RepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"playlists\"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": "How many customers are there"}, {"role": "assistant", "content": "SELECT COUNT(*) FROM \"customers\""}, {"role": "user", "content": "How many customers are there"}, {"role": "assistant", "content": "SELECT COUNT(*) AS TotalCustomers FROM \"customers\""}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money ov

erall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items deta
il table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalS
pent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDE
R BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer who bought the mos
t albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT c.Customer
Id, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.Custome
rId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums D
ESC\nLIMIT 1"}, {"role": "user", "content": " \n   Get the total number of invoices for each customer
\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"cu
stomers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId"}, {"role": "user",
"content": "what are the top 5 countries that customers come from?"}, {"role": "assistant", "content": "SEL
ECT c.Country, COUNT(*) AS TotalCustomers\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY TotalCustomer
s DESC\nLIMIT 5"}, {"role": "user", "content": "How many customers are there"}]
Ollama Response:
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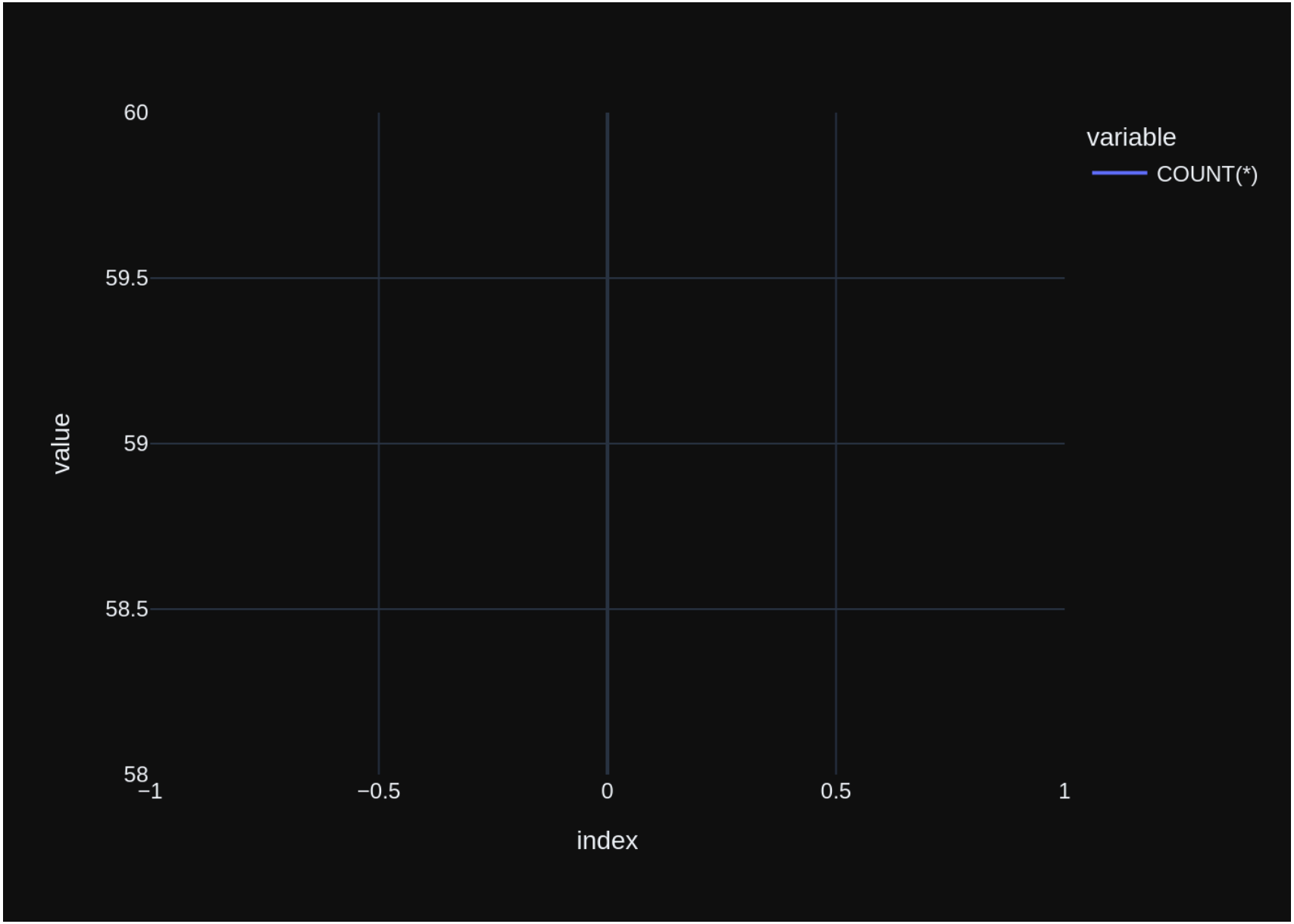
ontent': 'SELECT COUNT(*) FROM "customers"'}, 'done_reason': 'stop', 'done': True, 'total_duration': 74278
728099, 'load_duration': 1185480, 'prompt_eval_count': 1715, 'prompt_eval_duration': 71984476000, 'eval_cou
nt': 9, 'eval_duration': 1646219000}
SELECT COUNT(*) FROM "customers"
SELECT COUNT(*) FROM "customers"

	COUNT(*)
0	59

Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: 'How many customers are there'\n\nThe DataFrame was produced usin
g this query: SELECT COUNT(*) FROM \"customers\"\n\nThe following is information about the resulting panda
s DataFrame 'df': \nRunning df.dtypes gives:\n COUNT(*)   int64\ndtype: object"}, {"role": "user", "conten
t": "Can you generate the Python plotly code to chart the results of the dataframe? Assume the data is in a
pandas dataframe called 'df'. If there is only one value in the dataframe, use an Indicator. Respond with o
nly Python code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:36:09.845967023Z', 'message': {'role': 'assistant', 'c
ontent': '```python\nimport plotly.express as px\n\n# Create a bar chart using Plotly Express\nfig = px.bar
(df, values=\'COUNT(*)\')\n\n# Add labels and title\nfig.update_xaxes(title="")\nfig.update_yaxes(title="Co
unt")\nfig.update_layout(title="Number of Customers")\n\n# Show the chart\nfig.show()\n```'}, 'done_reaso
n': 'stop', 'done': True, 'total_duration': 24022788475, 'load_duration': 42487580, 'prompt_eval_count': 12
6, 'prompt_eval_duration': 4978402000, 'eval_count': 92, 'eval_duration': 18910877000}


60
59.5
59
58.5
58
value
−1
−0.5
0
0.5
1
index
variable
COUNT(*)

Out[19]:
```
('SELECT COUNT(*) FROM  "customers"',
   COUNT(*)
0        59,
Figure({
    'data': [{'hovertemplate': 'variable=COUNT(*)<br>index=%{x}<br>value=%{y}<extra></extra>',
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              'line': {'color': '#636efa', 'dash': 'solid'},
              'marker': {'symbol': 'circle'},
              'mode': 'lines',
              'name': 'COUNT(*)',
              'orientation': 'v',
              'showlegend': True,
              'type': 'scatter',
              'x': array([0]),
              'xaxis': 'x',
              'y': array([59]),
              'yaxis': 'y'}],
    'layout': {'legend': {'title': {'text': 'variable'}, 'tracegroupgap': 0},
               'margin': {'t': 60},
               'template': '...',
               'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'index'}},
               'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'value'}}}
})
```

English

In [20]:
```
question = """
    what are the top 5 countries that customers come from?
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "media_types"\r\n(\r\n   MediaTypeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the qu

```
ery with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why
it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and
answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content':
'what are the top 5 countries that customers come from?'}, {'role': 'assistant', 'content': 'SELECT c.Count
ry, COUNT(*) AS TotalCustomers\nFROM "customers" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT
5'}, {'role': 'user', 'content': '  \n     Find the top 5 customers who spent the most money overall, \n
\n     Hint: order total can be found on invoices table, calculation using invoice_items detail table is un
necessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "cu
stomers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DE
SC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': '  \n     Find the top 5 customers wh
o spent the most money overall, \n     \n     Hint: order total can be found on invoices table, calculation
using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerI
d, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGRO
UP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'content': '  \n     Find the
top 5 customers who spent the most money overall, \n     \n     Hint: order total can be found on invoices
table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content':
'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId =
i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'content': '  \n
List all customers from Canada and their email addresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.E
mail, c.Country\nFROM "customers" c\nWHERE c.Country = \'Canada\''}, {'role': 'user', 'content': '  \n    F
ind the total number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT Customer.Countr
y, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM "customers" customer\nJOIN "invoices" invoice ON custome
r.CustomerId = invoice.CustomerId\nGROUP BY Country'}, {'role': 'user', 'content': '  \n    Hint: album qua
ntity is found in invoice_items, \n    \n    Find the top 5 customers who bought the most albums in total q
uantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackI
d) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.Cus
tomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': '  \n
Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(I
nvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT
1\n-------------------------'}, {'role': 'user', 'content': '  \n    Hint: album quantity is found in invoi
ce_items, \n    \n    Find the top 5 customers who bought the most albums in total quantity (across all inv
oices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM
"customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = i
i.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': '  \n
Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT
(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP
BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': '  \n    what are the
top 5 countries that customers come from?\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
```

Prompt Content:

[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"media_types\"\r\n(\r\n   MediaTypeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific st

ring in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": "what are the top 5 countries that customers come from?"}, {"role": "assistant", "content": "SELECT c.Country, COUNT(*) AS TotalCustomers\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.Email, c.Country\nFROM \"customers\" c\nWHERE c.Country = 'Canada'"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM \"customers\" customer\nJOIN \"invoices\" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-----------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   what are the top 5 countries that customers come from?\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:37:36.246359462Z', 'message': {'role': 'assistant', 'c

ontent': 'SELECT Country, COUNT(CustomerId) AS CustomerCount\nFROM "customers"\nGROUP BY Country\nORDER BY
CustomerCount DESC\nLIMIT 5'}, 'done_reason': 'stop', 'done': True, 'total_duration': 86299283705, 'load_du
ration': 750454, 'prompt_eval_count': 1989, 'prompt_eval_duration': 79197813000, 'eval_count': 31, 'eval_du
ration': 6289540000}

```
SELECT Country, COUNT(CustomerId) AS CustomerCount
FROM "customers"
GROUP BY Country
ORDER BY CustomerCount DESC
LIMIT 5
```

```
SELECT Country, COUNT(CustomerId) AS CustomerCount
FROM "customers"
GROUP BY Country
ORDER BY CustomerCount DESC
LIMIT 5
```

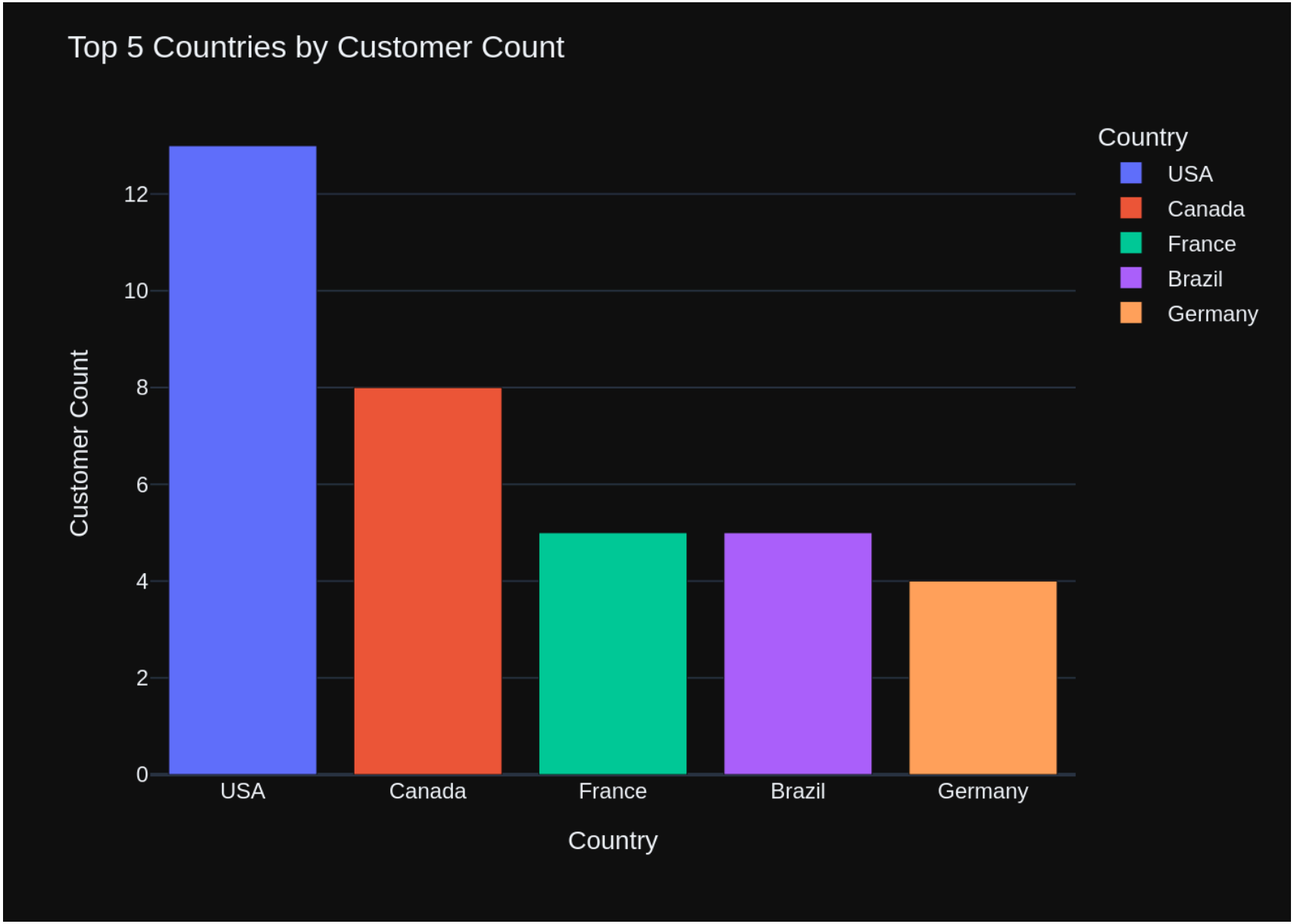
	Country	CustomerCount
0	USA	13
1	Canada	8
2	France	5
3	Brazil	5
4	Germany	4

```
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
```

[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: ' \n   what are the top 5 countries that customers come from?
\n'\n\nThe DataFrame was produced using this query: SELECT Country, COUNT(CustomerId) AS CustomerCount\nFRO
M \"customers\"\nGROUP BY Country\nORDER BY CustomerCount DESC\nLIMIT 5\n\nThe following is information abo
ut the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n Country   object\nCustomerCount
int64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the r
esults of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value i
n the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- ju
st the code."}]

```
Ollama Response:
```

{'model': 'aya:latest', 'created_at': '2024-06-14T11:38:05.208271662Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x='Country', y
='CustomerCount', color='Country')\n\n# Add labels and title\nfig.update_xaxes(title='Country')\nfig.update
_yaxes(title='Customer Count')\nfig.update_layout(title='Top 5 Countries by Customer Count')\n\n# Show the
chart\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 28936353168, 'load_duratio
n': 706025, 'prompt_eval_count': 185, 'prompt_eval_duration': 7681698000, 'eval_count': 102, 'eval_duratio
n': 21119977000}


Top 5 Countries by Customer Count
Country
USA
Canada
France
Brazil
Germany
Customer Count
0
2
4
6
8
10
12
USA
Canada
France
Brazil
Germany
Country

```
Out[20]: ('SELECT Country, COUNT(CustomerId) AS CustomerCount\nFROM "customers"\nGROUP BY Country\nORDER BY Custome
         rCount DESC\nLIMIT 5',
             Country  CustomerCount
          0      USA             13
          1   Canada              8
          2   France              5
          3   Brazil              5
          4  Germany              4,
          Figure({
              'data': [{'alignmentgroup': 'True',
                        'hovertemplate': 'Country=%{x}<br>CustomerCount=%{y}<extra></extra>',
                        'legendgroup': 'USA',
                        'marker': {'color': '#636efa', 'pattern': {'shape': ''}},
                        'name': 'USA',
                        'offsetgroup': 'USA',
                        'orientation': 'v',
                        'showlegend': True,
                        'textposition': 'auto',
                        'type': 'bar',
                        'x': array(['USA'], dtype=object),
                        'xaxis': 'x',
                        'y': array([13]),
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                    'offsetgroup': 'Brazil',
                    'orientation': 'v',
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```

```
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                  'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Customer Count'}}}
 }))
```

German

In [21]:
```
question = """
    aus welchen fünf Ländern kommen die meisten Kunden?
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': 'what are the top 5 countries that customers come from?'}, {'role': 'assistant', 'content': 'SELECT c.Country, COUNT(*) AS TotalCustomers\nFROM "customers" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   what are the top 5 countries that customers come from?\n'}, {'role': 'assistant', 'content': 'SELECT Country, COUNT(CustomerId) AS CustomerCount\nFROM "customers"\nGROUP BY Country\nORDER BY CustomerCount DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all customers from Canada and their email addresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, c.Email, SUM(i.Total) AS TotalSpent\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   List all customers from Canada and their email addresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.Email, c.Country\nFROM "customers" c\nWHERE c.Country = \'Canada\''}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all i

nvoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFRO
M "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY Tota
lAlbums DESC\nLIMIT 5\n------------------------'}, {'role': 'user', 'content': ' \n   Find the top 5 mos
t expensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT Name, UnitPrice\nFR
OM "tracks"\nORDER BY UnitPrice DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 most e
xpensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT t.TrackId, t.Name, t.U
nitPrice\nFROM "tracks" t\nORDER BY t.UnitPrice DESC\nLIMIT 5\n------------------------'}, {'role': 'use
r', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: ord
er total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'},
{'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN
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t: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most album
s in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUN
T(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "i
nvoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT
5'}, {'role': 'user', 'content': ' \n   aus welchen fünf Ländern kommen die meisten Kunden?\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE TABLE \"customers\"\r\n
(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r
\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   Cit
y NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n
Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEG
ER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON
UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE INDEX IFK_Playlist
TrackTrackId ON \"playlist_track\" (TrackId)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (Sup
portRepId)\n\nCREATE INDEX IFK_TrackGenreId ON \"tracks\" (GenreId)\n\nCREATE TABLE \"tracks\"\r\n(\r\n
TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INT
EGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   M
illiseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREI
GN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FO
REIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n
FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO
ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE INDEX IFK_AlbumArtistId ON \"albums\" (Arti
stId)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n

LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n
ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n
City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(1
0),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (Repo
rtsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===A
dditional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the prov
ided context is sufficient, please generate a valid SQL query without any explanations for the question. \n
2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular
column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the
query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain w
hy it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked a
nd answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "conten
t": "what are the top 5 countries that customers come from?"}, {"role": "assistant", "content": "SELECT c.C
ountry, COUNT(*) AS TotalCustomers\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC
\nLIMIT 5"}, {"role": "user", "content": " \n   what are the top 5 countries that customers come from?
\n"}, {"role": "assistant", "content": "SELECT Country, COUNT(CustomerId) AS CustomerCount\nFROM \"customer
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ll customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.Custome
rId, c.Email, SUM(i.Total) AS TotalSpent\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId
\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 1"}, {"role": "user", "content": " \n   List al
l customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.Email,
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lbum quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in
total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.
TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROU
P BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "conte
nt": " \n   Find the top 5 most expensive tracks (based on unit price):\n"}, {"role": "assistant", "conte
nt": "SELECT Name, UnitPrice\nFROM \"tracks\"\nORDER BY UnitPrice DESC\nLIMIT 5"}, {"role": "user", "conten
t": " \n   Find the top 5 most expensive tracks (based on unit price):\n"}, {"role": "assistant", "conten
t": "SELECT t.TrackId, t.Name, t.UnitPrice\nFROM \"tracks\" t\nORDER BY t.UnitPrice DESC\nLIMIT 5\n--------
-----------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most mone
y overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items
detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS To
talSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\n
ORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": "How many custo
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{"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the t
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t", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoice
s\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.C
ustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   aus welchen f\u00fcnf
L\u00e4ndern kommen die meisten Kunden?\n"}]

```
Ollama Response:
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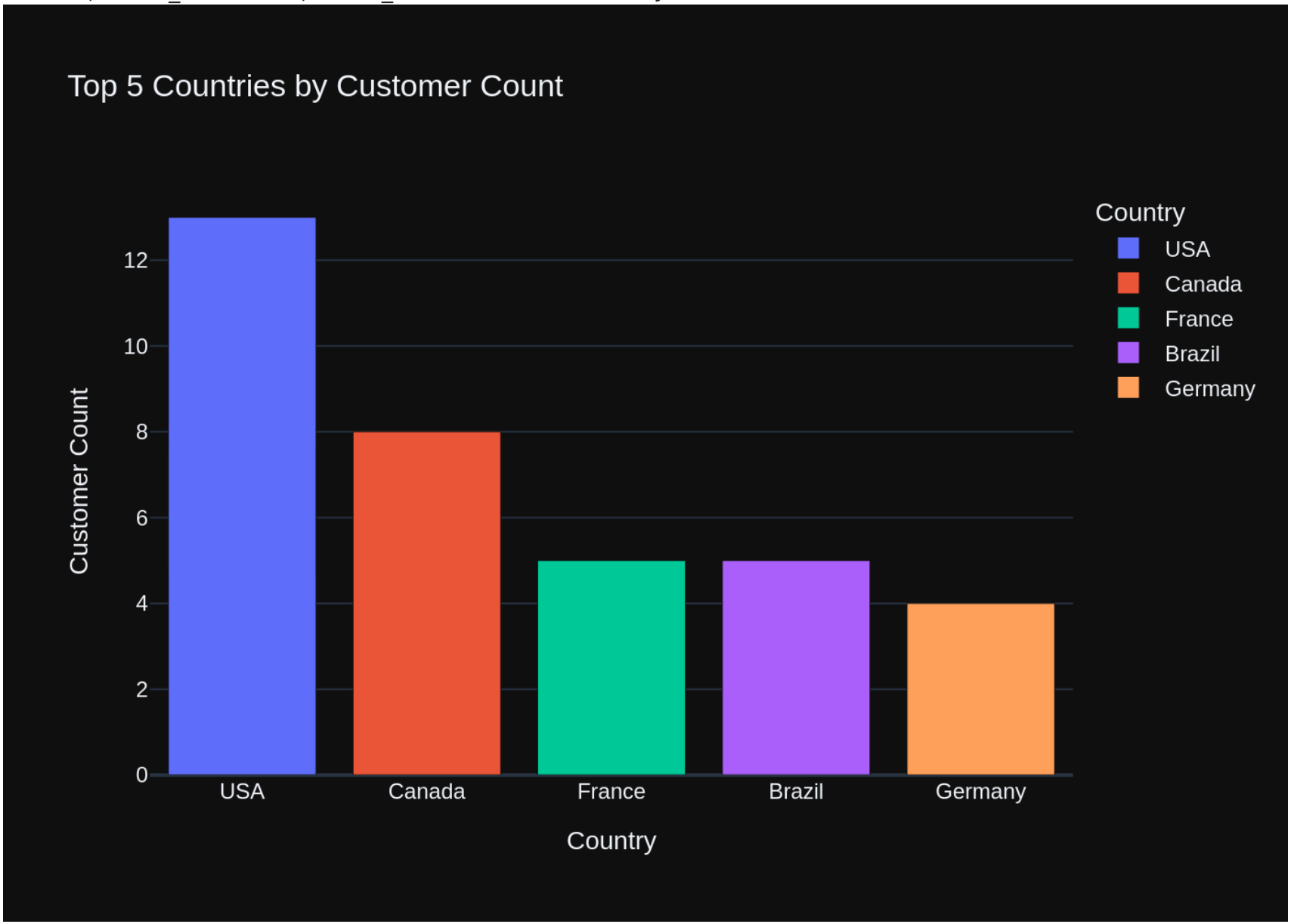
ontent': 'SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c\nGROUP BY c.Country\nORDER BY Cus
tomerCount DESC\nLIMIT 5'}, 'done_reason': 'stop', 'done': True, 'total_duration': 73491430715, 'load_durat
ion': 712886, 'prompt_eval_count': 1580, 'prompt_eval_duration': 65919171000, 'eval_count': 33, 'eval_durat
ion': 6877546000}
SELECT c.Country, COUNT(*) AS CustomerCount
FROM "customers" c
GROUP BY c.Country
ORDER BY CustomerCount DESC
LIMIT 5
SELECT c.Country, COUNT(*) AS CustomerCount
FROM "customers" c
GROUP BY c.Country
ORDER BY CustomerCount DESC
LIMIT 5
   Country  CustomerCount
0      USA             13
1   Canada              8
2   France              5
3   Brazil              5
4  Germany              4
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    aus welchen f\u00fcnf L\u00e4ndern kommen die meisten Ku
nden?\n'\n\nThe DataFrame was produced using this query: SELECT c.Country, COUNT(*) AS CustomerCount\nFROM
\"customers\" c\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT 5\n\nThe following is information a
bout the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n Country          object\nCustomerCou
nt     int64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to char
t the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one
value in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanation
s -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:39:43.694534215Z', 'message': {'role': 'assistant', 'c
ontent': '```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x="Country", y
="CustomerCount", color=\'Country\', title=\'Top 5 Countries by Customer Count\')\nfig.update_layout(xaxis_
title="Country", yaxis_title="Customer Count")\nfig.show()\n```'}, 'done_reason': 'stop', 'done': True, 'to
```

tal_duration': 24870558289, 'load_duration': 914418, 'prompt_eval_count': 185, 'prompt_eval_duration': 8153957000, 'eval_count': 79, 'eval_duration': 16581957000}



```
Out[21]: ('SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c\nGROUP BY c.Country\nORDER BY CustomerCo
         unt DESC\nLIMIT 5',
             Country  CustomerCount
          0      USA             13
          1   Canada              8
          2   France              5
          3   Brazil              5
          4  Germany              4,
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                        'offsetgroup': 'USA',
                        'orientation': 'v',
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                        'type': 'bar',
                        'x': array(['USA'], dtype=object),
                        'xaxis': 'x',
                        'y': array([13]),
                        'yaxis': 'y'},
                       {'alignmentgroup': 'True',
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                        'legendgroup': 'Canada',
                        'marker': {'color': '#EF553B', 'pattern': {'shape': ''}},
                        'name': 'Canada',
                        'offsetgroup': 'Canada',
                        'orientation': 'v',
                        'showlegend': True,
                        'textposition': 'auto',
                        'type': 'bar',
                        'x': array(['Canada'], dtype=object),
                        'xaxis': 'x',
                        'y': array([8]),
                        'yaxis': 'y'},
                       {'alignmentgroup': 'True',
                        'hovertemplate': 'Country=%{x}<br>CustomerCount=%{y}<extra></extra>',
                        'legendgroup': 'France',
                        'marker': {'color': '#00cc96', 'pattern': {'shape': ''}},
                        'name': 'France',
```

```
                    'offsetgroup': 'France',
                    'orientation': 'v',
                    'showlegend': True,
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                    'type': 'bar',
                    'x': array(['France'], dtype=object),
                    'xaxis': 'x',
                    'y': array([5]),
                    'yaxis': 'y'},
                   {'alignmentgroup': 'True',
                    'hovertemplate': 'Country=%{x}<br>CustomerCount=%{y}<extra></extra>',
                    'legendgroup': 'Brazil',
                    'marker': {'color': '#ab63fa', 'pattern': {'shape': ''}},
                    'name': 'Brazil',
                    'offsetgroup': 'Brazil',
                    'orientation': 'v',
                    'showlegend': True,
                    'textposition': 'auto',
                    'type': 'bar',
                    'x': array(['Brazil'], dtype=object),
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                    'y': array([5]),
                    'yaxis': 'y'},
                   {'alignmentgroup': 'True',
                    'hovertemplate': 'Country=%{x}<br>CustomerCount=%{y}<extra></extra>',
                    'legendgroup': 'Germany',
                    'marker': {'color': '#FFA15A', 'pattern': {'shape': ''}},
                    'name': 'Germany',
                    'offsetgroup': 'Germany',
                    'orientation': 'v',
                    'showlegend': True,
                    'textposition': 'auto',
                    'type': 'bar',
                    'x': array(['Germany'], dtype=object),
                    'xaxis': 'x',
                    'y': array([4]),
                    'yaxis': 'y'}],
 'layout': {'barmode': 'relative',
            'legend': {'title': {'text': 'Country'}, 'tracegroupgap': 0},
            'template': '...',
            'title': {'text': 'Top 5 Countries by Customer Count'},
            'xaxis': {'anchor': 'y',
```

```
                            'categoryarray': [USA, Canada, France, Brazil, Germany],
                            'categoryorder': 'array',
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                            'title': {'text': 'Country'}},
                  'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Customer Count'}}}
 }))
```

Chinese

In [22]:
```
question = """
    顾客来自的前 5 个国家是哪些？
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

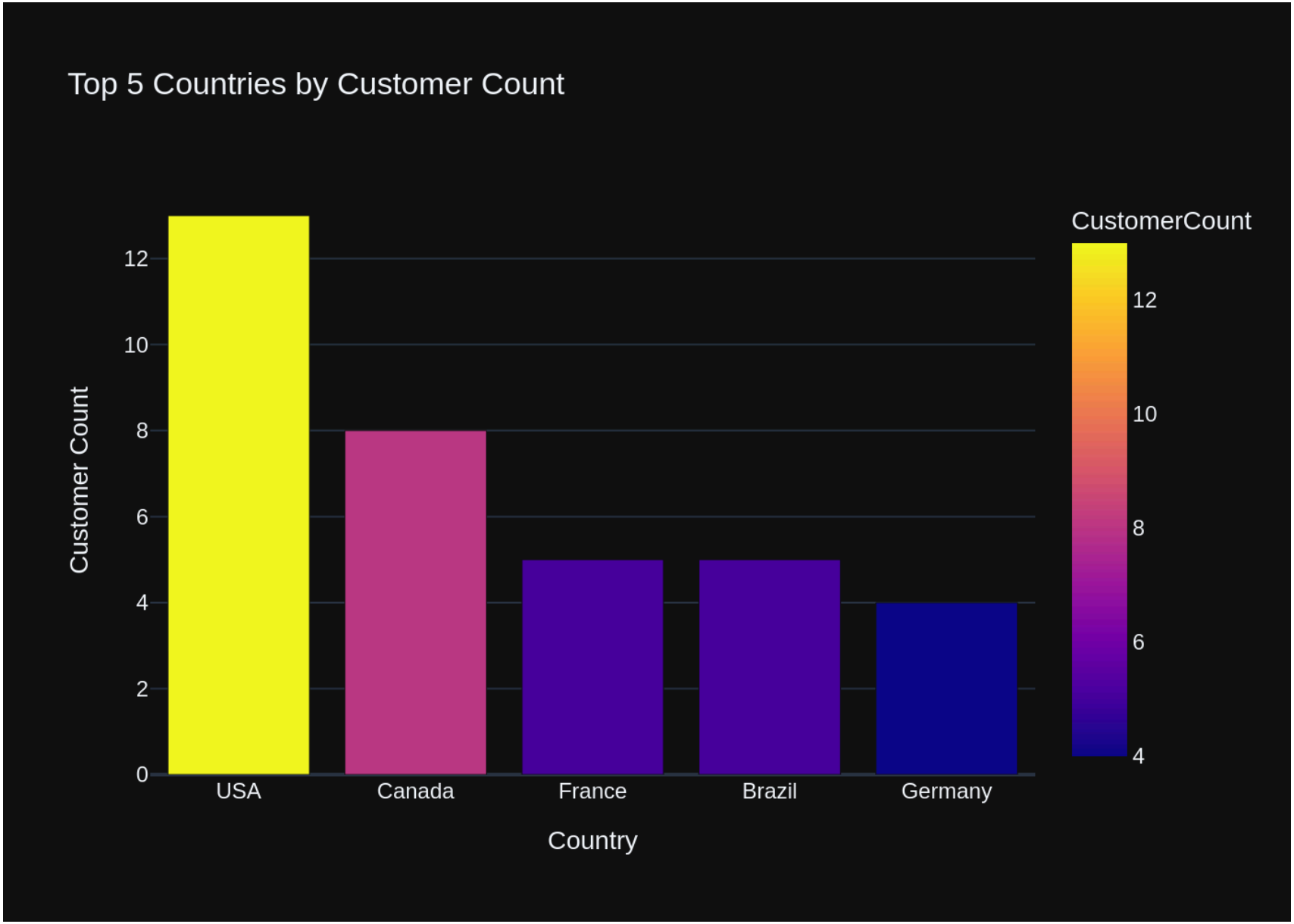
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   aus welchen fünf Ländern kommen die meisten Kunden?\n'}, {'role': 'assistant', 'content': 'SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   what are the top 5 countries that customers come from?\n'}, {'role': 'assistant', 'content': 'SELECT

Country, COUNT(CustomerId) AS CustomerCount\nFROM "customers"\nGROUP BY Country\nORDER BY CustomerCount DES
C\nLIMIT 5'}, {'role': 'user', 'content': 'what are the top 5 countries that customers come from?'}, {'rol
e': 'assistant', 'content': 'SELECT c.Country, COUNT(*) AS TotalCustomers\nFROM "customers" c\nGROUP BY c.C
ountry\nORDER BY TotalCustomers DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the total number
of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT i.BillingCountry, COUNT(*) AS TotalI
nvoices\nFROM "invoices" i\nGROUP BY i.BillingCountry'}, {'role': 'user', 'content': ' \n   Find the tota
l number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT BillingCountry, COUNT(i.Inv
oiceId) AS TotalInvoices\nFROM "invoices" i\nGROUP BY BillingCountry'}, {'role': 'user', 'content': ' \n
Find the total number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT Customer.Count
ry, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM "customers" customer\nJOIN "invoices" invoice ON custome
r.CustomerId = invoice.CustomerId\nGROUP BY Country'}, {'role': 'user', 'content': ' \n   Find the top 5
customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table,
calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT
c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.Cust
omerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n
Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on
invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'co
ntent': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.Custom
erId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'conten
t': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total ca
n be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'a
ssistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices"
i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n---------------
----------'}, {'role': 'user', 'content': ' \n   List all customers from Canada and their email addresse
s:\n'}, {'role': 'assistant', 'content': 'SELECT c.Email, c.Country\nFROM "customers" c\nWHERE c.Country =
\'Canada\''}, {'role': 'user', 'content': ' \n   顾客来自的前 5 个国家是哪些？\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTO
INCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n
Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n
Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r
\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENC
ES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoic
e_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER N
OT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGE
R NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION

ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTI
ON ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   T
itle NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Ad
dress NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n
PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n
FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTI
ON\r\n)\n\nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n
CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r
\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n
BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFER
ENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlit
e_sequence(name,seq)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT N
ULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId)
REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"pl
aylist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAIN
T PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlis
ts\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES
\"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustom
erId ON \"invoices\" (CustomerId)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)
\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON \"invoice_items\" (InvoiceId)\n\n\n===Additional Context \n\nI
n the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is suffici
ent, please generate a valid SQL query without any explanations for the question. \n2. If the provided cont
ext is almost sufficient but requires knowledge of a specific string in a particular column, please generat
e an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment s
aying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generat
ed. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, pl
ease repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   aus welch
en f\u00fcnf L\u00e4ndern kommen die meisten Kunden?\n"}, {"role": "assistant", "content": "SELECT c.Countr
y, COUNT(*) AS CustomerCount\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT
5"}, {"role": "user", "content": " \n   what are the top 5 countries that customers come from?\n"}, {"rol
e": "assistant", "content": "SELECT Country, COUNT(CustomerId) AS CustomerCount\nFROM \"customers\"\nGROUP
BY Country\nORDER BY CustomerCount DESC\nLIMIT 5"}, {"role": "user", "content": "what are the top 5 countri
es that customers come from?"}, {"role": "assistant", "content": "SELECT c.Country, COUNT(*) AS TotalCustom
ers\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT 5"}, {"role": "user", "c
ontent": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SEL
ECT i.BillingCountry, COUNT(*) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY i.BillingCountry"}, {"role":
"user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "cont
ent": "SELECT BillingCountry, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY BillingCou
ntry"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role":
"assistant", "content": "SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM \"customer
s\" customer\nJOIN \"invoices\" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country"},

{"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n
Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessa
ry \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"custo
mers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending
DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money ov
erall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items deta
il table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalS
pent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDE
R BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent t
he most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using in
voice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.
Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.
CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": "
\n   List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SEL
ECT c.Email, c.Country\nFROM \"customers\" c\nWHERE c.Country = 'Canada'"}, {"role": "user", "content": "
\n   \u987e\u5ba2\u6765\u81ea\u7684\u524d 5 \u4e2a\u56fd\u5bb6\u662f\u54ea\u4e9b\uff1f\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:41:07.00523115Z', 'message': {'role': 'assistant', 'co
ntent': 'SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c\nGROUP BY c.Country\nORDER BY Cust
omerCount DESC\nLIMIT 5;'}, 'done_reason': 'stop', 'done': True, 'total_duration': 83207475328, 'load_durat
ion': 776415, 'prompt_eval_count': 1789, 'prompt_eval_duration': 75628625000, 'eval_count': 34, 'eval_durat
ion': 6881480000}
```
SELECT c.Country, COUNT(*) AS CustomerCount
FROM "customers" c
GROUP BY c.Country
ORDER BY CustomerCount DESC
LIMIT 5;
```
Output from LLM: SELECT c.Country, COUNT(*) AS CustomerCount
FROM "customers" c
GROUP BY c.Country
ORDER BY CustomerCount DESC
LIMIT 5;
Extracted SQL: SELECT c.Country, COUNT(*) AS CustomerCount
FROM "customers" c
GROUP BY c.Country
ORDER BY CustomerCount DESC
LIMIT 5
SELECT c.Country, COUNT(*) AS CustomerCount
FROM "customers" c
GROUP BY c.Country
ORDER BY CustomerCount DESC
LIMIT 5

```
   Country  CustomerCount
0      USA             13
1   Canada              8
2   France              5
3   Brazil              5
4  Germany              4
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    \u987e\u5ba2\u6765\u81ea\u7684\u524d 5 \u4e2a\u56fd\u5bb
6\u662f\u54ea\u4e9b\uff1f\n'\n\nThe DataFrame was produced using this query: SELECT c.Country, COUNT(*) AS
CustomerCount\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT 5\n\nThe follow
ing is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n Country
object\nCustomerCount     int64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python
plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If
there is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not answer wi
th any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:41:38.822559028Z', 'message': {'role': 'assistant', 'c
ontent': '```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x="Country", y
="CustomerCount", color="CustomerCount",\n              title="Top 5 Countries by Customer Count")\n\n# Add
customizability to the figure\nfig.update_xaxes(title="Country")\nfig.update_yaxes(title="Customer Count")
\nfig.update_layout(barmode=\'group\', legend=dict(title="Country"))\n\n# Show the plot\nfig.show()\n```'},
'done_reason': 'stop', 'done': True, 'total_duration': 31792382782, 'load_duration': 693804, 'prompt_eval_c
ount': 188, 'prompt_eval_duration': 7249251000, 'eval_count': 121, 'eval_duration': 24406708000}
```


Top 5 Countries by Customer Count
CustomerCount
12
10
8
6
4
Customer Count
0
2
4
6
8
10
12
USA
Canada
France
Brazil
Germany
Country

Out[22]:
```
('SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c\nGROUP BY c.Country\nORDER BY CustomerCo
unt DESC\nLIMIT 5',
    Country  CustomerCount
 0      USA             13
 1   Canada              8
 2   France              5
 3   Brazil              5
 4  Germany              4,
 Figure({
     'data': [{'alignmentgroup': 'True',
               'hovertemplate': 'Country=%{x}<br>CustomerCount=%{marker.color}<extra></extra>',
               'legendgroup': '',
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pe': ''}},
               'name': '',
               'offsetgroup': '',
               'orientation': 'v',
               'showlegend': False,
               'textposition': 'auto',
               'type': 'bar',
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               'xaxis': 'x',
               'y': array([13,  8,  5,  5,  4]),
               'yaxis': 'y'}],
     'layout': {'barmode': 'group',
                'coloraxis': {'colorbar': {'title': {'text': 'CustomerCount'}},
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                                             '#9c179e'], [0.4444444444444444,
                                             '#bd3786'], [0.5555555555555556,
                                             '#d8576b'], [0.6666666666666666,
                                             '#ed7953'], [0.7777777777777778,
                                             '#fb9f3a'], [0.8888888888888888,
                                             '#fdca26'], [1.0, '#f0f921']]},
                'legend': {'title': {'text': 'Country'}, 'tracegroupgap': 0},
                'template': '...',
                'title': {'text': 'Top 5 Countries by Customer Count'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Country'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Customer Count'}}}
 }))
```

More SQL questions

see `sample-sql-queries-sqlite-chinook.ipynb`

In [23]:
```
question = """
    List all albums and their corresponding artist names
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "artists"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   List all albums and their corresponding artist names \n'}, {'role': 'assistant', 'content': 'SELECT a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId = ar.ArtistId'}, {'role': 'user', 'content': ' \n   List all albums and their corresponding artist names \n'}, {'role': 'assistant', 'content': 'SELECT a.Title, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId = ar.ArtistId\n----------------------'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "gen

res" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all albums and their corresponding artist names \n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE TABLE \"artists\"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_TrackGenreId ON

\"tracks\" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_track\" (TrackId)\n\nCREATE TAB
LE \"playlists\"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(12
0)\r\n)\n\nCREATE TABLE \"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   N
ame NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_TrackMediaTypeId ON \"tracks\" (MediaTypeId)\n\n\n===Additional
Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided conte
xt is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the
provided context is almost sufficient but requires knowledge of a specific string in a particular column, p
lease generate an intermediate SQL query to find the distinct strings in that column. Prepend the query wit
h a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it ca
n't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answe
red before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": "
\n   List all albums and their corresponding artist names \n"}, {"role": "assistant", "content": "SELECT
a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.Artis
tId"}, {"role": "user", "content": " \n   List all albums and their corresponding artist names \n"}, {"r
ole": "assistant", "content": "SELECT a.Title, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" a
r ON a.ArtistId = ar.ArtistId\n-------------------------"}, {"role": "user", "content": " \n   There are 3
tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are
linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n"}, {"r
ole": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFR
OM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.Album
Id\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n
There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and
tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of trac
ks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\"
a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.
Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   Identify artists who hav
e albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.Arti
stId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.Art
istId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n G
ROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName"},
{"role": "user", "content": " \n   Identify artists who have albums with tracks appearing in multiple ge
nres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\"
a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"gen
res\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreI
d) > 1\n)\nGROUP BY a.ArtistId, a.Name"}, {"role": "user", "content": " \n   Hint: album quantity is foun
d in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (acro
ss all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlb
ums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON
i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user",
"content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers wh
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LECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.In

```
voiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "cont
ent": "  \n     Find the customer who bought the most albums in total quantity (across all invoices): \n"},
{"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\"
c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.Invoic
eId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": "  \n    Hin
t: album quantity is found in invoice_items, \n    \n    Find the top 5 customers who bought the most album
s in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUN
T(ii.InvoiceLineId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.Invo
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SELECT a.Title, ar.Name AS ArtistName
FROM  "albums" a
JOIN  "artists" ar ON a.ArtistId = ar.ArtistId
SELECT a.Title, ar.Name AS ArtistName
FROM  "albums" a
JOIN  "artists" ar ON a.ArtistId = ar.ArtistId
                                                 Title  \
0                For For Those About To Rock We Salute You
1                                     Balls to the Wall
2                                     Restless and Wild
3                                     Let There Be Rock
4                                              Big Ones
..                                                  ...
342                             Respighi:Pines of Rome
343  Schubert: The Late String Quartets & String Qu...
344                                Monteverdi: L'Orfeo
345                              Mozart: Chamber Music
346  Koyaanisqatsi (Soundtrack from the Motion Pict...

                                           ArtistName
0                                               AC/DC
1                                              Accept
2                                              Accept
3                                               AC/DC
4                                            Aerosmith
..                                                 ...
342                                    Eugene Ormandy
```

```
343                              Emerson String Quartet
344  C. Monteverdi, Nigel Rogers - Chiaroscuro; Lon...
345                                       Nash Ensemble
346                               Philip Glass Ensemble

[347 rows x 2 columns]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    List all albums and their corresponding artist names
\n'\n\nThe DataFrame was produced using this query: SELECT a.Title, ar.Name AS ArtistName\nFROM  \"albums\"
a\nJOIN  \"artists\" ar ON a.ArtistId = ar.ArtistId\n\nThe following is information about the resulting pan
das DataFrame 'df': \nRunning df.dtypes gives:\n Title         object\nArtistName    object\ndtype: objec
t"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of the dataf
rame? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the dataframe, us
e an Indicator. Respond with only Python code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:43:20.206262559Z', 'message': {'role': 'assistant', 'c
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g.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 21607350787, 'load_duration': 75087
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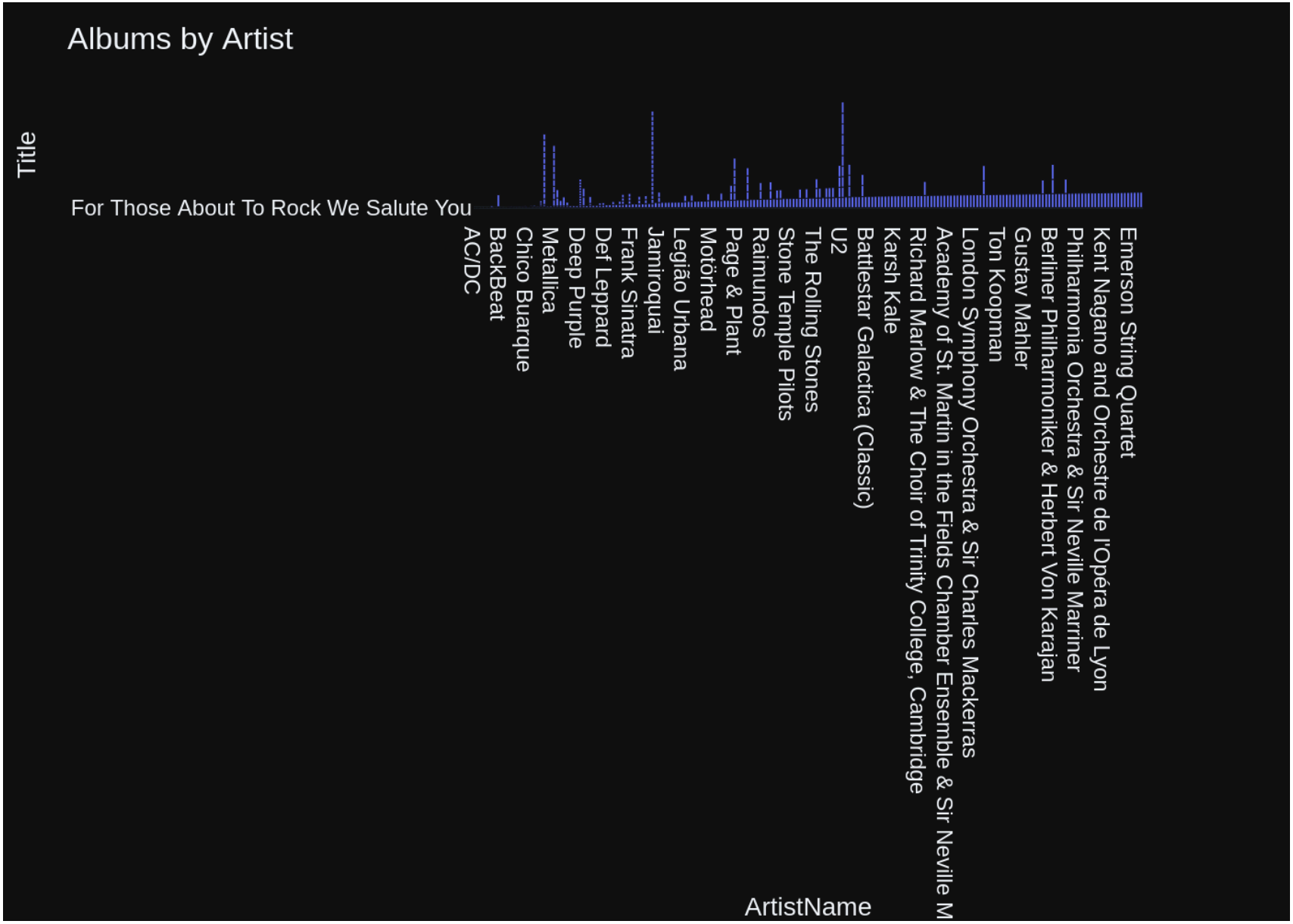
Albums by Artist
Title
For Those About To Rock We Salute You
AC/DC
BackBeat
Chico Buarque
Metallica
Deep Purple
Def Leppard
Frank Sinatra
Legião Urbana
Jamiroquai
Motörhead
Page & Plant
Raimundos
Stone Temple Pilots
The Rolling Stones
U2
Battlestar Galactica (Classic)
Karsh Kale
Richard Marlow & The Choir of Trinity College, Cambridge
Academy of St. Martin in the Fields Chamber Ensemble & Sir Neville M
London Symphony Orchestra & Sir Charles Mackerras
Ton Koopman
Gustav Mahler
Berliner Philharmoniker & Herbert Von Karajan
Philharmonia Orchestra & Sir Neville Marriner
Kent Nagano and Orchestre de l'Opéra de Lyon
Emerson String Quartet
ArtistName

```
Out[23]: ('SELECT a.Title, ar.Name AS ArtistName\nFROM  "albums" a\nJOIN  "artists" ar ON a.ArtistId = ar.ArtistI
         d',
                                                  Title  \
          0               For Those About To Rock We Salute You
          1                                   Balls to the Wall
          2                                   Restless and Wild
          3                                   Let There Be Rock
          4                                            Big Ones
          ..                                                ...
          342                           Respighi:Pines of Rome
          343  Schubert: The Late String Quartets & String Qu...
          344                              Monteverdi: L'Orfeo
          345                            Mozart: Chamber Music
          346  Koyaanisqatsi (Soundtrack from the Motion Pict...

                                               ArtistName
          0                                        AC/DC
          1                                       Accept
          2                                       Accept
          3                                        AC/DC
          4                                     Aerosmith
          ..                                          ...
          342                                Eugene Ormandy
          343                           Emerson String Quartet
          344  C. Monteverdi, Nigel Rogers - Chiaroscuro; Lon...
          345                                 Nash Ensemble
          346                           Philip Glass Ensemble

          [347 rows x 2 columns],
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                        'x': array(['AC/DC', 'Accept', 'Accept', ...,
                                    'C. Monteverdi, Nigel Rogers - Chiaroscuro; London Baroque; London Cornett & Sa
```

```
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                            'Nash Ensemble', 'Philip Glass Ensemble'], dtype=object),
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                           'Restless and Wild', ..., "Monteverdi: L'Orfeo",
                           'Mozart: Chamber Music',
                           'Koyaanisqatsi (Soundtrack from the Motion Picture)'], dtype=object),
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                'template': '...',
                'title': {'text': 'Albums by Artist'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'ArtistName'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Title'}}}
 }))
```

In [24]:
```
question = """
    Find all tracks with a name containing "What" (case-insensitive)
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order \n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find all tracks with a name containing "What" (case-insensitive)\n'}, {'role': 'assistant', 'content': "SELECT * FROM tracks WHERE lower(Name) LIKE '%what%'"}, {'role': 'user', 'content': ' \n   Find all tracks with a name containing "What" (case-insensitive)\n'}, {'role': 'assistant', 'content': 'SELECT * \nFROM "tracks" \nWHERE LOWER(Name) LIKE \'%what%\''}, {'role': 'user', 'content': ' \n   Get all playlists containing at least 10 tracks and the total duration of those tracks:\n'}, {'role': 'assistant', 'content': 'SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Milliseconds) AS TotalDuration\nFROM "playlist_track" pt\nJOIN "playlists" p ON pt.PlaylistId = p.PlaylistId\nJOIN "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10'}, {'role': 'user', 'content': ' \n   Get all playlists containing at least 10 tracks and the total duration of those tracks:\n'}, {'role': 'assistant', 'content': 'SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM "playlists" p\nJOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId\nJOIN "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name'}, {'role': 'user', 'content': '

\n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT t.TrackId, t.Name, t.UnitPrice\nFROM "tracks" t\nORDER BY t.UnitPrice DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT Name, UnitPrice\nFROM "tracks"\nORDER BY UnitPrice DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'role': 'user', 'content': ' \n   Find all tracks with a name containing "What" (case-insensitive)\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_TrackGenreId ON \"tracks\" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_track\" (TrackId)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON \"tracks\" (MediaTypeId)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE INDEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE TABLE \"playlists\"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate

SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate
_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please us
e the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the an
swer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Find all tracks with a name
containing \"What\" (case-insensitive)\n"}, {"role": "assistant", "content": "SELECT * FROM tracks WHERE lo
wer(Name) LIKE '%what%'"}, {"role": "user", "content": " \n   Find all tracks with a name containing \"Wh
at\" (case-insensitive)\n"}, {"role": "assistant", "content": "SELECT * \nFROM \"tracks\" \nWHERE LOWER(Nam
e) LIKE '%what%'"}, {"role": "user", "content": " \n   Get all playlists containing at least 10 tracks a
nd the total duration of those tracks:\n"}, {"role": "assistant", "content": "SELECT pt.PlaylistId, p.Name
AS PlaylistName, SUM(t.Milliseconds) AS TotalDuration\nFROM \"playlist_track\" pt\nJOIN \"playlists\" p ON
pt.PlaylistId = p.PlaylistId\nJOIN \"tracks\" t ON pt.TrackId = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\n
HAVING COUNT(pt.TrackId) >= 10"}, {"role": "user", "content": " \n   Get all playlists containing at lea
st 10 tracks and the total duration of those tracks:\n"}, {"role": "assistant", "content": "SELECT p.Playli
stId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM \"playlists\" p\nJOIN \"playlist_track\" pt
ON p.PlaylistId = pt.PlaylistId\nJOIN \"tracks\" t ON pt.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING
COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC"}, {"role": "user", "content": " \n
Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant",
"content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId =
al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.G
enreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Nam
e"}, {"role": "user", "content": " \n   List all genres and the number of tracks in each genre:\n"}, {"ro
le": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tra
cks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name"}, {"role": "user", "content": " \n   List all genres a
nd the number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreI
d) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY
TotalTracks DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 most expensive tracks (bas
ed on unit price):\n"}, {"role": "assistant", "content": "SELECT t.TrackId, t.Name, t.UnitPrice\nFROM \"tra
cks\" t\nORDER BY t.UnitPrice DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 most exp
ensive tracks (based on unit price):\n"}, {"role": "assistant", "content": "SELECT Name, UnitPrice\nFROM
\"tracks\"\nORDER BY UnitPrice DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Identify artists who
have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.A
rtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.
ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n
GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName"},
{"role": "user", "content": " \n   Find all tracks with a name containing \"What\" (case-insensitive)
\n"}]

Add of existing embedding ID: 308edcd4-070f-52fe-b4c5-43177fb59bb1-sql
Insert of existing embedding ID: 308edcd4-070f-52fe-b4c5-43177fb59bb1-sql

```
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:44:28.481142909Z', 'message': {'role': 'assistant', 'c
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tal_duration': 68119427497, 'load_duration': 743258, 'prompt_eval_count': 1578, 'prompt_eval_duration': 645
31291000, 'eval_count': 15, 'eval_duration': 2895087000}
SELECT * FROM tracks WHERE lower(Name) LIKE '%what%';
Output from LLM: SELECT * FROM tracks WHERE lower(Name) LIKE '%what%';
Extracted SQL: SELECT * FROM tracks WHERE lower(Name) LIKE '%what%'
SELECT * FROM tracks WHERE lower(Name) LIKE '%what%'
    TrackId                                          Name  AlbumId  \
0        26                                What It Takes        5
1        88                                 What You Are       10
2       130                             Do what cha wanna       13
3       342                  What is and Should Never Be       30
4       607                                      So What       48
5       960                                   What A Day       76
6      1000                                What If I Do?       80
7      1039                              What Now My Love       83
8      1145                                   Whatsername       89
9      1440            Whatever It Is, I Just Can't Stop      116
10     1469                         Look What You've Done      119
11     1470                             Get What You Need      119
12     1628              What Is And What Should Never Be      133
13     1778  You're What's Happening (In The World Today)      146
14     1823                                      So What      149
15     2772          I Don't Know What To Do With Myself      223
16     2884                                What Kate Did      231
17     2893                     Whatever the Case May Be      230
18     2992    I Still Haven't Found What I'm Looking for      237
19     3007    I Still Haven't Found What I'm Looking For      238
20     3258              Whatever Gets You Thru the Night      255
21     3475                         What Is It About Men      322

    MediaTypeId  GenreId                                        Composer  \
0             1        1            Steven Tyler, Joe Perry, Desmond Child
1             1        1                         Audioslave/Chris Cornell
2             1        2                                      George Duke
3             1        1                       Jimmy Page/Robert Plant
4             1        2                                      Miles Davis
5             1        1             Mike Bordin, Billy Gould, Mike Patton
6             1        1  Dave Grohl, Taylor Hawkins, Nate Mendel, Chris...
7             1       12          carl sigman/gilbert becaud/pierre leroyer
```

```
8             1       4                                        Green Day
9             1       1                                  Jay Kay/Kay, Jay
10            1       4                                         N. Cester
11            1       4                       C. Cester/C. Muncey/N. Cester
12            1       1                            Jimmy Page, Robert Plant
13            1      14                Allen Story/George Gordy/Robert Gordy
14            1       3                                     Culmer/Exalt
15            1       7                                             None
16            3      19                                             None
17            3      19                                             None
18            1       1       Bono/Clayton, Adam/Mullen Jr., Larry/The Edge
19            1       1                                               U2
20            2       9                                             None
21            2       9  Delroy "Chris" Cooper, Donovan Jackson, Earl C...

    Milliseconds      Bytes  UnitPrice
0         310622   10144730       0.99
1         249391    5988186       0.99
2         274155    9018565       0.99
3         260675    8497116       0.99
4         564009   18360449       0.99
5         158275    5203430       0.99
6         302994    9929799       0.99
7         149995    4913383       0.99
8         252316    8244843       0.99
9         247222    8249453       0.99
10        230974    7517083       0.99
11        247719    8043765       0.99
12        287973    9369385       0.99
13        142027    4631104       0.99
14        189152    6162894       0.99
15        221387    7251478       0.99
16       2610250  484583988       1.99
17       2616410  183867185       1.99
18        353567   11542247       0.99
19        280764    9306737       0.99
20        215084    3499018       0.99
21        209573    3426106       0.99
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
```

```
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Find all tracks with a name containing \"What\" (case-in
sensitive)\n'\n\nThe DataFrame was produced using this query: SELECT * FROM tracks WHERE lower(Name) LIKE
'%what%'\n\nThe following is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes giv
es:\n TrackId           int64\nName             object\nAlbumId           int64\nMediaTypeId       int64\nG
enreId           int64\nComposer         object\nMilliseconds      int64\nBytes            int64\nUnitPric
e       float64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to c
hart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only o
ne value in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanat
ions -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:44:55.790274122Z', 'message': {'role': 'assistant', 'c
ontent': '```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x="TrackId", y
="Name")\n\n# Update layout\nfig.update_layout(\n    title="Tracks with \'What\' in the Name",\n    xaxis_t
itle="Track ID",\n    yaxis_title="Track Name",\n)\n\n# Render the figure\nfig.show()\n```'}, 'done_reaso
n': 'stop', 'done': True, 'total_duration': 27282563735, 'load_duration': 710633, 'prompt_eval_count': 218,
'prompt_eval_duration': 8497699000, 'eval_count': 93, 'eval_duration': 18654027000}
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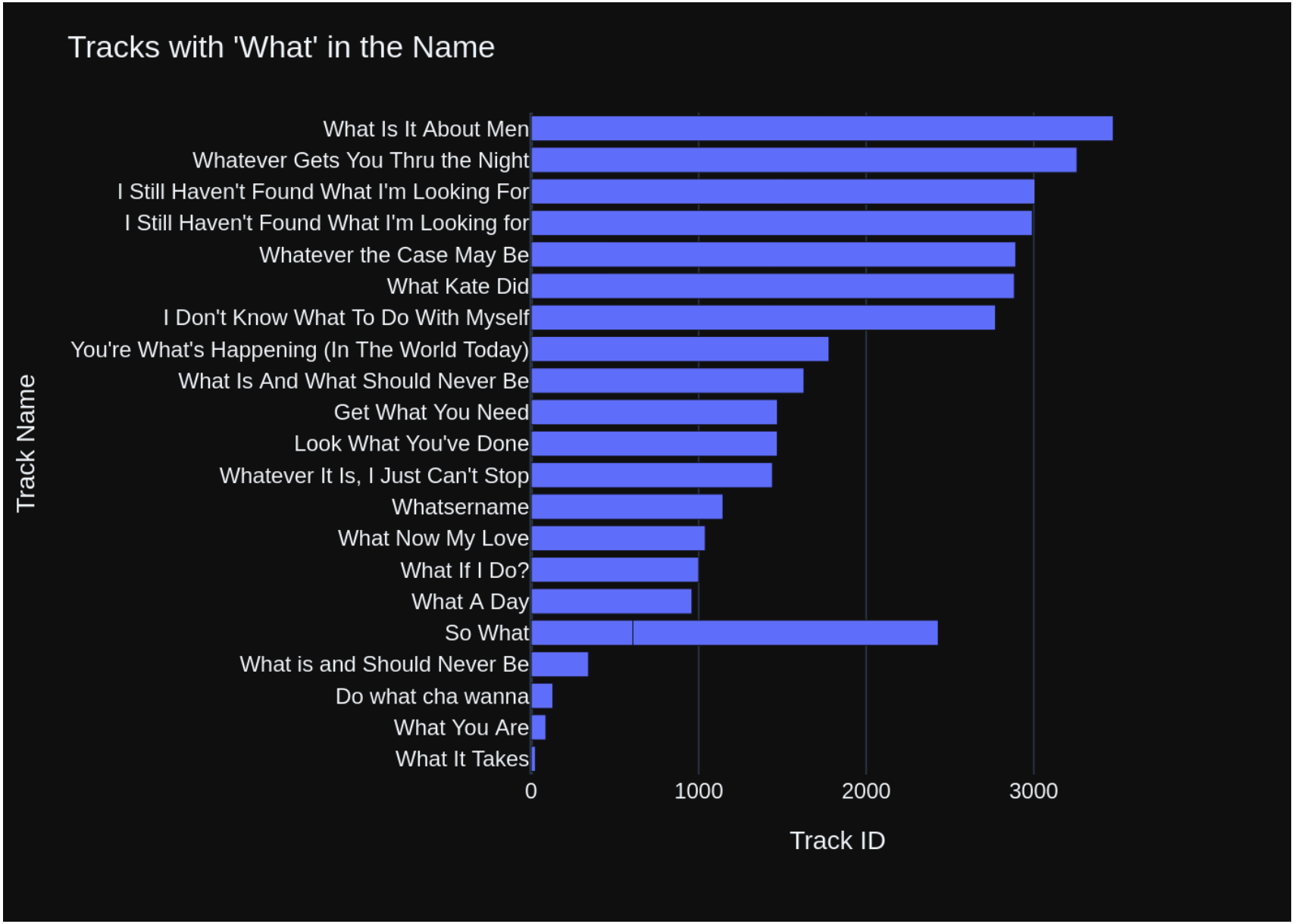
Tracks with 'What' in the Name
What Is It About Men
Whatever Gets You Thru the Night
I Still Haven't Found What I'm Looking For
I Still Haven't Found What I'm Looking for
Whatever the Case May Be
What Kate Did
I Don't Know What To Do With Myself
You're What's Happening (In The World Today)
What Is And What Should Never Be
Get What You Need
Look What You've Done
Whatever It Is, I Just Can't Stop
Whatsername
What Now My Love
What If I Do?
What A Day
So What
What is and Should Never Be
Do what cha wanna
What You Are
What It Takes
Track Name
0
1000
2000
3000
Track ID

Out[24]: ("SELECT * FROM tracks WHERE lower(Name) LIKE '%what%'",

	TrackId	Name	AlbumId	\
0	26	What It Takes	5	
1	88	What You Are	10	
2	130	Do what cha wanna	13	
3	342	What is and Should Never Be	30	
4	607	So What	48	
5	960	What A Day	76	
6	1000	What If I Do?	80	
7	1039	What Now My Love	83	
8	1145	Whatsername	89	
9	1440	Whatever It Is, I Just Can't Stop	116	
10	1469	Look What You've Done	119	
11	1470	Get What You Need	119	
12	1628	What Is And What Should Never Be	133	
13	1778	You're What's Happening (In The World Today)	146	
14	1823	So What	149	
15	2772	I Don't Know What To Do With Myself	223	
16	2884	What Kate Did	231	
17	2893	Whatever the Case May Be	230	
18	2992	I Still Haven't Found What I'm Looking for	237	
19	3007	I Still Haven't Found What I'm Looking For	238	
20	3258	Whatever Gets You Thru the Night	255	
21	3475	What Is It About Men	322	

	MediaTypeId	GenreId	Composer	\
0	1	1	Steven Tyler, Joe Perry, Desmond Child	
1	1	1	Audioslave/Chris Cornell	
2	1	2	George Duke	
3	1	1	Jimmy Page/Robert Plant	
4	1	2	Miles Davis	
5	1	1	Mike Bordin, Billy Gould, Mike Patton	
6	1	1	Dave Grohl, Taylor Hawkins, Nate Mendel, Chris...	
7	1	12	carl sigman/gilbert becaud/pierre leroyer	
8	1	4	Green Day	
9	1	1	Jay Kay/Kay, Jay	
10	1	4	N. Cester	
11	1	4	C. Cester/C. Muncey/N. Cester	
12	1	1	Jimmy Page, Robert Plant	
13	1	14	Allen Story/George Gordy/Robert Gordy	
14	1	3	Culmer/Exalt	
15	1	7	None	

```
16            3       19                                                None
17            3       19                                                None
18            1        1      Bono/Clayton, Adam/Mullen Jr., Larry/The Edge
19            1        1                                                  U2
20            2        9                                                None
21            2        9  Delroy "Chris" Cooper, Donovan Jackson, Earl C...

    Milliseconds      Bytes  UnitPrice
0         310622   10144730       0.99
1         249391    5988186       0.99
2         274155    9018565       0.99
3         260675    8497116       0.99
4         564009   18360449       0.99
5         158275    5203430       0.99
6         302994    9929799       0.99
7         149995    4913383       0.99
8         252316    8244843       0.99
9         247222    8249453       0.99
10        230974    7517083       0.99
11        247719    8043765       0.99
12        287973    9369385       0.99
13        142027    4631104       0.99
14        189152    6162894       0.99
15        221387    7251478       0.99
16       2610250  484583988       1.99
17       2616410  183867185       1.99
18        353567   11542247       0.99
19        280764    9306737       0.99
20        215084    3499018       0.99
21        209573    3426106       0.99  ,
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              'offsetgroup': '',
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              'showlegend': False,
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              'type': 'bar',
              'x': array([  26,   88,  130,  342,  607,  960, 1000, 1039, 1145, 1440, 1469, 1470,
```

```
                            1628, 1778, 1823, 2772, 2884, 2893, 2992, 3007, 3258, 3475]),
                  'xaxis': 'x',
                  'y': array(['What It Takes', 'What You Are', 'Do what cha wanna',
                              'What is and Should Never Be', 'So What', 'What A Day', 'What If I Do?',
                              'What Now My Love', 'Whatsername', "Whatever It Is, I Just Can't Stop",
                              "Look What You've Done", 'Get What You Need',
                              'What Is And What Should Never Be',
                              "You're What's Happening (In The World Today)", 'So What',
                              "I Don't Know What To Do With Myself", 'What Kate Did',
                              'Whatever the Case May Be',
                              "I Still Haven't Found What I'm Looking for",
                              "I Still Haven't Found What I'm Looking For",
                              'Whatever Gets You Thru the Night', 'What Is It About Men'],
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                  'yaxis': 'y'}],
      'layout': {'barmode': 'relative',
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                 'margin': {'t': 60},
                 'template': '...',
                 'title': {'text': "Tracks with 'What' in the Name"},
                 'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Track ID'}},
                 'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Track Name'}}}
     }))
```

In [25]:

```
question = """
    Get the total number of invoices for each customer
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Get the total number of invoices for each customer\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId'}, {'role': 'use

r', 'content': ' \n   Find the total number of invoices per country:\n'}, {'role': 'assistant', 'conten
t': 'SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM "customers" customer\nJOIN "in
voices" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country'}, {'role': 'user', 'conten
t': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.Cus
tomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.Cus
tomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n
Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(I
nvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT
1\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the total number of invoices per
country:\n'}, {'role': 'assistant', 'content': 'SELECT BillingCountry, COUNT(i.InvoiceId) AS TotalInvoices
\nFROM "invoices" i\nGROUP BY BillingCountry'}, {'role': 'user', 'content': ' \n   Find the customer wit
h the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOfInv
oices\nFROM "invoices"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1'}, {'role': 'user', 'cont
ent': ' \n   Get the average invoice total for each customer:\n'}, {'role': 'assistant', 'content': 'SELE
CT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId
= i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC\nLIMIT 10'}, {'role': 'user', 'con
tent': ' \n   Get the average invoice total for each customer:\n'}, {'role': 'assistant', 'content': 'SEL
ECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerI
d = i.CustomerId\nGROUP BY c.CustomerId'}, {'role': 'user', 'content': ' \n   Find the total number of in
voices per country:\n'}, {'role': 'assistant', 'content': 'SELECT i.BillingCountry, COUNT(*) AS TotalInvoic
es\nFROM "invoices" i\nGROUP BY i.BillingCountry'}, {'role': 'user', 'content': ' \n   Get the average in
voice total for each customer:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, AVG(i.Total) AS
AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.Custo
merId\nORDER BY AverageInvoiceTotal DESC'}, {'role': 'user', 'content': ' \n   Get the total number of in
voices for each customer\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   Billin
gAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCou
ntry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInv
oiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER
PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r
\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId)
REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (Tr

ackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Get the total number of invoices for each customer\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM \"customers\" customer\nJOIN \"invoices\" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT BillingCountry, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY BillingCountry"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "cont

ent": "SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM \"invoices\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Get the average invoice total for each customer:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC\nLIMIT 10"}, {"role": "user", "content": " \n   Get the average invoice total for each customer:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT i.BillingCountry, COUNT(*) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY i.BillingCountry"}, {"role": "user", "content": " \n   Get the average invoice total for each customer:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC"}, {"role": "user", "content": " \n   Get the total number of invoices for each customer\n"}]

Add of existing embedding ID: 49e67df3-a604-51f8-ad01-b8f5a2043eac-sql
Insert of existing embedding ID: 49e67df3-a604-51f8-ad01-b8f5a2043eac-sql

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Ollama Response:
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N c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId'}, 'done_reason': 'stop', 'done': True, 'total_duratio
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SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices
FROM "customers" c
JOIN "invoices" i ON c.CustomerId = i.CustomerId
GROUP BY c.CustomerId
SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices
FROM "customers" c
JOIN "invoices" i ON c.CustomerId = i.CustomerId
GROUP BY c.CustomerId
    CustomerId  TotalInvoices
0            1              7
1            2              7
2            3              7
3            4              7
4            5              7
5            6              7
6            7              7
7            8              7
8            9              7
9           10              7
10          11              7
11          12              7
12          13              7
13          14              7
14          15              7
15          16              7
16          17              7
17          18              7
18          19              7
19          20              7
20          21              7
21          22              7
22          23              7
23          24              7
24          25              7
25          26              7
26          27              7
```

```
27          28              7
28          29              7
29          30              7
30          31              7
31          32              7
32          33              7
33          34              7
34          35              7
35          36              7
36          37              7
37          38              7
38          39              7
39          40              7
40          41              7
41          42              7
42          43              7
43          44              7
44          45              7
45          46              7
46          47              7
47          48              7
48          49              7
49          50              7
50          51              7
51          52              7
52          53              7
53          54              7
54          55              7
55          56              7
56          57              7
57          58              7
58          59              6
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Get the total number of invoices for each customer\n'\n
\nThe DataFrame was produced using this query: SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFR
OM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\n\nThe follow
ing is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n CustomerId
```

int64\nTotalInvoices   int64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the code."}]
Ollama Response:
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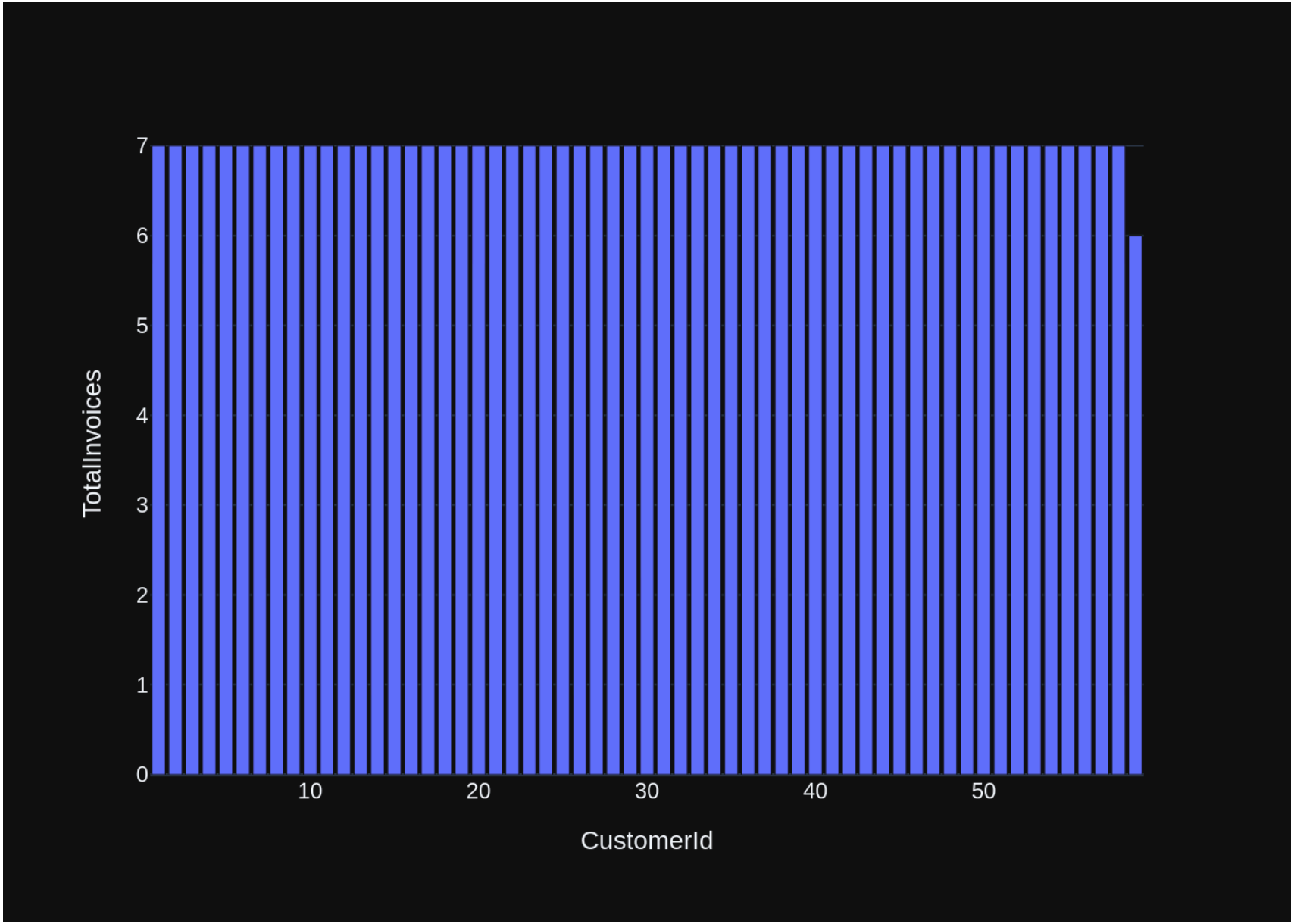
7
6
5
4
3
2
1
0
TotalInvoices
10
20
30
40
50
CustomerId

Out[25]: ('SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.Cus
tomerId = i.CustomerId\nGROUP BY c.CustomerId',

	CustomerId	TotalInvoices
0	1	7
1	2	7
2	3	7
3	4	7
4	5	7
5	6	7
6	7	7
7	8	7
8	9	7
9	10	7
10	11	7
11	12	7
12	13	7
13	14	7
14	15	7
15	16	7
16	17	7
17	18	7
18	19	7
19	20	7
20	21	7
21	22	7
22	23	7
23	24	7
24	25	7
25	26	7
26	27	7
27	28	7
28	29	7
29	30	7
30	31	7
31	32	7
32	33	7
33	34	7
34	35	7
35	36	7
36	37	7
37	38	7
38	39	7

```
39          40              7
40          41              7
41          42              7
42          43              7
43          44              7
44          45              7
45          46              7
46          47              7
47          48              7
48          49              7
49          50              7
50          51              7
51          52              7
52          53              7
53          54              7
54          55              7
55          56              7
56          57              7
57          58              7
58          59              6,
Figure({
    'data': [{'alignmentgroup': 'True',
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                          19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36,
                          37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54,
                          55, 56, 57, 58, 59]),
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              'y': array([7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 7,
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                          7, 7, 7, 7, 7, 7, 7, 7, 7, 7, 6]),
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    'layout': {'barmode': 'relative',
               'legend': {'tracegroupgap': 0},
```

```
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                    'template': '...',
                    'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'CustomerId'}},
                    'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'TotalInvoices'}}}
 }))
```

In [26]:

```
question = """
    Find the total number of invoices per country:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the total number of invoices per countr

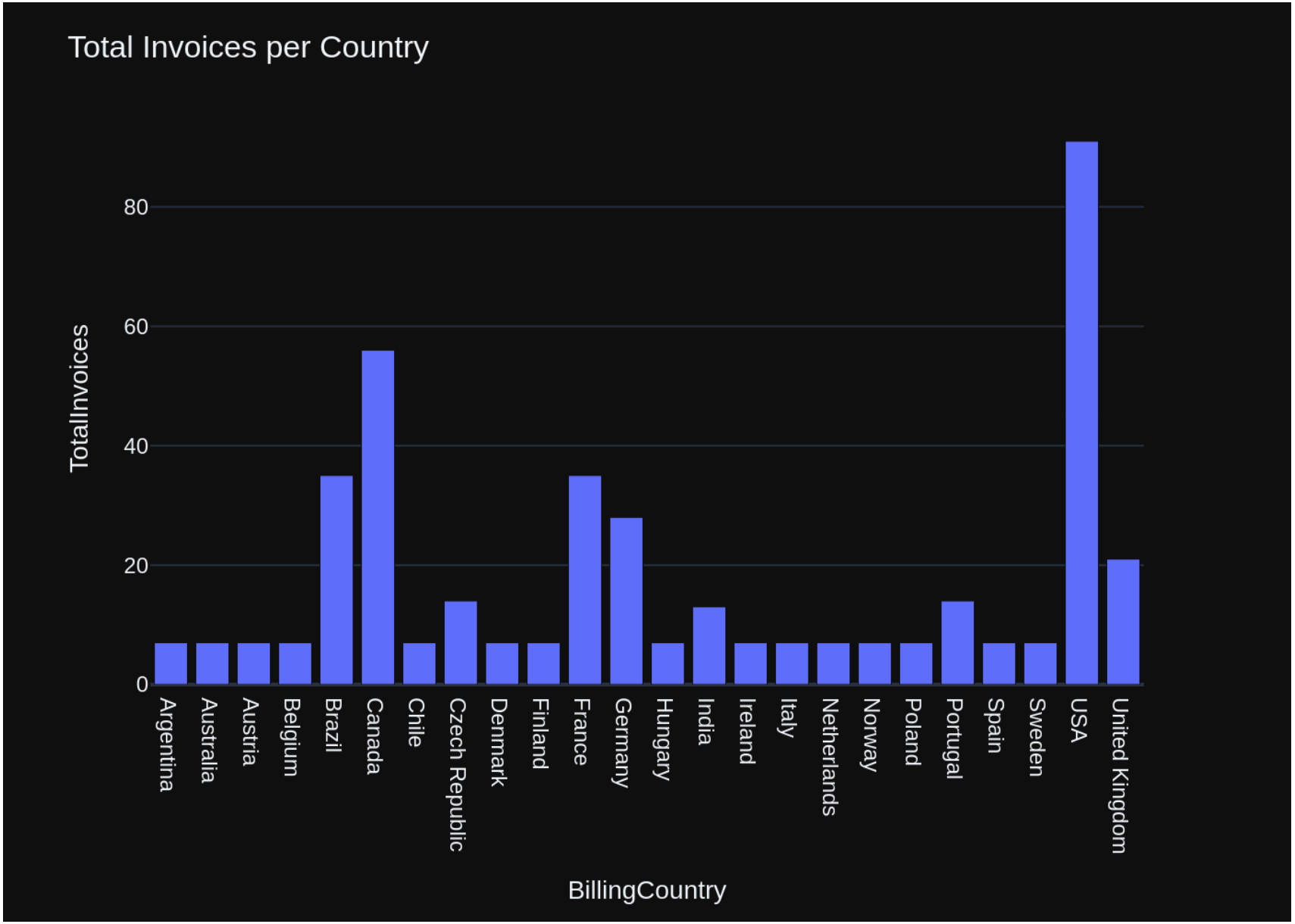
y:\n'}, {'role': 'assistant', 'content': 'SELECT BillingCountry, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "invoices" i\nGROUP BY BillingCountry'}, {'role': 'user', 'content': ' \n   Find the total number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT i.BillingCountry, COUNT(*) AS TotalInvoices\nFROM "invoices" i\nGROUP BY i.BillingCountry'}, {'role': 'user', 'content': ' \n   Find the total number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM "customers" customer\nJOIN "invoices" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country'}, {'role': 'user', 'content': ' \n   Get the total number of invoices for each customer\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId'}, {'role': 'user', 'content': ' \n   Find all invoices since 2010 and the total amount invoiced:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate > \'2010-01-01\'\nGROUP BY i.InvoiceId'}, {'role': 'user', 'content': ' \n   Find all invoices since 2010 and the total amount invoiced:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceDate, SUM(i.Total) AS TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate >= \'2010-01-01\'\nGROUP BY i.InvoiceDate'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------'}, {'role': 'user', 'content': ' \n   List all invoices with a total exceeding $10:\n'}, {'role': 'assistant', 'content': 'SELECT *\nFROM "invoices" \nWHERE (Total > 10)\nGROUP BY InvoiceId'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find all invoices since 2010 and the total amount invoiced:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceId, SUM(i.Total) AS InvoiceAmount\nFROM "invoices" i\nWHERE strftime(\'%Y\', i.InvoiceDate) >= \'2010\'\nGROUP BY i.InvoiceId\nORDER BY InvoiceAmount DESC'}, {'role': 'user', 'content': ' \n   Find the total number of invoices per country:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (Tra

ckId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoi
ces\" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE INDE
X IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeI
d INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVAR
CHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n
HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n
Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r
\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON D
ELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMA
RY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT N
ULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARC
HAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax
NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (Support
RepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE
TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160)
NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistI
d) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTE
GER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n
MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds I
NTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (Album
Id) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (Ge
nreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY
(MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)
\n\nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\n\n===Additional Context \n\nIn the S
QLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, pl
ease generate a valid SQL query without any explanations for the question. \n2. If the provided context is
almost sufficient but requires knowledge of a specific string in a particular column, please generate an in
termediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying i
ntermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n
4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please r
epeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Find the total
number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT BillingCountry, COUNT(i.Invoi
ceId) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY BillingCountry"}, {"role": "user", "content": " \n
Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT i.BillingCount
ry, COUNT(*) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY i.BillingCountry"}, {"role": "user", "conten
t": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT C
ustomer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM \"customers\" customer\nJOIN \"invoices\" i
nvoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country"}, {"role": "user", "content": " \n
Get the total number of invoices for each customer\n"}, {"role": "assistant", "content": "SELECT c.Customer
Id, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.Cust
omerId\nGROUP BY c.CustomerId"}, {"role": "user", "content": " \n   Find all invoices since 2010 and the
total amount invoiced:\n"}, {"role": "assistant", "content": "SELECT i.InvoiceId, SUM(i.Total) AS TotalAmou

nt\nFROM \"invoices\" i\nWHERE i.InvoiceDate > '2010-01-01'\nGROUP BY i.InvoiceId"}, {"role": "user", "cont
ent": " \n   Find all invoices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "cont
ent": "SELECT i.InvoiceDate, SUM(i.Total) AS TotalAmount\nFROM \"invoices\" i\nWHERE i.InvoiceDate >= '2010
-01-01'\nGROUP BY i.InvoiceDate"}, {"role": "user", "content": " \n   Find the customer with the most in
voices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFR
OM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"},
{"role": "user", "content": " \n   List all invoices with a total exceeding $10:\n"}, {"role": "assistan
t", "content": "SELECT *\nFROM \"invoices\" \nWHERE (Total > 10)\nGROUP BY InvoiceId"}, {"role": "user", "c
ontent": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT
c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerI
d = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "conten
t": " \n   Find all invoices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "conten
t": "SELECT i.InvoiceId, SUM(i.Total) AS InvoiceAmount\nFROM \"invoices\" i\nWHERE strftime('%Y', i.Invoice
Date) >= '2010'\nGROUP BY i.InvoiceId\nORDER BY InvoiceAmount DESC"}, {"role": "user", "content": " \n
Find the total number of invoices per country:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:47:58.789365595Z', 'message': {'role': 'assistant', 'c
ontent': 'SELECT BillingCountry, COUNT(InvoiceId) AS TotalInvoices\nFROM Invoices\nGROUP BY BillingCountr
y'}, 'done_reason': 'stop', 'done': True, 'total_duration': 81588051375, 'load_duration': 761760, 'prompt_e
val_count': 1841, 'prompt_eval_duration': 76227879000, 'eval_count': 23, 'eval_duration': 4650469000}
```
SELECT BillingCountry, COUNT(InvoiceId) AS TotalInvoices
FROM Invoices
GROUP BY BillingCountry
```
```
SELECT BillingCountry, COUNT(InvoiceId) AS TotalInvoices
FROM Invoices
GROUP BY BillingCountry
```

	BillingCountry	TotalInvoices
0	Argentina	7
1	Australia	7
2	Austria	7
3	Belgium	7
4	Brazil	35
5	Canada	56
6	Chile	7
7	Czech Republic	14
8	Denmark	7
9	Finland	7
10	France	35
11	Germany	28
12	Hungary	7
13	India	13
14	Ireland	7

```
15           Italy             7
16     Netherlands             7
17          Norway             7
18          Poland             7
19        Portugal            14
20           Spain             7
21          Sweden             7
22             USA            91
23  United Kingdom            21
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Find the total number of invoices per country:\n'\n\nThe
DataFrame was produced using this query: SELECT BillingCountry, COUNT(InvoiceId) AS TotalInvoices\nFROM Inv
oices\nGROUP BY BillingCountry\n\nThe following is information about the resulting pandas DataFrame 'df':
\nRunning df.dtypes gives:\n BillingCountry    object\nTotalInvoices      int64\ndtype: object"}, {"role":
"user", "content": "Can you generate the Python plotly code to chart the results of the dataframe? Assume t
he data is in a pandas dataframe called 'df'. If there is only one value in the dataframe, use an Indicato
r. Respond with only Python code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:48:21.564785636Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x='BillingCountr
y', y='TotalInvoices')\n\n# Add title to the chart\nfig.update_layout(title='Total Invoices per Country')\n
\n# Show the chart\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 22749722772,
'load_duration': 682980, 'prompt_eval_count': 175, 'prompt_eval_duration': 7253147000, 'eval_count': 74, 'e
val_duration': 15365016000}
```


Total Invoices per Country
TotalInvoices
0
20
40
60
80
Argentina
Australia
Austria
Belgium
Brazil
Canada
Chile
Czech Republic
Denmark
Finland
France
Germany
Hungary
India
Ireland
Italy
Netherlands
Norway
Poland
Portugal
Spain
Sweden
USA
United Kingdom
BillingCountry

Out[26]: ('SELECT BillingCountry, COUNT(InvoiceId) AS TotalInvoices\nFROM Invoices\nGROUP BY BillingCountry',

	BillingCountry	TotalInvoices
0	Argentina	7
1	Australia	7
2	Austria	7
3	Belgium	7
4	Brazil	35
5	Canada	56
6	Chile	7
7	Czech Republic	14
8	Denmark	7
9	Finland	7
10	France	35
11	Germany	28
12	Hungary	7
13	India	13
14	Ireland	7
15	Italy	7
16	Netherlands	7
17	Norway	7
18	Poland	7
19	Portugal	14
20	Spain	7
21	Sweden	7
22	USA	91
23	United Kingdom	21,

```
Figure({
    'data': [{'alignmentgroup': 'True',
              'hovertemplate': 'BillingCountry=%{x}<br>TotalInvoices=%{y}<extra></extra>',
              'legendgroup': '',
              'marker': {'color': '#636efa', 'pattern': {'shape': ''}},
              'name': '',
              'offsetgroup': '',
              'orientation': 'v',
              'showlegend': False,
              'textposition': 'auto',
              'type': 'bar',
              'x': array(['Argentina', 'Australia', 'Austria', 'Belgium', 'Brazil', 'Canada',
                          'Chile', 'Czech Republic', 'Denmark', 'Finland', 'France', 'Germany',
                          'Hungary', 'India', 'Ireland', 'Italy', 'Netherlands', 'Norway',
                          'Poland', 'Portugal', 'Spain', 'Sweden', 'USA', 'United Kingdom'],
                         dtype=object),
```

```
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                'y': array([ 7,  7,  7,  7, 35, 56,  7, 14,  7,  7, 35, 28,  7, 13,  7,  7,  7,  7,
                             7, 14,  7,  7, 91, 21]),
                'yaxis': 'y'}],
     'layout': {'barmode': 'relative',
                'legend': {'tracegroupgap': 0},
                'margin': {'t': 60},
                'template': '...',
                'title': {'text': 'Total Invoices per Country'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'BillingCountry'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'TotalInvoices'}}}
 }))
```

In [27]:
```
question = """
    List all invoices with a total exceeding $10:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   List all invoices with a total exceeding $10:\n'}, {'role': 'assistant', 'content': 'SELECT * \nFROM "invoices" \nWHERE Total > 10.00'}, {'role': 'user', 'content': ' \n   List all invoices with a total exceeding $10:\n'}, {'role': 'assistant', 'content': 'SELECT *

```
FROM "invoices" WHERE Total > 10'}, {'role': 'user', 'content': '  \n    List all invoices with a total exc
eeding $10:\n'}, {'role': 'assistant', 'content': 'SELECT *\nFROM "invoices" \nWHERE (Total > 10)\nGROUP BY
InvoiceId'}, {'role': 'user', 'content': '  \n    Find all invoices since 2010 and the total amount invoice
d:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM "invoices"
i\nWHERE i.InvoiceDate > \'2010-01-01\'\nGROUP BY i.InvoiceId'}, {'role': 'user', 'content': '  \n    Find
all invoices since 2010 and the total amount invoiced:\n'}, {'role': 'assistant', 'content': 'SELECT i.Invo
iceDate, SUM(i.Total) AS TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate >= \'2010-01-01\'\nGROUP BY i.
InvoiceDate'}, {'role': 'user', 'content': '  \n    Find all invoices since 2010 and the total amount invoi
ced:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceId, SUM(i.Total) AS InvoiceAmount\nFROM "invoic
es" i\nWHERE strftime(\'%Y\', i.InvoiceDate) >= \'2010\'\nGROUP BY i.InvoiceId\nORDER BY InvoiceAmount DES
C'}, {'role': 'user', 'content': '  \n     Find the top 5 customers who spent the most money overall, \n
\n     Hint: order total can be found on invoices table, calculation using invoice_items detail table is un
necessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "cu
stomers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DE
SC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': '  \n     Find the top 5 customers wh
o spent the most money overall, \n     \n     Hint: order total can be found on invoices table, calculation
using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerI
d, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP
BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'content': '  \n     Find the top 5
customers who spent the most money overall, \n     \n     Hint: order total can be found on invoices table,
calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT
c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.Cust
omerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'content': '  \n
Hint: album quantity is found in invoice_items, \n    \n    Find the top 5 customers who bought the most al
bums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, C
OUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\n
GROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'c
ontent': '  \n    List all invoices with a total exceeding $10:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoice_items\"\r\n(\r\n    InvoiceLineId INTEGER PRIMARY K
EY AUTOINCREMENT NOT NULL,\r\n    InvoiceId INTEGER  NOT NULL,\r\n    TrackId INTEGER  NOT NULL,\r\n    Uni
tPrice NUMERIC(10,2)  NOT NULL,\r\n    Quantity INTEGER  NOT NULL,\r\n    FOREIGN KEY (InvoiceId) REFERENCE
S \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (TrackId) RE
FERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_Invo
iceLineInvoiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE TABLE \"invoices\"\r\n(\r\n    InvoiceId INTEGE
R PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    CustomerId INTEGER  NOT NULL,\r\n    InvoiceDate DATETIME  NOT
```

NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(4
0),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2)
NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE IN
DEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEG
ER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n
MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds I
NTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (Album
Id) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (Ge
nreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY
(MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)
\n\nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\nCREATE TABLE \"customers\"\r\n(\r\n
CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   Last
Name NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR
(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone
NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r
\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDAT
E NO ACTION\r\n)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT
NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHA
R(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCH
AR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode
NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN
KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)
\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\n\n===Additional Context \n\nIn
the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficien
t, please generate a valid SQL query without any explanations for the question. \n2. If the provided contex
t is almost sufficient but requires knowledge of a specific string in a particular column, please generate
an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment say
ing intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generate
d. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, ple
ase repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   List all i
nvoices with a total exceeding $10:\n"}, {"role": "assistant", "content": "SELECT * \nFROM \"invoices\" \nW
HERE Total > 10.00"}, {"role": "user", "content": " \n   List all invoices with a total exceeding $1
0:\n"}, {"role": "assistant", "content": "SELECT * FROM \"invoices\" WHERE Total > 10"}, {"role": "user",
"content": " \n   List all invoices with a total exceeding $10:\n"}, {"role": "assistant", "content": "SE
LECT *\nFROM \"invoices\" \nWHERE (Total > 10)\nGROUP BY InvoiceId"}, {"role": "user", "content": " \n
Find all invoices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "content": "SELECT
i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM \"invoices\" i\nWHERE i.InvoiceDate > '2010-01-01'\nGROUP BY
i.InvoiceId"}, {"role": "user", "content": " \n   Find all invoices since 2010 and the total amount invoi
ced:\n"}, {"role": "assistant", "content": "SELECT i.InvoiceDate, SUM(i.Total) AS TotalAmount\nFROM \"invoi
ces\" i\nWHERE i.InvoiceDate >= '2010-01-01'\nGROUP BY i.InvoiceDate"}, {"role": "user", "content": " \n
Find all invoices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "content": "SELECT

i.InvoiceId, SUM(i.Total) AS InvoiceAmount\nFROM \"invoices\" i\nWHERE strftime('%Y', i.InvoiceDate) >= '20
10'\nGROUP BY i.InvoiceId\nORDER BY InvoiceAmount DESC"}, {"role": "user", "content": " \n   Find the to
p 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices ta
ble, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SE
LECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId =
i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"rol
e": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   H
int: order total can be found on invoices table, calculation using invoice_items detail table is unnecessar
y \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers
\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\n
LIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall,
\n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail tabl
e is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending
\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY
TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoic
e_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invo
ices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM
\"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY To
talAlbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   List all invoice
s with a total exceeding $10:\n"}]

Add of existing embedding ID: 6f4242b8-c8d7-5d80-877e-00b6407ae9ad-sql
Insert of existing embedding ID: 6f4242b8-c8d7-5d80-877e-00b6407ae9ad-sql

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Ollama Response:
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ontent': 'SELECT * FROM "invoices" WHERE Total > 10'}, 'done_reason': 'stop', 'done': True, 'total_duratio
n': 84240199001, 'load_duration': 748869, 'prompt_eval_count': 1933, 'prompt_eval_duration': 80805917000,
'eval_count': 14, 'eval_duration': 2736744000}
SELECT * FROM "invoices" WHERE Total > 10
SELECT * FROM "invoices" WHERE Total > 10
    InvoiceId  CustomerId          InvoiceDate             BillingAddress  \
0           5          23  2009-01-11 00:00:00            69 Salem Street
1          12           2  2009-02-11 00:00:00    Theodor-Heuss-Straße 34
2          19          40  2009-03-14 00:00:00             8, Rue Hanovre
3          26          19  2009-04-14 00:00:00            1 Infinite Loop
4          33          57  2009-05-15 00:00:00            Calle Lira, 198
..        ...         ...                  ...                        ...
59        383          10  2013-08-12 00:00:00  Rua Dr. Falcão Filho, 155
60        390          48  2013-09-12 00:00:00      Lijnbaansgracht 120bg
61        397          27  2013-10-13 00:00:00             1033 N Park Ave
62        404           6  2013-11-13 00:00:00               Rilská 3174/6
63        411          44  2013-12-14 00:00:00            Porthaninkatu 9

   BillingCity BillingState  BillingCountry BillingPostalCode  Total
0       Boston           MA             USA              2113  13.86
1    Stuttgart         None         Germany             70174  13.86
2        Paris         None          France             75002  13.86
3    Cupertino           CA             USA             95014  13.86
4     Santiago         None           Chile              None  13.86
..         ...          ...             ...               ...    ...
59   São Paulo           SP          Brazil         01007-010  13.86
60   Amsterdam           VV     Netherlands              1016  13.86
61      Tucson           AZ             USA             85719  13.86
62      Prague         None  Czech Republic             14300  25.86
63    Helsinki         None         Finland             00530  13.86

[64 rows x 9 columns]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    List all invoices with a total exceeding $10:\n'\n\nThe
DataFrame was produced using this query: SELECT * FROM \"invoices\" WHERE Total > 10\n\nThe following is in
```

formation about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n InvoiceId   in
t64\nCustomerId   int64\nInvoiceDate   object\nBillingAddress   object\nBillingCity
object\nBillingState   object\nBillingCountry   object\nBillingPostalCode   object\nTotal
float64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the
results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value
in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- j
ust the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:50:09.976149558Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport pandas as pd\nimport plotly.express as px\n\n# Assuming your DataFrame is named
'df' and you want to plot the 'Total' column\nfig = px.bar(df, x='InvoiceId', y='Total')\nfig.update_layout
(title='Total Invoice Values')\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 2
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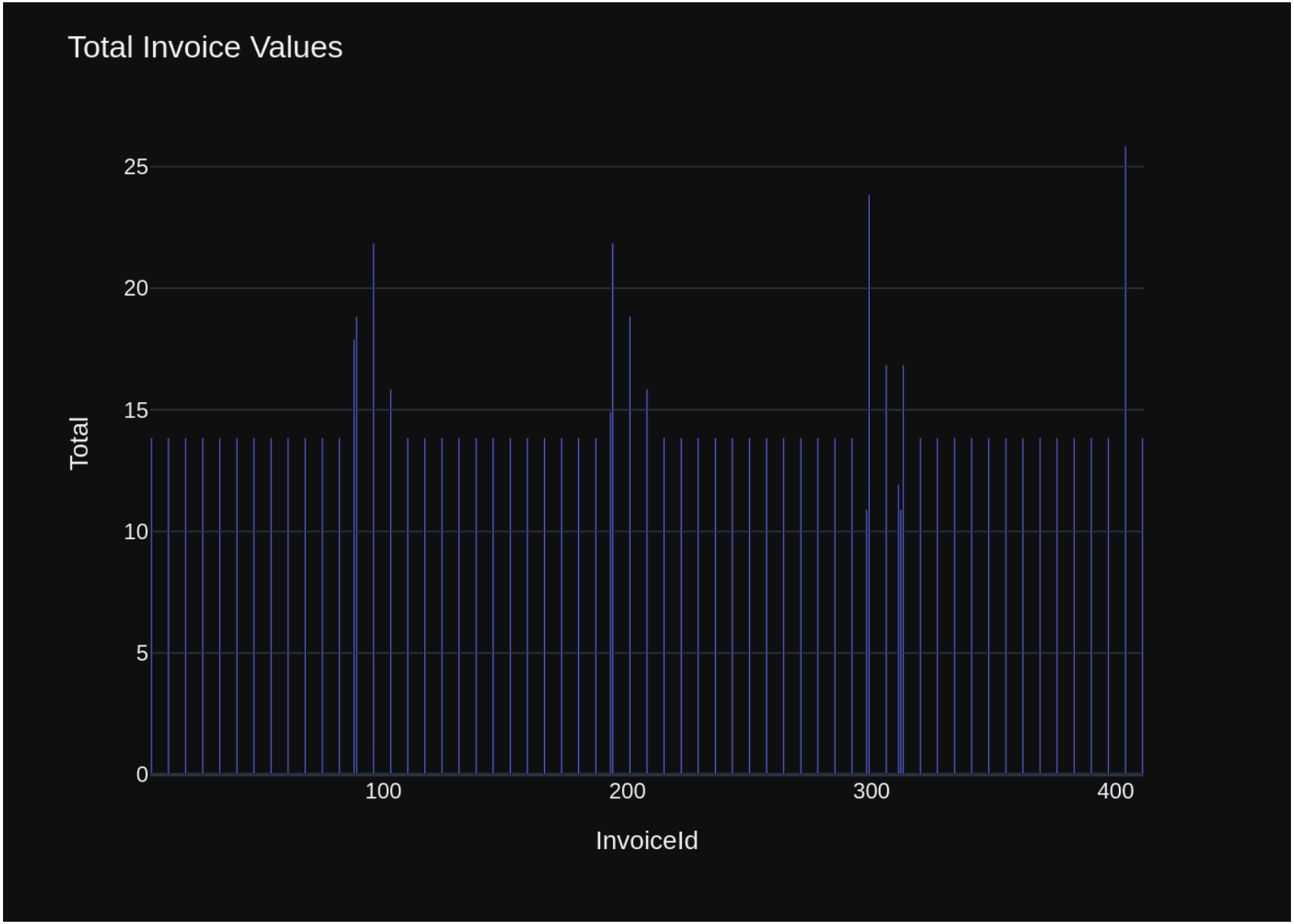
unt': 75, 'eval_duration': 15352376000}


Total Invoice Values
25
20
15
10
5
0
Total
100
200
300
400
InvoiceId

Out[27]:
```
('SELECT * FROM "invoices" WHERE Total > 10',
    InvoiceId  CustomerId          InvoiceDate             BillingAddress  \
0           5          23  2009-01-11 00:00:00            69 Salem Street
1          12           2  2009-02-11 00:00:00    Theodor-Heuss-Straße 34
2          19          40  2009-03-14 00:00:00             8, Rue Hanovre
3          26          19  2009-04-14 00:00:00            1 Infinite Loop
4          33          57  2009-05-15 00:00:00            Calle Lira, 198
..        ...         ...                  ...                        ...
59        383          10  2013-08-12 00:00:00  Rua Dr. Falcão Filho, 155
60        390          48  2013-09-12 00:00:00      Lijnbaansgracht 120bg
61        397          27  2013-10-13 00:00:00            1033 N Park Ave
62        404           6  2013-11-13 00:00:00              Rilská 3174/6
63        411          44  2013-12-14 00:00:00            Porthaninkatu 9

   BillingCity BillingState  BillingCountry BillingPostalCode  Total
0       Boston           MA             USA              2113  13.86
1    Stuttgart         None         Germany             70174  13.86
2        Paris         None          France             75002  13.86
3    Cupertino           CA             USA             95014  13.86
4     Santiago         None           Chile              None  13.86
..         ...          ...             ...               ...    ...
59   São Paulo           SP          Brazil         01007-010  13.86
60   Amsterdam           VV     Netherlands              1016  13.86
61      Tucson           AZ             USA             85719  13.86
62      Prague         None  Czech Republic             14300  25.86
63    Helsinki         None         Finland             00530  13.86

[64 rows x 9 columns],
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              'legendgroup': '',
              'marker': {'color': '#636efa', 'pattern': {'shape': ''}},
              'name': '',
              'offsetgroup': '',
              'orientation': 'v',
              'showlegend': False,
              'textposition': 'auto',
              'type': 'bar',
              'x': array([  5,  12,  19,  26,  33,  40,  47,  54,  61,  68,  75,  82,  88,  89,
                           96, 103, 110, 117, 124, 131, 138, 145, 152, 159, 166, 173, 180, 187,
                          193, 194, 201, 208, 215, 222, 229, 236, 243, 250, 257, 264, 271, 278,
```

```
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                           362, 369, 376, 383, 390, 397, 404, 411]),
                'xaxis': 'x',
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                           13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 14.91, 21.86,
                           18.86, 15.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86,
                           13.86, 13.86, 13.86, 13.86, 10.91, 23.86, 16.86, 11.94, 10.91, 16.86,
                           13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86, 13.86,
                           13.86, 13.86, 25.86, 13.86]),
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                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'InvoiceId'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Total'}}}
 }))
```

In [28]:

```
question = """
    Find all invoices since 2010 and the total amount invoiced:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate

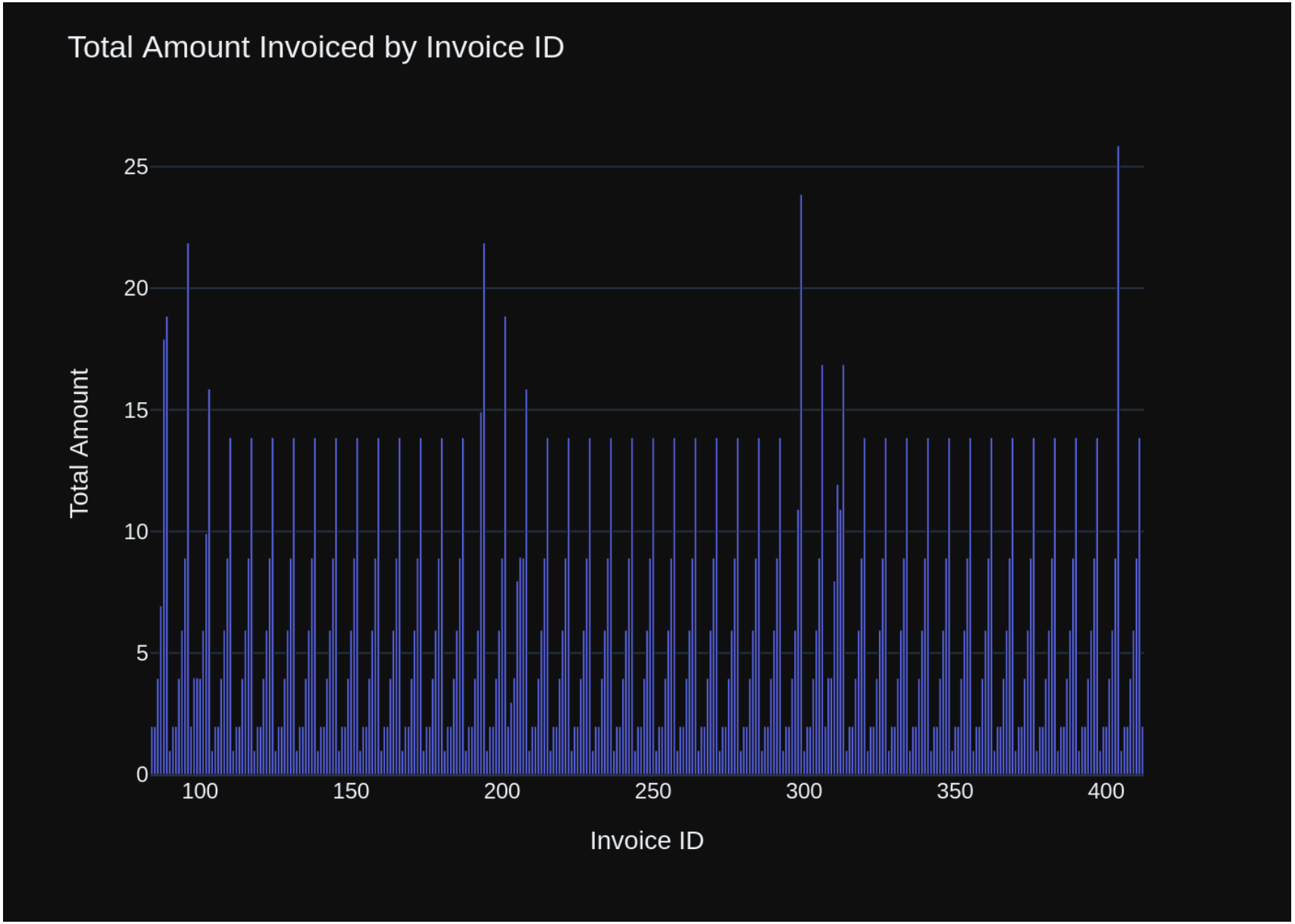
_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please u
se the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the a
nswer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find all invoices since 20
10 and the total amount invoiced:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceId, SUM(i.Total) A
S TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate > \'2010-01-01\'\nGROUP BY i.InvoiceId'}, {'role': 'u
ser', 'content': ' \n   Find all invoices since 2010 and the total amount invoiced:\n'}, {'role': 'assist
ant', 'content': 'SELECT i.InvoiceDate, SUM(i.Total) AS TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate
>= \'2010-01-01\'\nGROUP BY i.InvoiceDate'}, {'role': 'user', 'content': ' \n   Find all invoices since 2
010 and the total amount invoiced:\n'}, {'role': 'assistant', 'content': 'SELECT i.InvoiceId, SUM(i.Total)
AS InvoiceAmount\nFROM "invoices" i\nWHERE strftime(\'%Y\', i.InvoiceDate) >= \'2010\'\nGROUP BY i.InvoiceI
d\nORDER BY InvoiceAmount DESC'}, {'role': 'user', 'content': ' \n   List all invoices with a total excee
ding $10:\n'}, {'role': 'assistant', 'content': 'SELECT *\nFROM "invoices" \nWHERE (Total > 10)\nGROUP BY I
nvoiceId'}, {'role': 'user', 'content': ' \n   List all invoices with a total exceeding $10:\n'}, {'rol
e': 'assistant', 'content': 'SELECT * FROM "invoices" WHERE Total > 10'}, {'role': 'user', 'content': ' \n
Find the total number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT BillingCountr
y, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "invoices" i\nGROUP BY BillingCountry'}, {'role': 'user', 'con
tent': ' \n   List all invoices with a total exceeding $10:\n'}, {'role': 'assistant', 'content': 'SELECT
* \nFROM "invoices" \nWHERE Total > 10.00'}, {'role': 'user', 'content': ' \n   Find the total number of
invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT BillingCountry, COUNT(InvoiceId) AS Tot
alInvoices\nFROM Invoices\nGROUP BY BillingCountry'}, {'role': 'user', 'content': ' \n   Find the total n
umber of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT i.BillingCountry, COUNT(*) AS
TotalInvoices\nFROM "invoices" i\nGROUP BY i.BillingCountry'}, {'role': 'user', 'content': ' \n   Find th
e total number of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT Customer.Country, COU
NT(invoice.InvoiceId) AS InvoiceCount\nFROM "customers" customer\nJOIN "invoices" invoice ON customer.Custo
merId = invoice.CustomerId\nGROUP BY Country'}, {'role': 'user', 'content': ' \n   Find all invoices sinc
e 2010 and the total amount invoiced:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   Billin
gAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCou
ntry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NO
T NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceI
d) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (Tra

ckId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON \"in
voice_items\" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE INDE
X IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeI
d INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVAR
CHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n
HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n
Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r
\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON D
ELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMA
RY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT N
ULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARC
HAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax
NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (Support
RepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE
TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200)
NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Comp
oser NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(1
0,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON
UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON D
ELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY
AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOR
EIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)
\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT N
ULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId)
REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY
(TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Addi
tional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provide
d context is sufficient, please generate a valid SQL query without any explanations for the question. \n2.
If the provided context is almost sufficient but requires knowledge of a specific string in a particular co
lumn, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the qu
ery with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why
it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and
answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content":
" \n   Find all invoices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "content":
"SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM \"invoices\" i\nWHERE i.InvoiceDate > '2010-01-01'\n
GROUP BY i.InvoiceId"}, {"role": "user", "content": " \n   Find all invoices since 2010 and the total amo
unt invoiced:\n"}, {"role": "assistant", "content": "SELECT i.InvoiceDate, SUM(i.Total) AS TotalAmount\nFRO
M \"invoices\" i\nWHERE i.InvoiceDate >= '2010-01-01'\nGROUP BY i.InvoiceDate"}, {"role": "user", "conten
t": " \n   Find all invoices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "conten
t": "SELECT i.InvoiceId, SUM(i.Total) AS InvoiceAmount\nFROM \"invoices\" i\nWHERE strftime('%Y', i.Invoice
Date) >= '2010'\nGROUP BY i.InvoiceId\nORDER BY InvoiceAmount DESC"}, {"role": "user", "content": " \n

List all invoices with a total exceeding $10:\n"}, {"role": "assistant", "content": "SELECT *\nFROM \"invoi
ces\" \nWHERE (Total > 10)\nGROUP BY InvoiceId"}, {"role": "user", "content": " \n   List all invoices wi
th a total exceeding $10:\n"}, {"role": "assistant", "content": "SELECT * FROM \"invoices\" WHERE Total > 1
0"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "ass
istant", "content": "SELECT BillingCountry, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"invoices\" i\nGROUP
BY BillingCountry"}, {"role": "user", "content": " \n   List all invoices with a total exceeding $1
0:\n"}, {"role": "assistant", "content": "SELECT * \nFROM \"invoices\" \nWHERE Total > 10.00"}, {"role": "u
ser", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistant", "conten
t": "SELECT BillingCountry, COUNT(InvoiceId) AS TotalInvoices\nFROM Invoices\nGROUP BY BillingCountry"},
{"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"role": "assistan
t", "content": "SELECT i.BillingCountry, COUNT(*) AS TotalInvoices\nFROM \"invoices\" i\nGROUP BY i.Billing
Country"}, {"role": "user", "content": " \n   Find the total number of invoices per country:\n"}, {"rol
e": "assistant", "content": "SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM \"cust
omers\" customer\nJOIN \"invoices\" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Countr
y"}, {"role": "user", "content": " \n   Find all invoices since 2010 and the total amount invoiced:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:51:37.5025166Z', 'message': {'role': 'assistant', 'con
tent': 'SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate >= \'2010-
01-01\'\nGROUP BY i.InvoiceId'}, 'done_reason': 'stop', 'done': True, 'total_duration': 87431054480, 'load_
duration': 831166, 'prompt_eval_count': 1862, 'prompt_eval_duration': 76397222000, 'eval_count': 50, 'eval_
duration': 10350319000}
```
SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount
FROM  "invoices" i
WHERE i.InvoiceDate >= '2010-01-01'
GROUP BY i.InvoiceId
```
```
SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount
FROM  "invoices" i
WHERE i.InvoiceDate >= '2010-01-01'
GROUP BY i.InvoiceId
```

	InvoiceId	TotalAmount
0	84	1.98
1	85	1.98
2	86	3.96
3	87	6.94
4	88	17.91
..	...	...
324	408	3.96
325	409	5.94
326	410	8.91
327	411	13.86
328	412	1.99

```
[329 rows x 2 columns]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Find all invoices since 2010 and the total amount invoic
ed:\n'\n\nThe DataFrame was produced using this query: SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFRO
M  \"invoices\" i\nWHERE i.InvoiceDate >= '2010-01-01'\nGROUP BY i.InvoiceId\n\nThe following is informatio
n about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n InvoiceId        int64\nTotalAmou
nt    float64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to cha
rt the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one
value in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanation
s -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:52:05.65230383Z', 'message': {'role': 'assistant', 'co
ntent': "```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x='InvoiceId', y
='TotalAmount')\n\n# Update layout\nfig.update_layout(\n    title='Total Amount Invoiced by Invoice ID',\n
xaxis_title='Invoice ID',\n    yaxis_title='Total Amount'\n)\n\n# Show the plot\nfig.show()\n```"}, 'done_r
eason': 'stop', 'done': True, 'total_duration': 28122681637, 'load_duration': 747459, 'prompt_eval_count':
212, 'prompt_eval_duration': 8750979000, 'eval_count': 93, 'eval_duration': 19238768000}
```


Total Amount Invoiced by Invoice ID
Total Amount
0
5
10
15
20
25
100
150
200
250
300
350
400
Invoice ID

Out[28]:
```
('SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM  "invoices" i\nWHERE i.InvoiceDate >= \'2010-01-01
\'\nGROUP BY i.InvoiceId',
      InvoiceId  TotalAmount
 0           84         1.98
 1           85         1.98
 2           86         3.96
 3           87         6.94
 4           88        17.91
 ..         ...          ...
 324        408         3.96
 325        409         5.94
 326        410         8.91
 327        411        13.86
 328        412         1.99

 [329 rows x 2 columns],
 Figure({
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               'marker': {'color': '#636efa', 'pattern': {'shape': ''}},
               'name': '',
               'offsetgroup': '',
               'orientation': 'v',
               'showlegend': False,
               'textposition': 'auto',
               'type': 'bar',
               'x': array([ 84,  85,  86, ..., 410, 411, 412]),
               'xaxis': 'x',
               'y': array([ 1.98,  1.98,  3.96, ...,  8.91, 13.86,  1.99]),
               'yaxis': 'y'}],
     'layout': {'barmode': 'relative',
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                'margin': {'t': 60},
                'template': '...',
                'title': {'text': 'Total Amount Invoiced by Invoice ID'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Invoice ID'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Total Amount'}}}
 }))
```

In [29]:
```
question = """
    List all employees and their reporting manager's name (if any):
```

```
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

```
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\nCREATE TA
BLE "employees"\r\n(\r\n    EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    LastName NVARCHAR
(20)  NOT NULL,\r\n    FirstName NVARCHAR(20)  NOT NULL,\r\n    Title NVARCHAR(30),\r\n    ReportsTo INTEGE
R,\r\n    BirthDate DATETIME,\r\n    HireDate DATETIME,\r\n    Address NVARCHAR(70),\r\n    City NVARCHAR(4
0),\r\n    State NVARCHAR(40),\r\n    Country NVARCHAR(40),\r\n    PostalCode NVARCHAR(10),\r\n    Phone NV
ARCHAR(24),\r\n    Fax NVARCHAR(24),\r\n    Email NVARCHAR(60),\r\n    FOREIGN KEY (ReportsTo) REFERENCES
"employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "customers"\r
\n(\r\n    CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    FirstName NVARCHAR(40)  NOT NUL
L,\r\n    LastName NVARCHAR(20)  NOT NULL,\r\n    Company NVARCHAR(80),\r\n    Address NVARCHAR(70),\r\n
City NVARCHAR(40),\r\n    State NVARCHAR(40),\r\n    Country NVARCHAR(40),\r\n    PostalCode NVARCHAR(1
0),\r\n    Phone NVARCHAR(24),\r\n    Fax NVARCHAR(24),\r\n    Email NVARCHAR(60)  NOT NULL,\r\n    Support
RepId INTEGER,\r\n    FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO A
CTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCR
EATE TABLE "invoices"\r\n(\r\n    InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    CustomerId I
NTEGER  NOT NULL,\r\n    InvoiceDate DATETIME  NOT NULL,\r\n    BillingAddress NVARCHAR(70),\r\n    Billing
City NVARCHAR(40),\r\n    BillingState NVARCHAR(40),\r\n    BillingCountry NVARCHAR(40),\r\n    BillingPost
alCode NVARCHAR(10),\r\n    Total NUMERIC(10,2)  NOT NULL,\r\n    FOREIGN KEY (CustomerId) REFERENCES "cust
omers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r
\n(\r\n    InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    InvoiceId INTEGER  NOT NULL,\r
\n    TrackId INTEGER  NOT NULL,\r\n    UnitPrice NUMERIC(10,2)  NOT NULL,\r\n    Quantity INTEGER  NOT NUL
L,\r\n    FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE N
O ACTION,\r\n    FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE
NO ACTION\r\n)\n\nCREATE TABLE "artists"\r\n(\r\n    ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r
\n    Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n    TrackId INTEGER PRIMARY KEY AUTOINCREMEN
T NOT NULL,\r\n    Name NVARCHAR(200)  NOT NULL,\r\n    AlbumId INTEGER,\r\n    MediaTypeId INTEGER  NOT NU
LL,\r\n    GenreId INTEGER,\r\n    Composer NVARCHAR(220),\r\n    Milliseconds INTEGER  NOT NULL,\r\n    By
tes INTEGER,\r\n    UnitPrice NUMERIC(10,2)  NOT NULL,\r\n    FOREIGN KEY (AlbumId) REFERENCES "albums" (Al
bumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (GenreId) REFERENCES "genres" (G
enreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (MediaTypeId) REFERENCES "media
_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r
\n    AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    Title NVARCHAR(160)  NOT NULL,\r\n    Arti
stId INTEGER  NOT NULL,\r\n    FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO
ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\n\n===Additional Context \n\nI
n the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is suffici
ent, please generate a valid SQL query without any explanations for the question. \n2. If the provided cont
ext is almost sufficient but requires knowledge of a specific string in a particular column, please generat
e an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment s
aying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be genera
ted. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, p
lease repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': "  \n    List all
```

```
employees and their reporting manager's name (if any):\n"}, {'role': 'assistant', 'content': 'SELECT e.Firs
tName, e.LastName, mt.FirstName AS ManagerFirstName, mt.LastName AS ManagerLastName\nFROM "employees" e\nLE
FT JOIN "employees" mt ON e.ReportsTo = mt.EmployeeId'}, {'role': 'user', 'content': "  \n    List all empl
oyees and their reporting manager's name (if any):\n"}, {'role': 'assistant', 'content': 'SELECT e1.*, CONC
AT(e2.FirstName, \' \', e2.LastName) AS ManagerName\nFROM "employees" e1\nLEFT JOIN "employees" e2 ON e1.Re
portsTo = e2.EmployeeId\nORDER BY e1.EmployeeId'}, {'role': 'user', 'content': "  \n    List all employees
and their reporting manager's name (if any):\n"}, {'role': 'assistant', 'content': "SELECT e.FirstName, e.L
astName, CASE WHEN e.ReportsTo IS NULL THEN 'None' ELSE (\n    SELECT e2.FirstName || ', ' || e2.LastName\n
FROM employees e2\n    WHERE e2.EmployeeId = e.ReportsTo\n) END AS ManagerName\nFROM employees e"}, {'rol
e': 'user', 'content': '  \n     Find the top 5 customers who spent the most money overall, \n     \n     H
int: order total can be found on invoices table, calculation using invoice_items detail table is unnecessar
y \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers"
c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT
5'}, {'role': 'user', 'content': '  \n     List all customers from Canada and their email addresses:\n'},
{'role': 'assistant', 'content': 'SELECT c.CustomerId, c.Email, SUM(i.Total) AS TotalSpent\nFROM Customers
c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT
1'}, {'role': 'user', 'content': '  \n     Find the top 5 customers who spent the most money overall, \n
\n     Hint: order total can be found on invoices table, calculation using invoice_items detail table is un
necessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM
"customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpend
ing DESC\nLIMIT 5'}, {'role': 'user', 'content': '  \n     Find the top 5 customers who spent the most mone
y overall, \n     \n     Hint: order total can be found on invoices table, calculation using invoice_items
detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS To
talSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDE
R BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': '  \n     Find the
customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.Invoic
eId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.Cus
tomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': '  \n     Find the customer wi
th the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOfIn
voices\nFROM "invoices"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1'}, {'role': 'user', 'con
tent': 'what are the top 5 countries that customers come from?'}, {'role': 'assistant', 'content': 'SELECT
c.Country, COUNT(*) AS TotalCustomers\nFROM "customers" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC
\nLIMIT 5'}, {'role': 'user', 'content': "  \n    List all employees and their reporting manager's name (if
any):\n"}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\nCREATE
```

TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVAR
CHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo IN
TEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCH
AR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phon
e NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENC
ES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"custom
ers\"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT
NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n
City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(1
0),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   Support
RepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO
ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n
\nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Custom
erId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   B
illingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   Billi
ngPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES
\"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoice_i
tems\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT
NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER
NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON
UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"artists\"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT
NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY
AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INT
EGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NUL
L,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES
\"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENC
ES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) R
EFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABL
E \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NO
T NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId)
\r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\n\n===Add
itional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provid
ed context is sufficient, please generate a valid SQL query without any explanations for the question. \n2.
If the provided context is almost sufficient but requires knowledge of a specific string in a particular co
lumn, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the qu
ery with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why
it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and
answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content":
" \n   List all employees and their reporting manager's name (if any):\n"}, {"role": "assistant", "conten
t": "SELECT e.FirstName, e.LastName, mt.FirstName AS ManagerFirstName, mt.LastName AS ManagerLastName\nFROM
\"employees\" e\nLEFT JOIN \"employees\" mt ON e.ReportsTo = mt.EmployeeId"}, {"role": "user", "content": "

\n   List all employees and their reporting manager's name (if any):\n"}, {"role": "assistant", "content": "SELECT e1.*, CONCAT(e2.FirstName, ' ', e2.LastName) AS ManagerName\nFROM \"employees\" e1\nLEFT JOIN \"employees\" e2 ON e1.ReportsTo = e2.EmployeeId\nORDER BY e1.EmployeeId"}, {"role": "user", "content": " \n   List all employees and their reporting manager's name (if any):\n"}, {"role": "assistant", "content": "SELECT e.FirstName, e.LastName, CASE WHEN e.ReportsTo IS NULL THEN 'None' ELSE (\n   SELECT e2.FirstName || ', ' || e2.LastName\n   FROM employees e2\n   WHERE e2.EmployeeId = e.ReportsTo\n) END AS ManagerName\nFROM employees e"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, c.Email, SUM(i.Total) AS TotalSpent\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM \"invoices\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1"}, {"role": "user", "content": "what are the top 5 countries that customers come from?"}, {"role": "assistant", "content": "SELECT c.Country, COUNT(*) AS TotalCustomers\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all employees and their reporting manager's name (if any):\n"}]

Add of existing embedding ID: c7de9fac-1104-5409-b17a-73b533b767d5-sql
Insert of existing embedding ID: c7de9fac-1104-5409-b17a-73b533b767d5-sql

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Ollama Response:
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ontent': 'SELECT e1.*, CONCAT(e2.FirstName, \' \', e2.LastName) AS ManagerName\nFROM "employees" e1\nLEFT J
OIN "employees" e2 ON e1.ReportsTo = e2.EmployeeId\nORDER BY e1.EmployeeId'}, 'done_reason': 'stop', 'don
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uration': 83432847000, 'eval_count': 59, 'eval_duration': 12384361000}
SELECT e1.*, CONCAT(e2.FirstName, ' ', e2.LastName) AS ManagerName
FROM "employees" e1
LEFT JOIN "employees" e2 ON e1.ReportsTo = e2.EmployeeId
ORDER BY e1.EmployeeId
SELECT e1.*, CONCAT(e2.FirstName, ' ', e2.LastName) AS ManagerName
FROM "employees" e1
LEFT JOIN "employees" e2 ON e1.ReportsTo = e2.EmployeeId
ORDER BY e1.EmployeeId
   EmployeeId  LastName FirstName               Title  ReportsTo  \
0           1     Adams    Andrew      General Manager        NaN
1           2   Edwards     Nancy        Sales Manager        1.0
2           3   Peacock      Jane  Sales Support Agent        2.0
3           4      Park  Margaret  Sales Support Agent        2.0
4           5   Johnson     Steve  Sales Support Agent        2.0
5           6  Mitchell   Michael           IT Manager        1.0
6           7      King    Robert             IT Staff        6.0
7           8  Callahan     Laura             IT Staff        6.0

             BirthDate             HireDate                     Address  \
0  1962-02-18 00:00:00  2002-08-14 00:00:00          11120 Jasper Ave NW
1  1958-12-08 00:00:00  2002-05-01 00:00:00                 825 8 Ave SW
2  1973-08-29 00:00:00  2002-04-01 00:00:00                1111 6 Ave SW
3  1947-09-19 00:00:00  2003-05-03 00:00:00             683 10 Street SW
4  1965-03-03 00:00:00  2003-10-17 00:00:00                 7727B 41 Ave
5  1973-07-01 00:00:00  2003-10-17 00:00:00         5827 Bowness Road NW
6  1970-05-29 00:00:00  2004-01-02 00:00:00  590 Columbia Boulevard West
7  1968-01-09 00:00:00  2004-03-04 00:00:00                  923 7 ST NW

         City State Country PostalCode              Phone                Fax  \
0    Edmonton    AB  Canada    T5K 2N1  +1 (780) 428-9482  +1 (780) 428-3457
1     Calgary    AB  Canada    T2P 2T3  +1 (403) 262-3443  +1 (403) 262-3322
2     Calgary    AB  Canada    T2P 5M5  +1 (403) 262-3443  +1 (403) 262-6712
3     Calgary    AB  Canada    T2P 5G3  +1 (403) 263-4423  +1 (403) 263-4289
4     Calgary    AB  Canada    T3B 1Y7   1 (780) 836-9987   1 (780) 836-9543
5     Calgary    AB  Canada    T3B 0C5  +1 (403) 246-9887  +1 (403) 246-9899
6  Lethbridge    AB  Canada    T1K 5N8  +1 (403) 456-9986  +1 (403) 456-8485
```

```
7  Lethbridge    AB  Canada    T1H 1Y8  +1 (403) 467-3351  +1 (403) 467-8772

                      Email       ManagerName
0    andrew@chinookcorp.com
1     nancy@chinookcorp.com      Andrew Adams
2      jane@chinookcorp.com     Nancy Edwards
3  margaret@chinookcorp.com     Nancy Edwards
4     steve@chinookcorp.com     Nancy Edwards
5   michael@chinookcorp.com      Andrew Adams
6    robert@chinookcorp.com  Michael Mitchell
7     laura@chinookcorp.com  Michael Mitchell
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    List all employees and their reporting manager's name (i
f any):\n'\n\nThe DataFrame was produced using this query: SELECT e1.*, CONCAT(e2.FirstName, ' ', e2.LastNa
me) AS ManagerName\nFROM \"employees\" e1\nLEFT JOIN \"employees\" e2 ON e1.ReportsTo = e2.EmployeeId\nORDE
R BY e1.EmployeeId\n\nThe following is information about the resulting pandas DataFrame 'df': \nRunning df.
dtypes gives:\n EmployeeId       int64\nLastName        object\nFirstName       object\nTitle           obj
ect\nReportsTo      float64\nBirthDate       object\nHireDate        object\nAddress         object\nCity
object\nState           object\nCountry         object\nPostalCode      object\nPhone           object\nFax
object\nEmail           object\nManagerName     object\ndtype: object"}, {"role": "user", "content": "Can y
ou generate the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas da
taframe called 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Pytho
n code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:54:37.943937815Z', 'message': {'role': 'assistant', 'c
ontent': '```python\nimport plotly.express as px\n\n# Assuming \'EmployeeId\' is the index and first column
\nfig = px.bar(df, x=df.index, y="ManagerName", color="EmployeeId")\n\n# Or if you want to use \'ReportsTo
\' column for ordering\n# fig = px.bar(df, x=df[\'ReportsTo\'], y="ManagerName", color="EmployeeId")\n\nfi
g.update_layout(\n    title="Employees and Their Reporting Managers",\n    xaxis_title="Employee ID",\n
yaxis_title="Manager Name"\n)\n\n# If you want to show only employees without a manager (if any)\n# filter_
values = df[\'ManagerName\'].dropna().tolist()\n# fig.add_trace(px.bar(filter_values, x=range(len(filter_va
lues)), marker_color="blue").data[0])\n\nfig.show()\n```'}, 'done_reason': 'stop', 'done': True, 'total_dur
ation': 55633883231, 'load_duration': 43550316, 'prompt_eval_count': 284, 'prompt_eval_duration': 120087960
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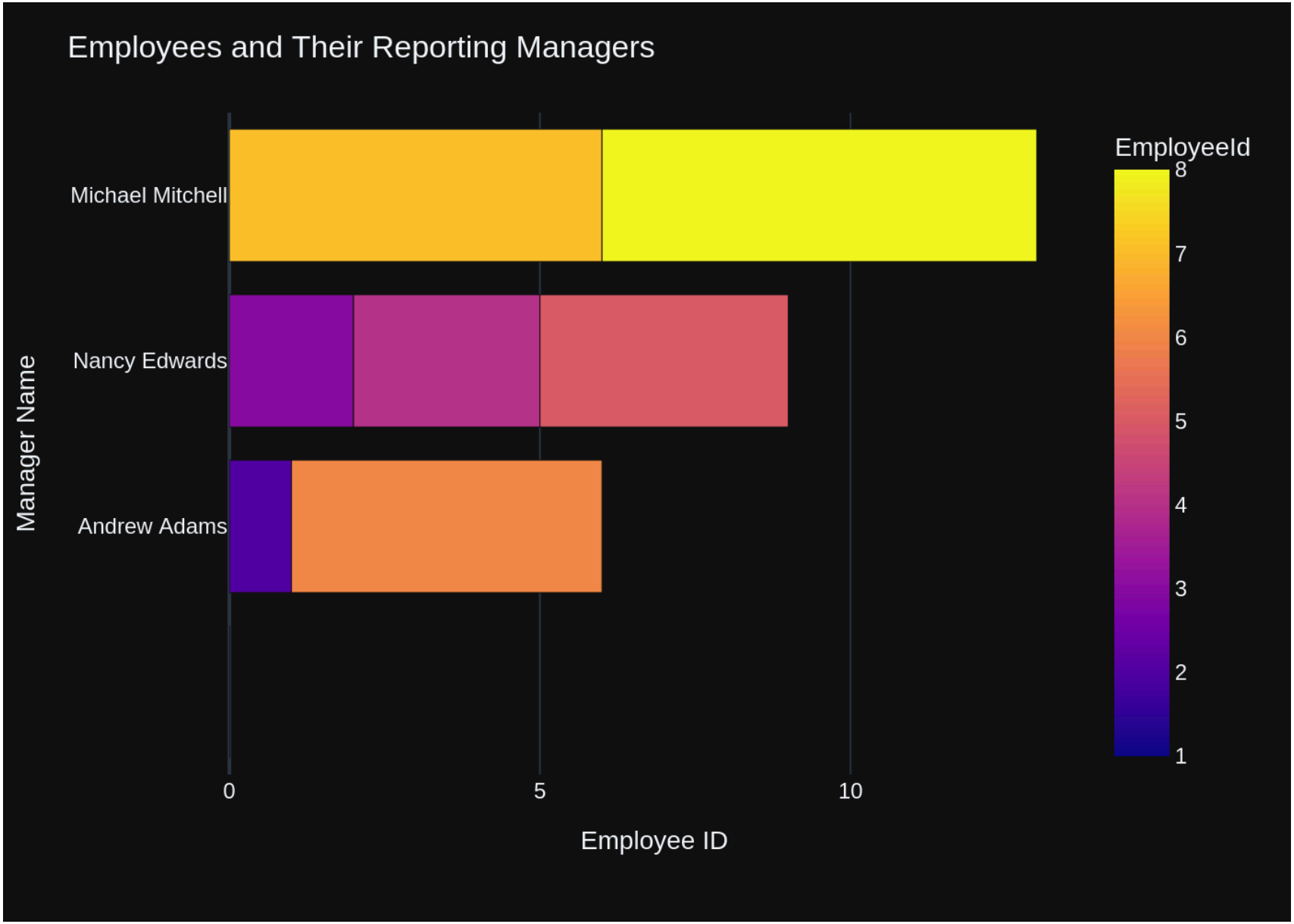
Employees and Their Reporting Managers
Michael Mitchell
Nancy Edwards
Andrew Adams
Manager Name
0
5
10
Employee ID
EmployeeId
8
7
6
5
4
3
2
1

Out[29]: ('SELECT e1.*, CONCAT(e2.FirstName, \' \', e2.LastName) AS ManagerName\nFROM "employees" e1\nLEFT JOIN "em
ployees" e2 ON e1.ReportsTo = e2.EmployeeId\nORDER BY e1.EmployeeId',

	EmployeeId	LastName	FirstName	Title	ReportsTo
0	1	Adams	Andrew	General Manager	NaN
1	2	Edwards	Nancy	Sales Manager	1.0
2	3	Peacock	Jane	Sales Support Agent	2.0
3	4	Park	Margaret	Sales Support Agent	2.0
4	5	Johnson	Steve	Sales Support Agent	2.0
5	6	Mitchell	Michael	IT Manager	1.0
6	7	King	Robert	IT Staff	6.0
7	8	Callahan	Laura	IT Staff	6.0

	BirthDate	HireDate	Address
0	1962-02-18 00:00:00	2002-08-14 00:00:00	11120 Jasper Ave NW
1	1958-12-08 00:00:00	2002-05-01 00:00:00	825 8 Ave SW
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4	1965-03-03 00:00:00	2003-10-17 00:00:00	7727B 41 Ave
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7	1968-01-09 00:00:00	2004-03-04 00:00:00	923 7 ST NW

	City	State	Country	PostalCode	Phone	Fax
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1	Calgary	AB	Canada	T2P 2T3	+1 (403) 262-3443	+1 (403) 262-3322
2	Calgary	AB	Canada	T2P 5M5	+1 (403) 262-3443	+1 (403) 262-6712
3	Calgary	AB	Canada	T2P 5G3	+1 (403) 263-4423	+1 (403) 263-4289
4	Calgary	AB	Canada	T3B 1Y7	1 (780) 836-9987	1 (780) 836-9543
5	Calgary	AB	Canada	T3B 0C5	+1 (403) 246-9887	+1 (403) 246-9899
6	Lethbridge	AB	Canada	T1K 5N8	+1 (403) 456-9986	+1 (403) 456-8485
7	Lethbridge	AB	Canada	T1H 1Y8	+1 (403) 467-3351	+1 (403) 467-8772

	Email	ManagerName
0	andrew@chinookcorp.com	
1	nancy@chinookcorp.com	Andrew Adams
2	jane@chinookcorp.com	Nancy Edwards
3	margaret@chinookcorp.com	Nancy Edwards
4	steve@chinookcorp.com	Nancy Edwards
5	michael@chinookcorp.com	Andrew Adams
6	robert@chinookcorp.com	Michael Mitchell
7	laura@chinookcorp.com	Michael Mitchell

,
Figure({

```
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a>',
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{'shape': ''}},
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                                             '#7201a8'], [0.3333333333333333,
                                             '#9c179e'], [0.4444444444444444,
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                'margin': {'t': 60},
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                'title': {'text': 'Employees and Their Reporting Managers'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Employee ID'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Manager Name'}}}
 }))
```

In [30]:

```
question = """
    Get the average invoice total for each customer:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Get the average invoice total for each customer:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId'}, {'role': 'user', 'content': ' \n   Get the average invoice total for each customer:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   Get the average invoice total for each customer:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC'}, {'role': 'user', 'conten

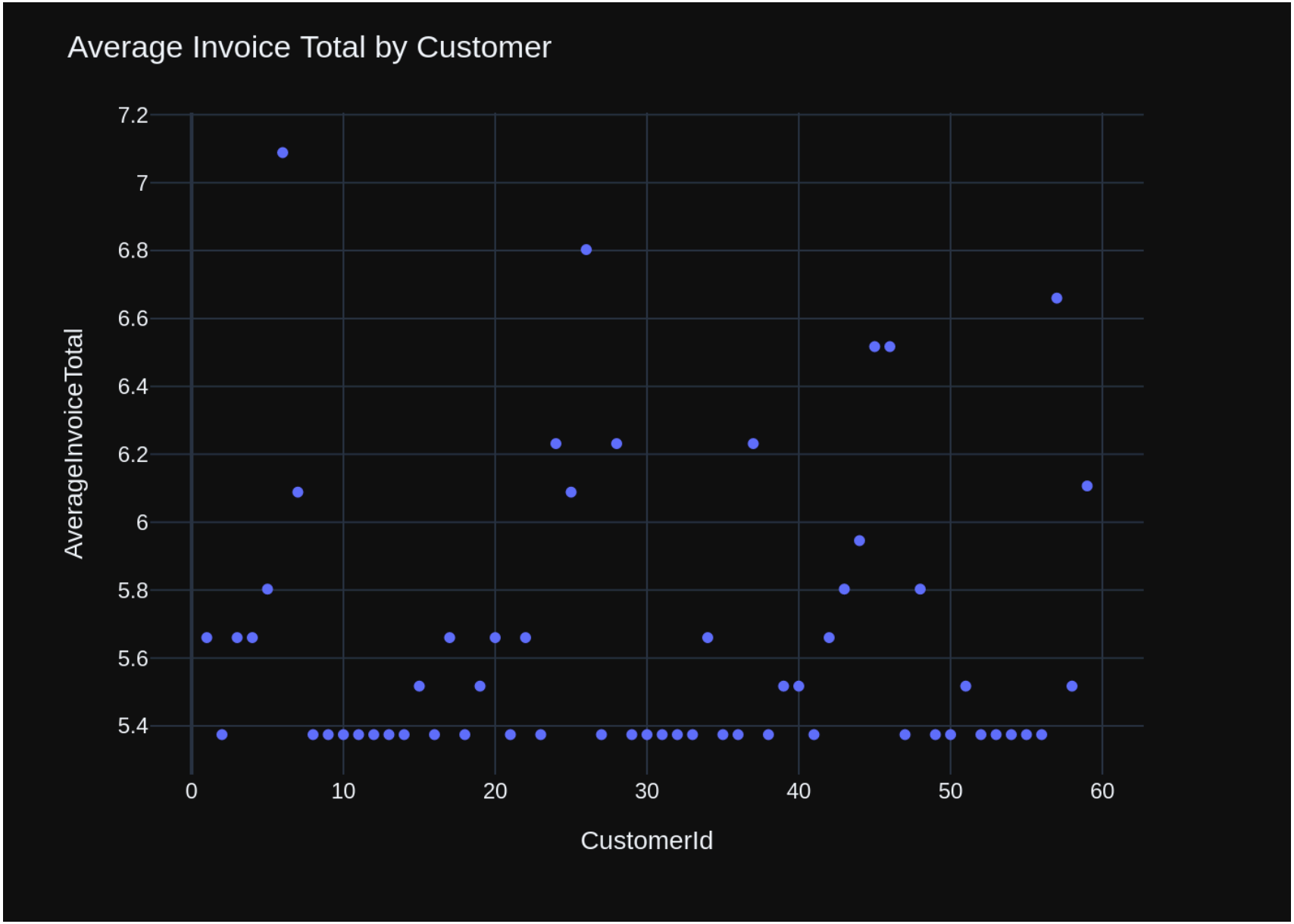
t': ' \n   Get the total number of invoices for each customer\n'}, {'role': 'assistant', 'content': 'SELE
CT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId
= i.CustomerId\nGROUP BY c.CustomerId'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who
spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation u
sing invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId,
SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY
c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': '
\n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be fo
und on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistan
t', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON
c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user',
'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order t
otal can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'ro
le': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN
"invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'},
{'role': 'user', 'content': ' \n   Find the total number of invoices per country:\n'}, {'role': 'assistan
t', 'content': 'SELECT Customer.Country, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM "customers" custome
r\nJOIN "invoices" invoice ON customer.CustomerId = invoice.CustomerId\nGROUP BY Country'}, {'role': 'use
r', 'content': ' \n   Find all invoices since 2010 and the total amount invoiced:\n'}, {'role': 'assistan
t', 'content': 'SELECT i.InvoiceId, SUM(i.Total) AS TotalAmount\nFROM "invoices" i\nWHERE i.InvoiceDate >
\'2010-01-01\'\nGROUP BY i.InvoiceId'}, {'role': 'user', 'content': ' \n   Find the customer with the mo
st invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoice
s\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY To
talInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Get the average invoice total for each cu
stomer:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   Billin
gAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCou
ntry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInv
oiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER
PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r
\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId)
REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (Tr

ackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE sqlite_stat1(tbl,idx,stat)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\nCREATE TABLE \"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Get the average invoice total for each customer:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId"}, {"role": "user", "content": " \n   Get the average invoice total for each customer:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC\nLIMIT 10"}, {"role": "user", "content": " \n   Get the average invoice total for each customer:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY AverageInvoiceTotal DESC"}, {"role": "user", "content": " \n   Get the total number of invoices for each customer\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customer

```
s who spent the most money overall, \n     \n     Hint: order total can be found on invoices table, calcula
tion using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.Custo
merId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.Custome
rId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": "  \n    Fi
nd the total number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT Customer.Countr
y, COUNT(invoice.InvoiceId) AS InvoiceCount\nFROM \"customers\" customer\nJOIN \"invoices\" invoice ON cust
omer.CustomerId = invoice.CustomerId\nGROUP BY Country"}, {"role": "user", "content": "  \n    Find all inv
oices since 2010 and the total amount invoiced:\n"}, {"role": "assistant", "content": "SELECT i.InvoiceId,
SUM(i.Total) AS TotalAmount\nFROM \"invoices\" i\nWHERE i.InvoiceDate > '2010-01-01'\nGROUP BY i.InvoiceI
d"}, {"role": "user", "content": "  \n     Find the customer with the most invoices \n"}, {"role": "assista
nt", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"inv
oices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"},
{"role": "user", "content": "  \n    Get the average invoice total for each customer:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:56:05.887708575Z', 'message': {'role': 'assistant', 'c
ontent': 'SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM  "customers" c\nJOIN  "invoices" i
ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId;'}, 'done_reason': 'stop', 'done': True, 'total_durat
ion': 87823527216, 'load_duration': 600799, 'prompt_eval_count': 1783, 'prompt_eval_duration': 76828344000,
'eval_count': 50, 'eval_duration': 10392615000}
SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal
FROM  "customers" c
JOIN  "invoices" i ON c.CustomerId = i.CustomerId
GROUP BY c.CustomerId;
Output from LLM: SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal
FROM  "customers" c
JOIN  "invoices" i ON c.CustomerId = i.CustomerId
GROUP BY c.CustomerId;
Extracted SQL: SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal
FROM  "customers" c
JOIN  "invoices" i ON c.CustomerId = i.CustomerId
GROUP BY c.CustomerId
SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal
FROM  "customers" c
JOIN  "invoices" i ON c.CustomerId = i.CustomerId
GROUP BY c.CustomerId
    CustomerId  AverageInvoiceTotal
0            1            5.660000
1            2            5.374286
2            3            5.660000
3            4            5.660000
4            5            5.802857
5            6            7.088571
```

6	7	6.088571
7	8	5.374286
8	9	5.374286
9	10	5.374286
10	11	5.374286
11	12	5.374286
12	13	5.374286
13	14	5.374286
14	15	5.517143
15	16	5.374286
16	17	5.660000
17	18	5.374286
18	19	5.517143
19	20	5.660000
20	21	5.374286
21	22	5.660000
22	23	5.374286
23	24	6.231429
24	25	6.088571
25	26	6.802857
26	27	5.374286
27	28	6.231429
28	29	5.374286
29	30	5.374286
30	31	5.374286
31	32	5.374286
32	33	5.374286
33	34	5.660000
34	35	5.374286
35	36	5.374286
36	37	6.231429
37	38	5.374286
38	39	5.517143
39	40	5.517143
40	41	5.374286
41	42	5.660000
42	43	5.802857
43	44	5.945714
44	45	6.517143
45	46	6.517143
46	47	5.374286
47	48	5.802857

```
48          49             5.374286
49          50             5.374286
50          51             5.517143
51          52             5.374286
52          53             5.374286
53          54             5.374286
54          55             5.374286
55          56             5.374286
56          57             6.660000
57          58             5.517143
58          59             6.106667
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Get the average invoice total for each customer:\n'\n\nT
he DataFrame was produced using this query: SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM
\"customers\" c\nJOIN  \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\n\nThe followin
g is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n CustomerId
int64\nAverageInvoiceTotal    float64\ndtype: object"}, {"role": "user", "content": "Can you generate the P
ython plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'd
f'. If there is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not an
swer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:56:33.118437311Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport pandas as pd\nimport plotly.express as px\n\n# Assuming the dataframe is named
'df' and contains a column called 'CustomerId' and a column called 'AverageInvoiceTotal'\nfig = px.scatter
(df, x='CustomerId', y='AverageInvoiceTotal')\nfig.update_layout(title='Average Invoice Total by Customer')
\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 27203051491, 'load_duration': 4
2228539, 'prompt_eval_count': 204, 'prompt_eval_duration': 8836657000, 'eval_count': 87, 'eval_duration': 1
8269933000}
```


Average Invoice Total by Customer
AverageInvoiceTotal
7.2
7
6.8
6.6
6.4
6.2
6
5.8
5.6
5.4
0
10
20
30
40
50
60
CustomerId

Out[30]: ('SELECT c.CustomerId, AVG(i.Total) AS AverageInvoiceTotal\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId',

	CustomerId	AverageInvoiceTotal
0	1	5.660000
1	2	5.374286
2	3	5.660000
3	4	5.660000
4	5	5.802857
5	6	7.088571
6	7	6.088571
7	8	5.374286
8	9	5.374286
9	10	5.374286
10	11	5.374286
11	12	5.374286
12	13	5.374286
13	14	5.374286
14	15	5.517143
15	16	5.374286
16	17	5.660000
17	18	5.374286
18	19	5.517143
19	20	5.660000
20	21	5.374286
21	22	5.660000
22	23	5.374286
23	24	6.231429
24	25	6.088571
25	26	6.802857
26	27	5.374286
27	28	6.231429
28	29	5.374286
29	30	5.374286
30	31	5.374286
31	32	5.374286
32	33	5.374286
33	34	5.660000
34	35	5.374286
35	36	5.374286
36	37	6.231429
37	38	5.374286
38	39	5.517143

```
39          40             5.517143
40          41             5.374286
41          42             5.660000
42          43             5.802857
43          44             5.945714
44          45             6.517143
45          46             6.517143
46          47             5.374286
47          48             5.802857
48          49             5.374286
49          50             5.374286
50          51             5.517143
51          52             5.374286
52          53             5.374286
53          54             5.374286
54          55             5.374286
55          56             5.374286
56          57             6.660000
57          58             5.517143
58          59             6.106667,
Figure({
    'data': [{'hovertemplate': 'CustomerId=%{x}<br>AverageInvoiceTotal=%{y}<extra></extra>',
              'legendgroup': '',
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                          19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36,
                          37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54,
                          55, 56, 57, 58, 59]),
              'xaxis': 'x',
              'y': array([5.66      , 5.37428571, 5.66      , 5.66      , 5.80285714, 7.08857143,
                          6.08857143, 5.37428571, 5.37428571, 5.37428571, 5.37428571, 5.37428571,
                          5.37428571, 5.37428571, 5.51714286, 5.37428571, 5.66      , 5.37428571,
                          5.51714286, 5.66      , 5.37428571, 5.66      , 5.37428571, 6.23142857,
                          6.08857143, 6.80285714, 5.37428571, 6.23142857, 5.37428571, 5.37428571,
                          5.37428571, 5.37428571, 5.37428571, 5.66      , 5.37428571, 5.37428571,
                          6.23142857, 5.37428571, 5.51714286, 5.51714286, 5.37428571, 5.66      ,
                          5.80285714, 5.94571429, 6.51714286, 6.51714286, 5.37428571, 5.80285714,
```

```
                            5.37428571, 5.37428571, 5.51714286, 5.37428571, 5.37428571, 5.37428571,
                            5.37428571, 5.37428571, 6.66      , 5.51714286, 6.10666667]),
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     'layout': {'legend': {'tracegroupgap': 0},
                'margin': {'t': 60},
                'template': '...',
                'title': {'text': 'Average Invoice Total by Customer'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'CustomerId'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'AverageInvoiceTotal'}}}
 }))
```

In [31]:
```
question = """
    Find the top 5 most expensive tracks (based on unit price):
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT Name, UnitPrice\nFROM "tracks"\nORDER BY UnitPrice DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT t.TrackId, t.Name, t.UnitPrice\nFROM "tracks" t\nORDER BY t.UnitPrice DESC\nLIMIT 5\n----------'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit price):\n'}, {'role': 'assistant', 'content': 'SELECT t.TrackId, t.Name, t.UnitPrice\nFROM "tracks" t\nORDER BY t.UnitPrice DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where alb

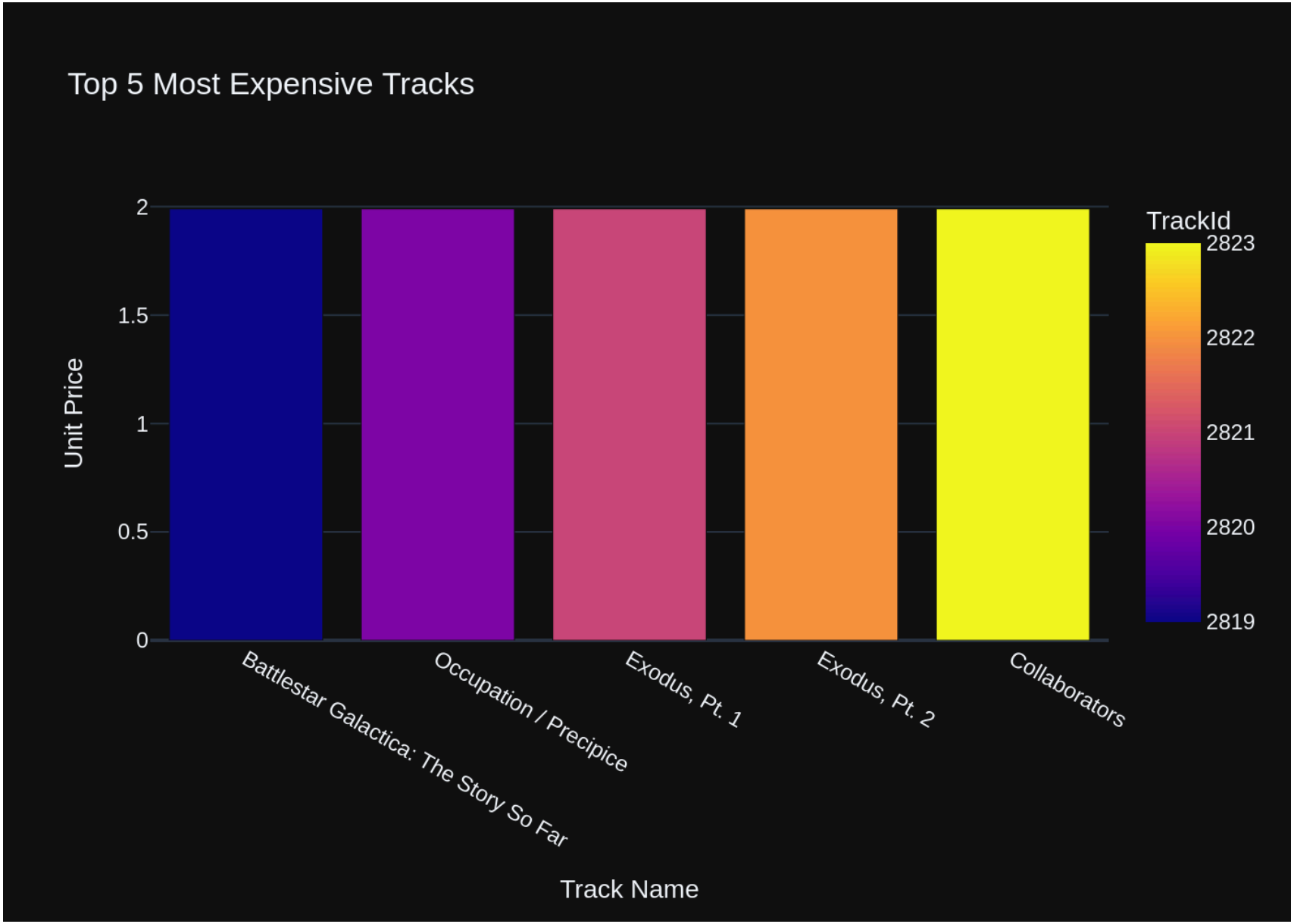
ums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit price):\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE INDEX IFK_TrackGenreId ON \"tracks\" (GenreId)\n\nCREATE INDEX I

FK_PlaylistTrackTrackId ON \"playlist_track\" (TrackId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice
_items\" (TrackId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON \"tracks\" (MediaTypeId)\n\nCREATE TABLE \"invoi
ce_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER
NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEG
ER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTIO
N ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO AC
TION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NUL
L,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackI
d),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UP
DATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON
UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE TABLE \"albums
\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r
\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tO
N DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice m
eans order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQ
L query without any explanations for the question. \n2. If the provided context is almost sufficient but re
quires knowledge of a specific string in a particular column, please generate an intermediate SQL query to
find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If
the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most re
levant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly
as it was given before. \n"}, {"role": "user", "content": " \n   Find the top 5 most expensive tracks (ba
sed on unit price):\n"}, {"role": "assistant", "content": "SELECT Name, UnitPrice\nFROM \"tracks\"\nORDER B
Y UnitPrice DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 most expensive tracks (bas
ed on unit price):\n"}, {"role": "assistant", "content": "SELECT t.TrackId, t.Name, t.UnitPrice\nFROM \"tra
cks\" t\nORDER BY t.UnitPrice DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n
Find the top 5 most expensive tracks (based on unit price):\n"}, {"role": "assistant", "content": "SELECT
t.TrackId, t.Name, t.UnitPrice\nFROM \"tracks\" t\nORDER BY t.UnitPrice DESC\nLIMIT 5"}, {"role": "user",
"content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by A
rtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based o
n the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT(t.TrackId) AS TotalTrack
s\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.
AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   There
are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and track
s are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks
\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalT
racks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId
= t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "conten
t": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bough
t the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.
CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId =
i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY Tota
lAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_item

s, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoice
s):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"in
voices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalA
lbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Hint: album quantity
is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantit
y (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS T
otalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.Custom
erId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers
who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculati
on using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.Custome
rId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\n
GROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "co
ntent": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who b
ought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELEC
T i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON
i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user",
"content": " \n   Find the top 5 most expensive tracks (based on unit price):\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:58:03.47402083Z', 'message': {'role': 'assistant', 'co
ntent': 'SELECT t.TrackId, t.Name, t.UnitPrice\nFROM "tracks" t\nWHERE t.UnitPrice = (\n   SELECT MAX(Uni
tPrice)\n   FROM "tracks"\n)\nLIMIT 5'}, 'done_reason': 'stop', 'done': True, 'total_duration': 902602673
86, 'load_duration': 724111, 'prompt_eval_count': 1834, 'prompt_eval_duration': 79384834000, 'eval_count':
49, 'eval_duration': 10270028000}
```
SELECT t.TrackId, t.Name, t.UnitPrice
FROM  "tracks" t
WHERE t.UnitPrice = (
    SELECT MAX(UnitPrice)
    FROM  "tracks"
)
LIMIT 5
```
```
SELECT t.TrackId, t.Name, t.UnitPrice
FROM  "tracks" t
WHERE t.UnitPrice = (
    SELECT MAX(UnitPrice)
    FROM  "tracks"
)
LIMIT 5
```

	TrackId	Name	UnitPrice
0	2819	Battlestar Galactica: The Story So Far	1.99
1	2820	Occupation / Precipice	1.99
2	2821	Exodus, Pt. 1	1.99
3	2822	Exodus, Pt. 2	1.99

```
4     2823                          Collaborators       1.99
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Find the top 5 most expensive tracks (based on unit pric
e):\n'\n\nThe DataFrame was produced using this query: SELECT t.TrackId, t.Name, t.UnitPrice\nFROM  \"track
s\" t\nWHERE t.UnitPrice = (\n    SELECT MAX(UnitPrice)\n    FROM  \"tracks\"\n)\nLIMIT 5\n\nThe following
is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n TrackId        int64
\nName          object\nUnitPrice    float64\ndtype: object"}, {"role": "user", "content": "Can you generat
e the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe ca
lled 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Python code. Do
not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T11:58:29.881413717Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x='Name', y='Uni
tPrice', color='TrackId', title='Top 5 Most Expensive Tracks')\nfig.update_xaxes(title='Track Name')\nfig.u
pdate_yaxes(title='Unit Price')\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration':
26380112094, 'load_duration': 44296480, 'prompt_eval_count': 214, 'prompt_eval_duration': 8889221000, 'eval
_count': 84, 'eval_duration': 17394527000}
```


Top 5 Most Expensive Tracks
Unit Price
2
1.5
1
0.5
0
Battlestar Galactica: The Story So Far
Occupation / Precipice
Exodus, Pt. 1
Exodus, Pt. 2
Collaborators
Track Name
TrackId
2823
2822
2821
2820
2819

```
Out[31]: ('SELECT t.TrackId, t.Name, t.UnitPrice\nFROM  "tracks" t\nWHERE t.UnitPrice = (\n    SELECT MAX(UnitPric
         e)\n    FROM  "tracks"\n)\nLIMIT 5',
            TrackId                                  Name  UnitPrice
          0     2819  Battlestar Galactica: The Story So Far       1.99
          1     2820                 Occupation / Precipice       1.99
          2     2821                          Exodus, Pt. 1       1.99
          3     2822                          Exodus, Pt. 2       1.99
          4     2823                          Collaborators       1.99,
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                                   'pattern': {'shape': ''}},
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                                    'Exodus, Pt. 1', 'Exodus, Pt. 2', 'Collaborators'], dtype=object),
                        'xaxis': 'x',
                        'y': array([1.99, 1.99, 1.99, 1.99, 1.99]),
                        'yaxis': 'y'}],
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                                                      '#7201a8'], [0.3333333333333333,
                                                      '#9c179e'], [0.4444444444444444,
                                                      '#bd3786'], [0.5555555555555556,
                                                      '#d8576b'], [0.6666666666666666,
                                                      '#ed7953'], [0.7777777777777778,
                                                      '#fb9f3a'], [0.8888888888888888,
                                                      '#fdca26'], [1.0, '#f0f921']]},
                         'legend': {'tracegroupgap': 0},
                         'template': '...',
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                         'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Track Name'}},
```

```
                    'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Unit Price'}}}
  }))
```

In [32]:
```
question = """
    List all genres and the number of tracks in each genre:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'ro

le': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genre
s:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJO
IN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2
\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\n
GROUP BY a.ArtistId, a.Name'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with
tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name A
S ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELE
CT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n
HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'role': 'user', 'conte
nt': ' \n   Get all playlists containing at least 10 tracks and the total duration of those tracks:\n'},
{'role': 'assistant', 'content': 'SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Milliseconds) AS Tota
lDuration\nFROM "playlist_track" pt\nJOIN "playlists" p ON pt.PlaylistId = p.PlaylistId\nJOIN "tracks" t ON
pt.TrackId = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10'}, {'role': 'user',
'content': ' \n   Get all playlists containing at least 10 tracks and the total duration of those track
s:\n'}, {'role': 'assistant', 'content': 'SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMillis
econds\nFROM "playlists" p\nJOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId\nJOIN "tracks" t ON p
t.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMi
lliseconds DESC'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit
price):\n'}, {'role': 'assistant', 'content': 'SELECT Name, UnitPrice\nFROM "tracks"\nORDER BY UnitPrice DE
SC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 most expensive tracks (based on unit pri
ce):\n'}, {'role': 'assistant', 'content': 'SELECT t.TrackId, t.Name, t.UnitPrice\nFROM "tracks" t\nORDER B
Y t.UnitPrice DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all genres and the number of track
s in each genre:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREM
ENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT
NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n
Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\"
(AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres
\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES
\"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_Trac
kGenreId ON \"tracks\" (GenreId)\n\nCREATE TABLE \"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINC
REMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_trac
k\" (TrackId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE TABLE \"playlists\"\r\n(\r
\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX
IFK_TrackMediaTypeId ON \"tracks\" (MediaTypeId)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId

INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (Playl
istId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO
ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE
NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOI
NCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN
KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCR
EATE INDEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\n\n===Additional Context \n\nIn the SQLite database
invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a
valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficien
t but requires knowledge of a specific string in a particular column, please generate an intermediate SQL q
uery to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql
\n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the
most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer e
xactly as it was given before. \n"}, {"role": "user", "content": " \n   List all genres and the number of
tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks
\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC
\nLIMIT 5"}, {"role": "user", "content": " \n   List all genres and the number of tracks in each genr
e:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g
\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name"}, {"role": "user", "content": " \n   There
are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and track
s are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks
\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalT
racks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId
= t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "conten
t": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistI
d, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the
number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFRO
M \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumI
d\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   Identify a
rtists who have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content":
"SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistI
d\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t
2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name"}, {"rol
e": "user", "content": " \n   Identify artists who have albums with tracks appearing in multiple genre
s:\n\n\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\n
JOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres
\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) >
1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName"}, {"role": "user", "content": " \n   Get all play
lists containing at least 10 tracks and the total duration of those tracks:\n"}, {"role": "assistant", "con
tent": "SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Milliseconds) AS TotalDuration\nFROM \"playlist
_track\" pt\nJOIN \"playlists\" p ON pt.PlaylistId = p.PlaylistId\nJOIN \"tracks\" t ON pt.TrackId = t.Trac
kId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10"}, {"role": "user", "content": " \n

```
Get all playlists containing at least 10 tracks and the total duration of those tracks:\n"}, {"role": "assi
stant", "content": "SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM \"playlis
ts\" p\nJOIN \"playlist_track\" pt ON p.PlaylistId = pt.PlaylistId\nJOIN \"tracks\" t ON pt.TrackId = t.Tra
ckId\nGROUP BY p.PlaylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DES
C"}, {"role": "user", "content": "  \n    Find the top 5 most expensive tracks (based on unit price):\n"},
{"role": "assistant", "content": "SELECT Name, UnitPrice\nFROM \"tracks\"\nORDER BY UnitPrice DESC\nLIMIT
5"}, {"role": "user", "content": "  \n    Find the top 5 most expensive tracks (based on unit price):\n"},
{"role": "assistant", "content": "SELECT t.TrackId, t.Name, t.UnitPrice\nFROM \"tracks\" t\nORDER BY t.Unit
Price DESC\nLIMIT 5"}, {"role": "user", "content": "  \n    List all genres and the number of tracks in eac
h genre:\n"}]
Ollama Response:
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t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC'}, 'done_reason': 'stop', 'done': True, 'total_durati
on': 88756658443, 'load_duration': 1182865, 'prompt_eval_count': 1820, 'prompt_eval_duration': 77331191000,
'eval_count': 52, 'eval_duration': 10716801000}
SELECT g.Name, COUNT(t.GenreId) AS TotalTracks
FROM  "genres" g
JOIN  "tracks" t ON g.GenreId = t.GenreId
GROUP BY g.Name
ORDER BY TotalTracks DESC
SELECT g.Name, COUNT(t.GenreId) AS TotalTracks
FROM  "genres" g
JOIN  "tracks" t ON g.GenreId = t.GenreId
GROUP BY g.Name
ORDER BY TotalTracks DESC
                   Name  TotalTracks
0                  Rock         1297
1                 Latin          579
2                 Metal          374
3   Alternative & Punk          332
4                  Jazz          130
5             TV Shows           93
6                 Blues           81
7             Classical           74
8                 Drama           64
9              R&B/Soul           61
10               Reggae           58
11                  Pop           48
12          Soundtrack           43
13         Alternative           40
14         Hip Hop/Rap           35
```

```
15   Electronica/Dance          30
16               World          28
17         Heavy Metal          28
18    Sci Fi & Fantasy          26
19      Easy Listening          24
20              Comedy          17
21         Bossa Nova           15
22     Science Fiction          13
23       Rock And Roll          12
24               Opera           1
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    List all genres and the number of tracks in each genr
e:\n'\n\nThe DataFrame was produced using this query: SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM
\"genres\" g\nJOIN  \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\n\nTh
e following is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n Name
object\nTotalTracks     int64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python pl
otly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If t
here is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not answer wit
h any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:00:29.165866209Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport plotly.express as px\n\n# Assuming your DataFrame is named 'df' and it has a co
lumn named 'Name' for genre names and a column named 'TotalTracks' for the number of tracks in each genre\n
fig = px.bar(df, x='Name', y='TotalTracks', color_discrete_sequence=px.colors.sequential['viridis'])\nfig.u
pdate_layout(title='Genres with Number of Tracks')\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True,
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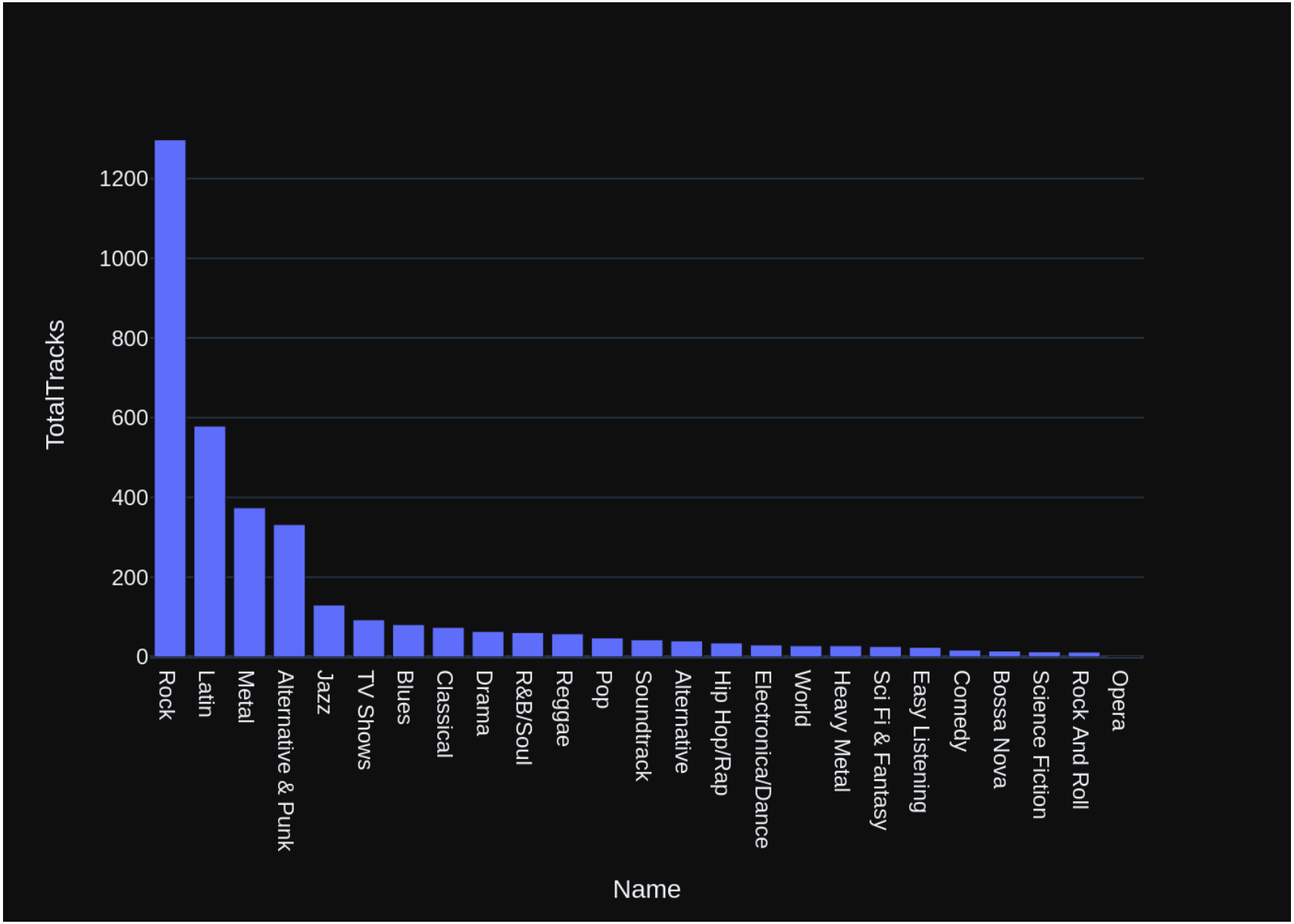
```


TotalTracks
1200
1000
800
600
400
200
0
Rock
Latin
Metal
Alternative & Punk
Jazz
TV Shows
Blues
Classical
Drama
R&B/Soul
Reggae
Pop
Soundtrack
Alternative
Hip Hop/Rap
Electronica/Dance
World
Heavy Metal
Sci Fi & Fantasy
Easy Listening
Comedy
Bossa Nova
Science Fiction
Rock And Roll
Opera
Name

Out[32]:
```
('SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM  "genres" g\nJOIN  "tracks" t ON g.GenreId = t.Genr
eId\nGROUP BY g.Name\nORDER BY TotalTracks DESC',
                    Name  TotalTracks
 0                  Rock         1297
 1                 Latin          579
 2                 Metal          374
 3   Alternative & Punk          332
 4                  Jazz          130
 5             TV Shows           93
 6                 Blues           81
 7             Classical           74
 8                 Drama           64
 9              R&B/Soul           61
 10               Reggae           58
 11                  Pop           48
 12          Soundtrack           43
 13         Alternative           40
 14         Hip Hop/Rap           35
 15   Electronica/Dance           30
 16               World           28
 17         Heavy Metal           28
 18    Sci Fi & Fantasy           26
 19      Easy Listening           24
 20              Comedy           17
 21          Bossa Nova           15
 22     Science Fiction           13
 23       Rock And Roll           12
 24               Opera            1,
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               'type': 'bar',
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                           'Blues', 'Classical', 'Drama', 'R&B/Soul', 'Reggae', 'Pop',
                           'Soundtrack', 'Alternative', 'Hip Hop/Rap', 'Electronica/Dance',
```

```
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                            'Bossa Nova', 'Science Fiction', 'Rock And Roll', 'Opera'], dtype=object),
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                              43,   40,   35,   30,   28,   28,   26,   24,   17,   15,   13,   12,
                               1]),
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                 'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'TotalTracks'}}}
  }))
```

In [33]:
```
question = """
    Get all genres that do not have any tracks associated with them:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

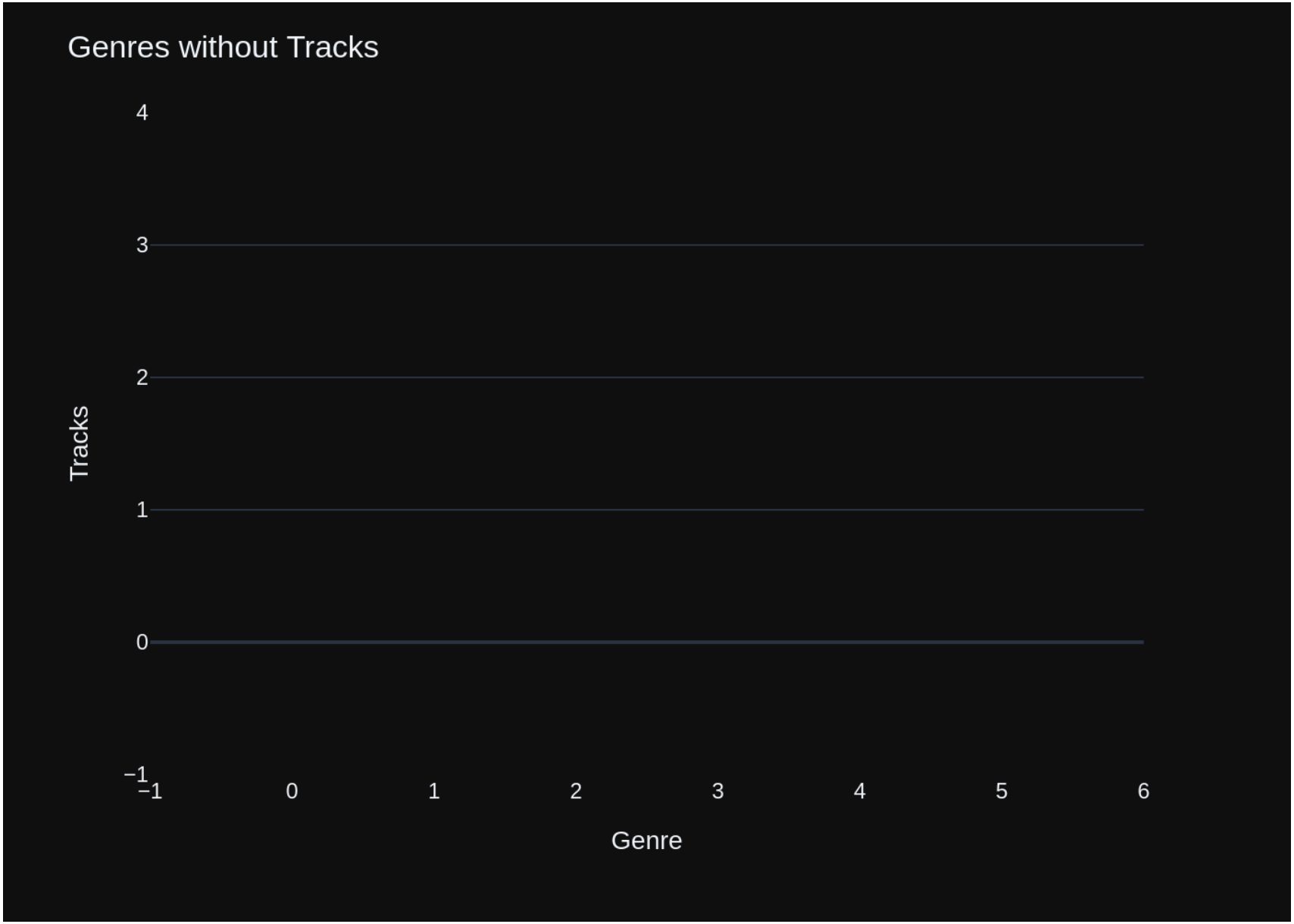
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appe

aring in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistNam
e\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.Genre
Id\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUN
T(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'role': 'user', 'content': ' \n
List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Nam
e, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.N
ame'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'},
{'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tr
acks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'role': 'user',
'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'con
tent': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId =
t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC'}, {'role': 'user', 'content': ' \n   Get all play
lists containing at least 10 tracks and the total duration of those tracks:\n'}, {'role': 'assistant', 'con
tent': 'SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM "playlists" p\nJOIN
"playlist_track" pt ON p.PlaylistId = pt.PlaylistId\nJOIN "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY p.
PlaylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC'}, {'role': 'use
r', 'content': ' \n   Get all playlists containing at least 10 tracks and the total duration of those tr
acks:\n'}, {'role': 'assistant', 'content': 'SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Millisecon
ds) AS TotalDuration\nFROM "playlist_track" pt\nJOIN "playlists" p ON pt.PlaylistId = p.PlaylistId\nJOIN "t
racks" t ON pt.TrackId = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10'}, {'rol
e': 'user', 'content': ' \n   Find all tracks with a name containing "What" (case-insensitive)\n'}, {'rol
e': 'assistant', 'content': "SELECT * FROM tracks WHERE lower(Name) LIKE '%what%'"}, {'role': 'user', 'cont
ent': ' \n   Get all genres that do not have any tracks associated with them:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE INDEX IFK_TrackGenreId ON \"tracks\" (GenreId)\n\nCREATE TABLE \"tr
acks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NUL
L,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NV
ARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) N
OT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE
NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDA
TE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE N
O ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_track\" (TrackId)
\n\nCREATE INDEX IFK_TrackMediaTypeId ON \"tracks\" (MediaTypeId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tra
cks\" (AlbumId)\n\nCREATE TABLE \"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN K

EY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCRE
ATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r
\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFER
ENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (Track
Id) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IF
K_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE TABLE \"playlists\"\r\n(\r\n   PlaylistId INTEGER PRIMA
RY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite
database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please g
enerate a valid SQL query without any explanations for the question. \n2. If the provided context is almost
sufficient but requires knowledge of a specific string in a particular column, please generate an intermedi
ate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermed
iate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Pleas
e use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat th
e answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Identify artists who h
ave albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.Ar
tistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.A
rtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n
GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name"}, {"role": "user", "co
ntent": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by Arti
stId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on t
he number of tracks\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName, COUNT
(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"trac
ks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"rol
e": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are
linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular arti
sts based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT(t.TrackId) AS
TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.Al
bumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": "
\n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assist
ant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.Arti
stId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2
ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId,
a.Name ORDER BY ArtistName"}, {"role": "user", "content": " \n   List all genres and the number of tracks
in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM
\"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name"}, {"role": "user", "content": "
\n   List all genres and the number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT
g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGRO
UP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all genres an
d the number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreI
d) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER
BY TotalTracks DESC"}, {"role": "user", "content": " \n   Get all playlists containing at least 10 track
s and the total duration of those tracks:\n"}, {"role": "assistant", "content": "SELECT p.PlaylistId, SUM

(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM \"playlists\" p\nJOIN \"playlist_track\" pt ON p.Play
listId = pt.PlaylistId\nJOIN \"tracks\" t ON pt.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING COUNT(p
t.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC"}, {"role": "user", "content": " \n   Get
all playlists containing at least 10 tracks and the total duration of those tracks:\n"}, {"role": "assistan
t", "content": "SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Milliseconds) AS TotalDuration\nFROM
\"playlist_track\" pt\nJOIN \"playlists\" p ON pt.PlaylistId = p.PlaylistId\nJOIN \"tracks\" t ON pt.TrackI
d = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10"}, {"role": "user", "conten
t": " \n   Find all tracks with a name containing \"What\" (case-insensitive)\n"}, {"role": "assistant",
"content": "SELECT * FROM tracks WHERE lower(Name) LIKE '%what%'"}, {"role": "user", "content": " \n   Ge
t all genres that do not have any tracks associated with them:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:01:57.859757089Z', 'message': {'role': 'assistant', 'c
ontent': 'SELECT g.Name AS GenreName, t.Name AS TrackName\nFROM "genres" g\nLEFT JOIN "tracks" t ON g.Genr
eId = t.GenreId\nWHERE t.TrackId IS NULL\nORDER BY g.Name;'}, 'done_reason': 'stop', 'done': True, 'total_d
uration': 88528908631, 'load_duration': 668771, 'prompt_eval_count': 1833, 'prompt_eval_duration': 76626764
000, 'eval_count': 54, 'eval_duration': 11202291000}
SELECT g.Name AS GenreName, t.Name AS TrackName
FROM "genres" g
LEFT JOIN "tracks" t ON g.GenreId = t.GenreId
WHERE t.TrackId IS NULL
ORDER BY g.Name;
Output from LLM: SELECT g.Name AS GenreName, t.Name AS TrackName
FROM "genres" g
LEFT JOIN "tracks" t ON g.GenreId = t.GenreId
WHERE t.TrackId IS NULL
ORDER BY g.Name;
Extracted SQL: SELECT g.Name AS GenreName, t.Name AS TrackName
FROM "genres" g
LEFT JOIN "tracks" t ON g.GenreId = t.GenreId
WHERE t.TrackId IS NULL
ORDER BY g.Name
SELECT g.Name AS GenreName, t.Name AS TrackName
FROM "genres" g
LEFT JOIN "tracks" t ON g.GenreId = t.GenreId
WHERE t.TrackId IS NULL
ORDER BY g.Name
Empty DataFrame
Columns: [GenreName, TrackName]
Index: []
Ollama parameters:
model=aya:latest,
options={},

```
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Get all genres that do not have any tracks associated wi
th them:\n'\n\nThe DataFrame was produced using this query: SELECT g.Name AS GenreName, t.Name AS TrackName
\nFROM  \"genres\" g\nLEFT JOIN \"tracks\" t ON g.GenreId = t.GenreId\nWHERE t.TrackId IS NULL\nORDER BY g.
Name\n\nThe following is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes give
s:\n GenreName    object\nTrackName    object\ndtype: object"}, {"role": "user", "content": "Can you genera
te the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe c
alled 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Python code. D
o not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:02:26.09308949Z', 'message': {'role': 'assistant', 'co
ntent': "```python\nimport plotly.express as px\n\n# Create a bar chart using plotly express\nfig = px.bar
(df, x='GenreName', y='TrackName')\n\n# Update layout\nfig.update_layout(\n    title='Genres without Track
s',\n    xaxis_title='Genre',\n    yaxis_title='Tracks'\n)\n\n# Display the plot\nfig.show()\n```"}, 'done_
reason': 'stop', 'done': True, 'total_duration': 28230978356, 'load_duration': 953095, 'prompt_eval_count':
208, 'prompt_eval_duration': 8968379000, 'eval_count': 92, 'eval_duration': 19125884000}
```


Genres without Tracks
4
3
2
1
0
−1
Tracks
−1
0
1
2
3
4
5
6
Genre

Out[33]:
```
('SELECT g.Name AS GenreName, t.Name AS TrackName\nFROM  "genres" g\nLEFT JOIN "tracks" t ON g.GenreId =
t.GenreId\nWHERE t.TrackId IS NULL\nORDER BY g.Name',
 Empty DataFrame
 Columns: [GenreName, TrackName]
 Index: [],
 Figure({
     'data': [{'alignmentgroup': 'True',
               'hovertemplate': 'GenreName=%{x}<br>TrackName=%{y}<extra></extra>',
               'legendgroup': '',
               'marker': {'color': '#636efa', 'pattern': {'shape': ''}},
               'name': '',
               'offsetgroup': '',
               'orientation': 'v',
               'showlegend': False,
               'textposition': 'auto',
               'type': 'bar',
               'x': array([], dtype=object),
               'xaxis': 'x',
               'y': array([], dtype=object),
               'yaxis': 'y'}],
     'layout': {'barmode': 'relative',
                'legend': {'tracegroupgap': 0},
                'margin': {'t': 60},
                'template': '...',
                'title': {'text': 'Genres without Tracks'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Genre'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Tracks'}}}
 }))
```

In [34]:
```
question = """
    List all customers who have not placed any orders:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepe

nd the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please ex
plain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been
asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user',
'content': ' \n   Find the customer who bought the most albums in total quantity (across all invoices):
\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoic
es" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums D
ESC\nLIMIT 1\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the top 5 customers w
ho spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculatio
n using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.Customer
Id, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP
BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'conten
t': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'},
{'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c
\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\n
GROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Hint: alb
um quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in t
otal quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.T
rackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice
_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'ro
le': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5
customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'c
ontent': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii
ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n----------------
--------'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'role':
'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM "invoices"\nGROUP BY Cu
stomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the customer w
ith the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS To
talInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nO
RDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who s
pent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation us
ing invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId,
SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY
c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the customer
with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) AS Numbe
rOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n--------------
----------'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overa
ll, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail
table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpen
ding\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY
TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all customers who have not placed
any orders:\n'}]
Ollama parameters:

```
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n    InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n    CustomerId INTEGER  NOT NULL,\r\n    InvoiceDate DATETIME  NOT NULL,\r\n    Billin
gAddress NVARCHAR(70),\r\n    BillingCity NVARCHAR(40),\r\n    BillingState NVARCHAR(40),\r\n    BillingCou
ntry NVARCHAR(40),\r\n    BillingPostalCode NVARCHAR(10),\r\n    Total NUMERIC(10,2)  NOT NULL,\r\n    FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE TABLE \"customers\"\r\n(\r\n    CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n
FirstName NVARCHAR(40)  NOT NULL,\r\n    LastName NVARCHAR(20)  NOT NULL,\r\n    Company NVARCHAR(80),\r\n
Address NVARCHAR(70),\r\n    City NVARCHAR(40),\r\n    State NVARCHAR(40),\r\n    Country NVARCHAR(40),\r\n
PostalCode NVARCHAR(10),\r\n    Phone NVARCHAR(24),\r\n    Fax NVARCHAR(24),\r\n    Email NVARCHAR(60)  NOT
NULL,\r\n    SupportRepId INTEGER,\r\n    FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId)
\r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n    InvoiceL
ineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    InvoiceId INTEGER  NOT NULL,\r\n    TrackId INTEGE
R  NOT NULL,\r\n    UnitPrice NUMERIC(10,2)  NOT NULL,\r\n    Quantity INTEGER  NOT NULL,\r\n    FOREIGN KE
Y (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    F
OREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n
\nCREATE TABLE \"employees\"\r\n(\r\n    EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    Last
Name NVARCHAR(20)  NOT NULL,\r\n    FirstName NVARCHAR(20)  NOT NULL,\r\n    Title NVARCHAR(30),\r\n    Rep
ortsTo INTEGER,\r\n    BirthDate DATETIME,\r\n    HireDate DATETIME,\r\n    Address NVARCHAR(70),\r\n    Ci
ty NVARCHAR(40),\r\n    State NVARCHAR(40),\r\n    Country NVARCHAR(40),\r\n    PostalCode NVARCHAR(10),\r
\n    Phone NVARCHAR(24),\r\n    Fax NVARCHAR(24),\r\n    Email NVARCHAR(60),\r\n    FOREIGN KEY (ReportsT
o) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TAB
LE \"playlist_track\"\r\n(\r\n    PlaylistId INTEGER  NOT NULL,\r\n    TrackId INTEGER  NOT NULL,\r\n    CO
NSTRAINT PK_PlaylistTrack PRIMARY KEY  (PlaylistId, TrackId),\r\n    FOREIGN KEY (PlaylistId) REFERENCES
\"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (TrackId) RE
FERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums
\"\r\n(\r\n    AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    Title NVARCHAR(160)  NOT NULL,\r
\n    ArtistId INTEGER  NOT NULL,\r\n    FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tO
N DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (Supp
ortRepId)\n\nCREATE TABLE \"playlists\"\r\n(\r\n    PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n    Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"tracks\"\r\n(\r\n    TrackId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n    Name NVARCHAR(200)  NOT NULL,\r\n    AlbumId INTEGER,\r\n    MediaTypeId INTEGER
NOT NULL,\r\n    GenreId INTEGER,\r\n    Composer NVARCHAR(220),\r\n    Milliseconds INTEGER  NOT NULL,\r\n
Bytes INTEGER,\r\n    UnitPrice NUMERIC(10,2)  NOT NULL,\r\n    FOREIGN KEY (AlbumId) REFERENCES \"albums\"
(AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (GenreId) REFERENCES \"genres
\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (MediaTypeId) REFERENCES
\"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_Invo
```

iceCustomerId ON \"invoices\" (CustomerId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-----------------------"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM \"invoices\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"ro

```
le": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOI
N \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT
5"}, {"role": "user", "content": "  \n    List all customers who have not placed any orders:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:03:57.91348811Z', 'message': {'role': 'assistant', 'co
ntent': 'SELECT CustomerId, FirstName, LastName\nFROM "customers"\nLEFT JOIN "invoices" ON "customers".Cust
omerId = "invoices".CustomerId\nWHERE InvoiceId IS NULL'}, 'done_reason': 'stop', 'done': True, 'total_dura
tion': 91730200472, 'load_duration': 850451, 'prompt_eval_count': 1943, 'prompt_eval_duration': 8239876200
0, 'eval_count': 41, 'eval_duration': 8454704000}
SELECT CustomerId, FirstName, LastName
FROM "customers"
LEFT JOIN "invoices" ON "customers".CustomerId = "invoices".CustomerId
WHERE InvoiceId IS NULL
SELECT CustomerId, FirstName, LastName
FROM "customers"
LEFT JOIN "invoices" ON "customers".CustomerId = "invoices".CustomerId
WHERE InvoiceId IS NULL
Couldn't run sql:  Execution failed on sql 'SELECT CustomerId, FirstName, LastName
FROM "customers"
LEFT JOIN "invoices" ON "customers".CustomerId = "invoices".CustomerId
WHERE InvoiceId IS NULL': ambiguous column name: CustomerId
```

In [35]:
```
question = """
    There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums
    Can you find the top 10 most popular artists based on the number of tracks
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "artists"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks \n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'role': 'us

er', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n
\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "al
bums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOI
N "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP B
Y a.ArtistId, a.Name'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_item
s, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoice
s):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "cus
tomers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.In
voiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n
Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most al
bums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, C
OUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\n
GROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'c
ontent': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who
bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELE
CT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceI
d = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content':
' \n   List all albums and their corresponding artist names \n'}, {'role': 'assistant', 'content': 'SELE
CT a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId = ar.Artist
Id'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find
the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assi
stant', 'content': 'SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM "invoices" i\nJOIN "i
nvoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT
5'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'ro
le': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "track
s" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'role': 'user', 'con
tent': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by Artis
tId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on th
e number of tracks\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREM
ENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT
NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n
Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\"
(AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres
\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES

\"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums
\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r
\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tO
N DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"artists\"\r\n(\r\n   ArtistId INTEGER PRIMAR
Y KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON \"albums
\" (ArtistId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE TABLE \"playlists\"\r\n(\r
\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE
\"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n
\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NUL
L,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) R
EFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (T
rackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDE
X IFK_TrackGenreId ON \"tracks\" (GenreId)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_track\"
(TrackId)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelin
es \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations f
or the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific str
ing in a particular column, please generate an intermediate SQL query to find the distinct strings in that
column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficie
nt, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the quest
ion has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"ro
le": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists ar
e linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular ar
tists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS Art
istName, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistI
d\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIM
IT 10"}, {"role": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums a
nd artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 mo
st popular artists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUN
T(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tra
cks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user",
"content": " \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"},
{"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"album
s\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOI
N \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP
BY a.ArtistId, a.Name ORDER BY ArtistName"}, {"role": "user", "content": " \n   Identify artists who hav
e albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.Arti
stId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.Art
istId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n G
ROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name"}, {"role": "user", "con
tent": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bo
ught the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT
c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId =

i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY Tota
lAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_item
s, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoice
s):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"in
voices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalA
lbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Hint: album quantity
is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantit
y (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS T
otalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.Custom
erId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all albums and their
corresponding artist names \n"}, {"role": "assistant", "content": "SELECT a.Title, a.ArtistId, ar.Name AS
ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.ArtistId"}, {"role": "user", "conten
t": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bough
t the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.
CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.Inv
oiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "conte
nt": " \n   List all genres and the number of tracks in each genre:\n"}, {"role": "assistant", "content":
"SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.Genr
eId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5"}, {"role": "user", "content": " \n   There are 3
tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are
linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n"}]

Add of existing embedding ID: 7d92306a-d153-5752-97bf-7bf120cd496a-sql
Insert of existing embedding ID: 7d92306a-d153-5752-97bf-7bf120cd496a-sql

```
Ollama Response:
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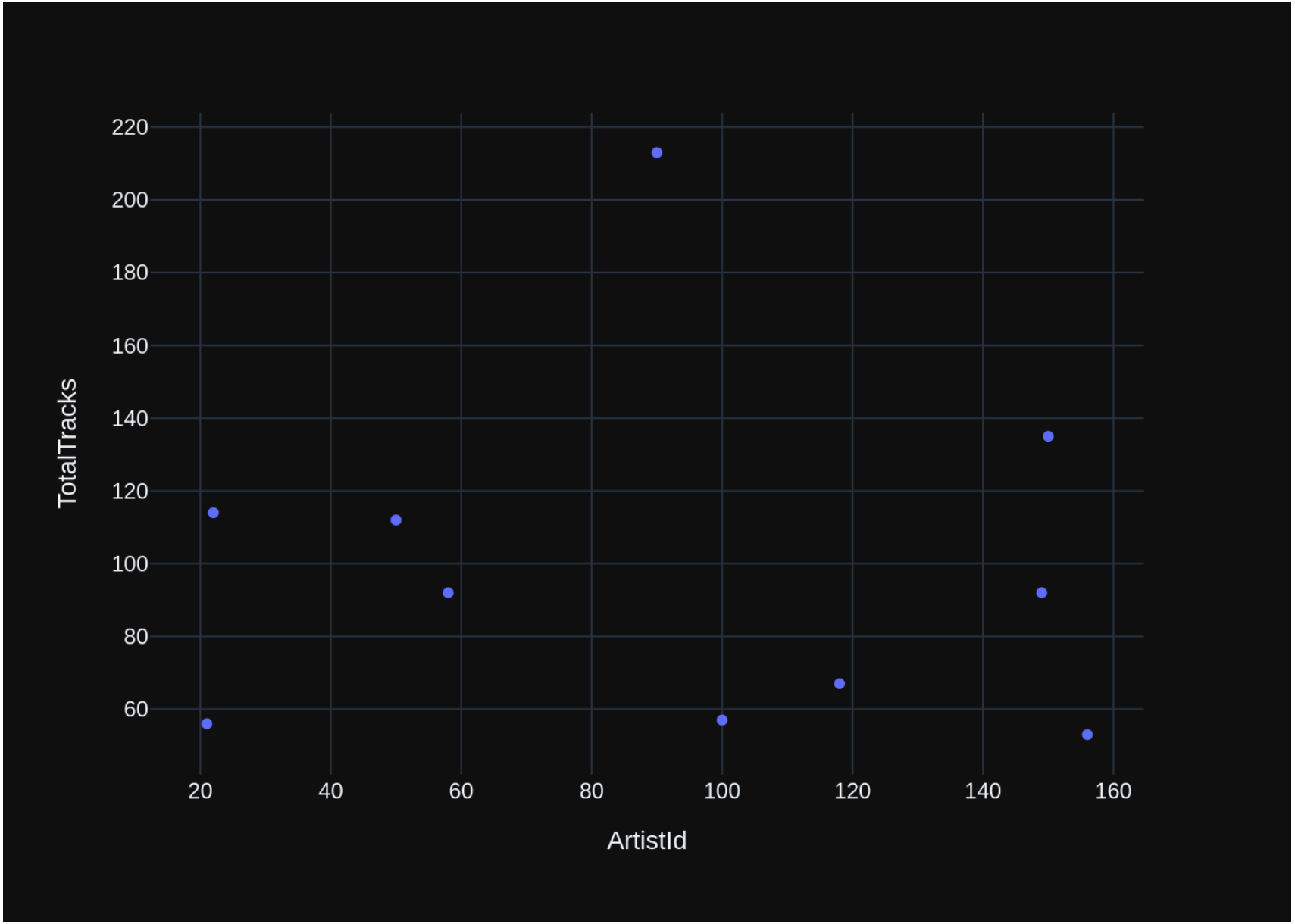
ontent': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN
"albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.
Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, 'done_reason': 'stop', 'done': True, 'total_duration': 9780276
1370, 'load_duration': 780469, 'prompt_eval_count': 1909, 'prompt_eval_duration': 79639662000, 'eval_coun
t': 84, 'eval_duration': 17514399000}
SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks
FROM "artists" a
JOIN "albums" al ON a.ArtistId = al.ArtistId
JOIN "tracks" t ON al.AlbumId = t.AlbumId
GROUP BY a.ArtistId, a.Name
ORDER BY TotalTracks DESC
LIMIT 10
SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks
FROM "artists" a
JOIN "albums" al ON a.ArtistId = al.ArtistId
JOIN "tracks" t ON al.AlbumId = t.AlbumId
GROUP BY a.ArtistId, a.Name
ORDER BY TotalTracks DESC
LIMIT 10
   ArtistId       ArtistName  TotalTracks
0        90      Iron Maiden          213
1       150               U2          135
2        22     Led Zeppelin          114
3        50        Metallica          112
4        58      Deep Purple           92
5       149             Lost           92
6       118        Pearl Jam           67
7       100    Lenny Kravitz           57
8        21  Various Artists           56
9       156       The Office           53
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: ' \n    There are 3 tables: artists, albums and tracks, where alb
ums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n    Can you find the top
10 most popular artists based on the number of tracks\n'\n\nThe DataFrame was produced using this query: SE
LECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\"
```

al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nO
RDER BY TotalTracks DESC\nLIMIT 10\n\nThe following is information about the resulting pandas DataFrame 'd
f': \nRunning df.dtypes gives:\n ArtistId   int64\nArtistName   object\nTotalTracks   int64\ndtyp
e: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of t
he dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the dataf
rame, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the cod
e."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:06:06.424434876Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport pandas as pd\nimport plotly.express as px\n\n# Assuming the 'df' DataFrame has
columns ['ArtistId', 'ArtistName', 'TotalTracks']\nfig = px.bar(df, x='ArtistName', y='TotalTracks', color
='ArtistId', title='Top 10 Most Popular Artists')\nfig.update_xaxes(rotation=45)\nfig.show()\n```"}, 'done_
reason': 'stop', 'done': True, 'total_duration': 30640339181, 'load_duration': 41478552, 'prompt_eval_coun
t': 264, 'prompt_eval_duration': 11145363000, 'eval_count': 93, 'eval_duration': 19354548000}


220
200
180
160
140
120
100
80
60
TotalTracks
20
40
60
80
100
120
140
160
ArtistId

Out[35]:
```
('SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "album
s" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name
\nORDER BY TotalTracks DESC\nLIMIT 10',
    ArtistId       ArtistName  TotalTracks
 0        90      Iron Maiden          213
 1       150               U2          135
 2        22     Led Zeppelin          114
 3        50        Metallica          112
 4        58      Deep Purple           92
 5       149             Lost           92
 6       118        Pearl Jam           67
 7       100    Lenny Kravitz           57
 8        21  Various Artists           56
 9       156       The Office           53,
 Figure({
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               'mode': 'markers',
               'name': '',
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               'type': 'scatter',
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               'xaxis': 'x',
               'y': array([213, 135, 114, 112,  92,  92,  67,  57,  56,  53]),
               'yaxis': 'y'}],
     'layout': {'legend': {'tracegroupgap': 0},
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                'template': '...',
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'ArtistId'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'TotalTracks'}}}
 }))
```

In [36]:
```
question = """
     List all customers from Canada and their email addresses:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

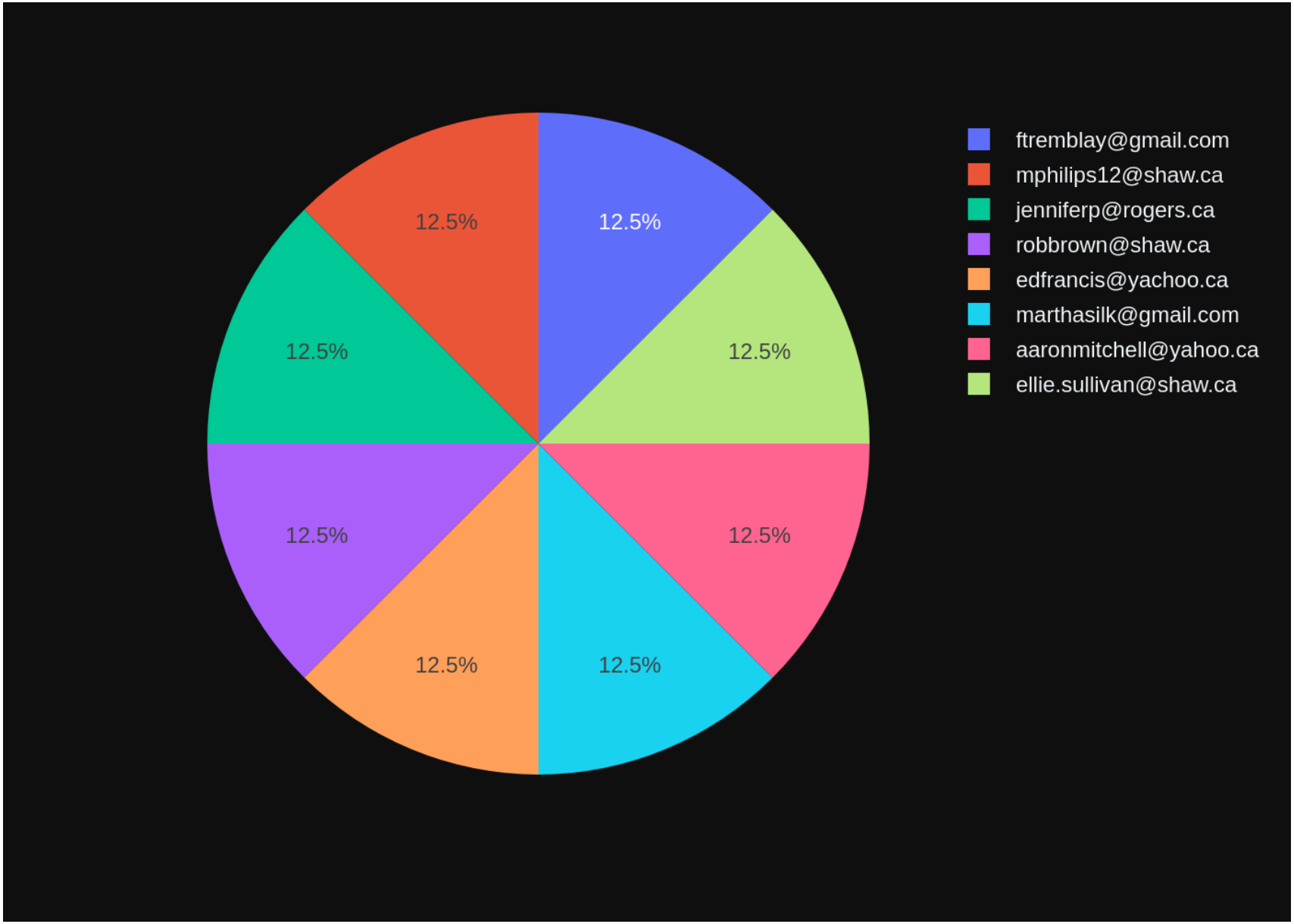
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   List all customers from Canada and their email addresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.Email, c.Country\nFROM "customers" c\nWHERE c.Country = \'Canada\''}, {'role': 'user', 'content': ' \n   List all customers from Canada and their email addresses:\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, c.Email, SUM(i.Tota

l) AS TotalSpent\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\n
ORDER BY TotalSpent DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   what are the top 5 countries that
customers come from?\n'}, {'role': 'assistant', 'content': 'SELECT Country, COUNT(CustomerId) AS CustomerCo
unt\nFROM "customers"\nGROUP BY Country\nORDER BY CustomerCount DESC\nLIMIT 5'}, {'role': 'user', 'conten
t': 'what are the top 5 countries that customers come from?'}, {'role': 'assistant', 'content': 'SELECT c.C
ountry, COUNT(*) AS TotalCustomers\nFROM "customers" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nL
IMIT 5'}, {'role': 'user', 'content': ' \n   顾客来自的前 5 个国家是哪些？\n'}, {'role': 'assistant', 'conten
t': 'SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c\nGROUP BY c.Country\nORDER BY Customer
Count DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   aus welchen fünf Ländern kommen die meisten Kun
den?\n'}, {'role': 'assistant', 'content': 'SELECT c.Country, COUNT(*) AS CustomerCount\nFROM "customers" c
\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find th
e customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.Invo
iceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.C
ustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the customer
with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOf
Invoices\nFROM "invoices"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1'}, {'role': 'user', 'c
ontent': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT
CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfIn
voices DESC\nLIMIT 1\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the total numb
er of invoices per country:\n'}, {'role': 'assistant', 'content': 'SELECT Customer.Country, COUNT(invoice.I
nvoiceId) AS InvoiceCount\nFROM "customers" customer\nJOIN "invoices" invoice ON customer.CustomerId = invo
ice.CustomerId\nGROUP BY Country'}, {'role': 'user', 'content': ' \n   List all customers from Canada an
d their email addresses:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\nC
REATE TABLE \"customers\"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstNa
me NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Addr
ess NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n
PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT
NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId)
\r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INT
EGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME
NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR
(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2)
NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE TABLE

\"employees\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE sqlite_sequence(name,seq)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.Email, c.Country\nFROM \"customers\" c\nWHERE c.Country = 'Canada'"}, {"role": "user", "content": " \n   List all customers from Canada and their email addresses:\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, c.Email, SUM(i.Total) AS TotalSpent\nFROM Customers c\nJOIN Invoices i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 1"}, {"role": "user", "content": " \n   what are the top 5 countries that customers come from?\n"}, {"role": "assistant", "content": "SELECT Country, COUNT(CustomerId) AS CustomerCount\nFROM \"customers\"\nGROUP BY Country\nORDER BY CustomerCount DESC\nLIMIT 5"}, {"role": "user", "content": "what are the top 5 countries that customers come from?"}, {"role": "assistant", "content": "SELECT c.Country, COUNT(*) AS TotalCustomers\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY TotalCustomers DESC\nLIMIT 5"}, {"role": "user", "content": " \n   \u987e\u5ba2\u6765\u81ea\u7684\u524d 5 \u4e2a\u56fd\u5bb6\u662f\u54ea\u4e9b\uff1f\n"}, {"role": "assistant", "content": "SELECT c.Country, COUNT(*) AS CustomerCount\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT 5"}, {"role": "user", "content": " \n   aus welchen f\u00fcnf L\u00e4ndern kommen die meisten Kunden?\n"}, {"role": "assistant", "content": "SELECT c.Country, COUNT(*) AS CustomerCount\nFROM \"customers\" c\nGROUP BY c.Country\nORDER BY CustomerCount DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY

```
c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": "  \n     Find the custom
er with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) as Nu
mOfInvoices\nFROM \"invoices\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1"}, {"role": "use
r", "content": "  \n     Find the customer with the most invoices \n"}, {"role": "assistant", "content": "S
ELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY Numb
erOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": "  \n    Find the tota
l number of invoices per country:\n"}, {"role": "assistant", "content": "SELECT Customer.Country, COUNT(inv
oice.InvoiceId) AS InvoiceCount\nFROM \"customers\" customer\nJOIN \"invoices\" invoice ON customer.Custome
rId = invoice.CustomerId\nGROUP BY Country"}, {"role": "user", "content": "  \n     List all customers from
Canada and their email addresses:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:07:23.528312344Z', 'message': {'role': 'assistant', 'c
ontent': 'SELECT c.Email, c.Country\nFROM  "customers" c\nWHERE c.Country = \'Canada\''}, 'done_reason': 's
top', 'done': True, 'total_duration': 76986025324, 'load_duration': 667861, 'prompt_eval_count': 1655, 'pro
mpt_eval_duration': 71284784000, 'eval_count': 25, 'eval_duration': 5058967000}
SELECT c.Email, c.Country
FROM  "customers" c
WHERE c.Country = 'Canada'
SELECT c.Email, c.Country
FROM  "customers" c
WHERE c.Country = 'Canada'
                   Email Country
0     ftremblay@gmail.com  Canada
1      mphilips12@shaw.ca  Canada
2     jenniferp@rogers.ca  Canada
3        robbrown@shaw.ca  Canada
4     edfrancis@yachoo.ca  Canada
5    marthasilk@gmail.com  Canada
6  aaronmitchell@yahoo.ca  Canada
7  ellie.sullivan@shaw.ca  Canada
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n     List all customers from Canada and their email addresse
s:\n'\n\nThe DataFrame was produced using this query: SELECT c.Email, c.Country\nFROM  \"customers\" c\nWHE
RE c.Country = 'Canada'\n\nThe following is information about the resulting pandas DataFrame 'df': \nRunnin
g df.dtypes gives:\n Email      object\nCountry    object\ndtype: object"}, {"role": "user", "content": "Ca
n you generate the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas
dataframe called 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Pyt
```

hon code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:07:59.762002397Z', 'message': {'role': 'assistant', 'content': "```python\nimport plotly.express as px\n\n# Create a bar chart using the 'df' dataframe and customize it to suit the request\nfig = px.bar(df, x='Email', y='Country', color='Country')\n\n# Update layout for better visualization\nfig.update_layout(\n   title='Canadian Customers',\n   xaxis_title='Customer Email',\n   yaxis_title='Country',\n   barmode='stack', # For stacked bar chart\n   color_discrete_sequence=px.colors.sequential.Plotly\n)\n\n# Show the plot\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 36208571147, 'load_duration': 44219294, 'prompt_eval_count': 176, 'prompt_eval_duration': 7567635000, 'eval_count': 132, 'eval_duration': 28502004000}


12.5%
12.5%
12.5%
12.5%
12.5%
12.5%
12.5%
ftremblay@gmail.com
mphilips12@shaw.ca
jenniferp@rogers.ca
robbrown@shaw.ca
edfrancis@yachoo.ca
marthasilk@gmail.com
aaronmitchell@yahoo.ca
ellie.sullivan@shaw.ca

Out[36]:
```
('SELECT c.Email, c.Country\nFROM  "customers" c\nWHERE c.Country = \'Canada\'',
                      Email Country
 0     ftremblay@gmail.com  Canada
 1      mphilips12@shaw.ca  Canada
 2     jenniferp@rogers.ca  Canada
 3        robbrown@shaw.ca  Canada
 4     edfrancis@yachoo.ca  Canada
 5    marthasilk@gmail.com  Canada
 6  aaronmitchell@yahoo.ca  Canada
 7  ellie.sullivan@shaw.ca  Canada,
 Figure({
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               'hovertemplate': 'Email=%{label}<extra></extra>',
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                                'robbrown@shaw.ca', 'edfrancis@yachoo.ca', 'marthasilk@gmail.com',
                                'aaronmitchell@yahoo.ca', 'ellie.sullivan@shaw.ca'], dtype=object),
               'legendgroup': '',
               'name': '',
               'showlegend': True,
               'type': 'pie'}],
     'layout': {'legend': {'tracegroupgap': 0}, 'margin': {'t': 60}, 'template': '...'}
 }))
```

In [37]:
```
question = """
     Find the customer with the most invoices
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

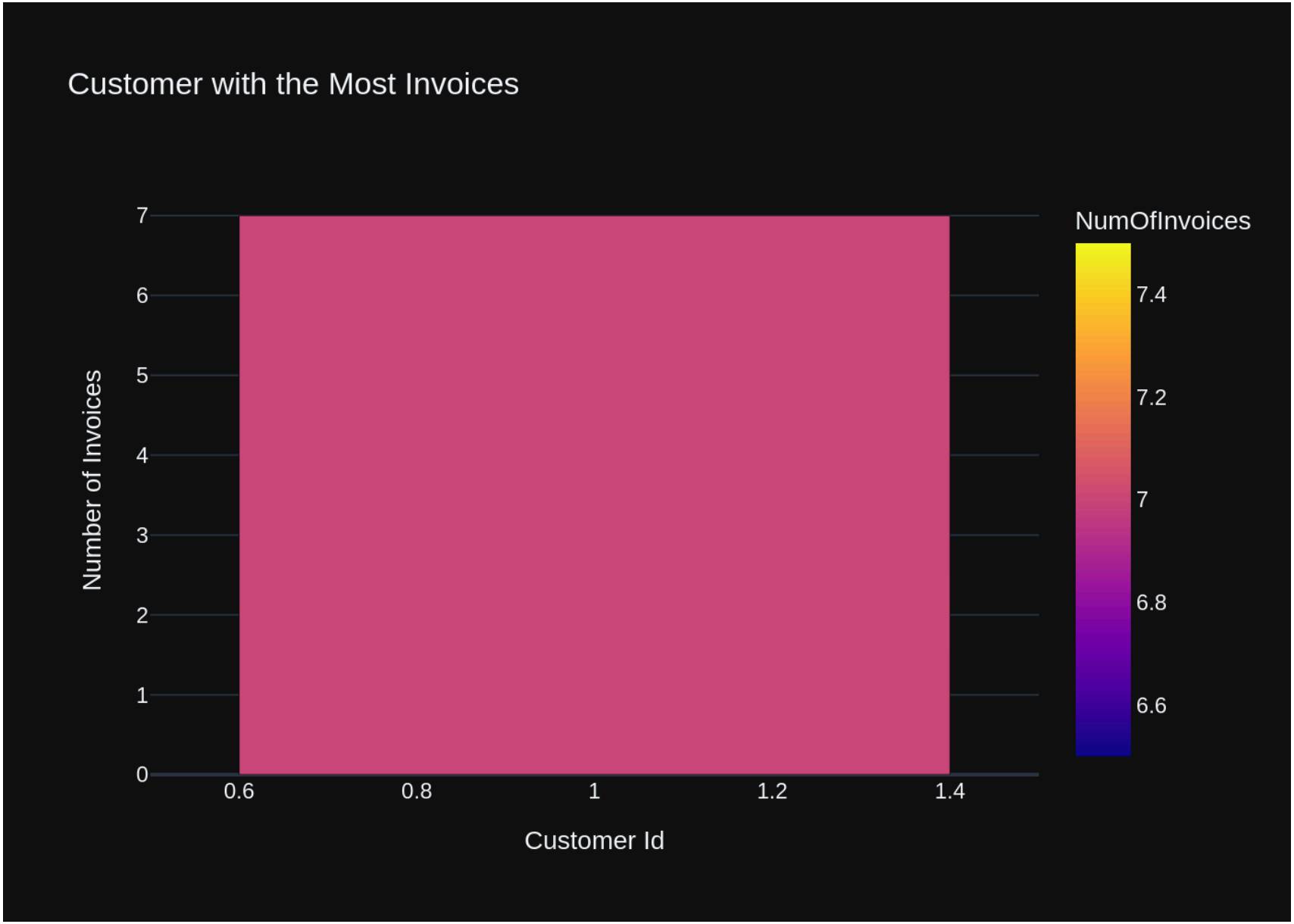
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON "customers" (SupportRepId)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices

DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'rol
e': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM "invoices"\nGROUP B
Y CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the custom
er with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) AS Nu
mberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n----------
----------'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money ov
erall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items deta
il table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalS
pent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY
TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the top 5
customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table,
calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT
c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.Custome
rId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find
the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoi
ces table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'conten
t': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.Custome
rId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'conten
t': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'},
{'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c
\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\n
GROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the
customer who bought the most albums in total quantity (across all invoices): \n'}, {'role': 'assistant', 'c
ontent': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii
ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n----------------
--------'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n
Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role':
'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "i
nvoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY
c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quanti
ty is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quan
tity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) A
S TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.Custome
rId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n
Find the customer with the most invoices \n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo

rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   Billin
gAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCou
ntry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineInv
oiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER
PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r
\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId)
REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (Tr
ackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX
IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"customers\"\r\n(\r\n   CustomerId
INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCH
AR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n
State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(2
4),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREI
GN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE INDEX IFK_CustomerSupportRepId ON \"customers\" (SupportRepId)\n\nCREATE TABLE \"employees
\"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NUL
L,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   Bir
thDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   St
ate NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r
\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES \"employees\"
(EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON
\"employees\" (ReportsTo)\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT
NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NUL
L,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Byt
es INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (A
lbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\"
(GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"me
dia_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context
\n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is su
fficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided
context is almost sufficient but requires knowledge of a specific string in a particular column, please gen
erate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comme
nt saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be gen
erated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered befor
e, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Fin
d the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.
InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROU
P BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the c
ustomer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId)

as NumOfInvoices\nFROM \"invoices\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT CustomerId, COUNT(InvoiceId) AS NumberOfInvoices \nFROM Invoices \nGROUP BY CustomerId\nORDER BY NumberOfInvoices DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:09:39.473541408Z', 'message': {'role': 'assistant', 'content': 'SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM "invoices"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1'}, 'done_reason': 'stop', 'done': True, 'total_duration': 99603221108, 'load_duration': 836831, 'prompt_eval_count': 1997, 'prompt_eval_duration': 90547117000, 'eval_count': 39, 'eval_duration': 8319781000}
```
SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices
FROM  "invoices"
```

```
GROUP BY CustomerId
ORDER BY NumOfInvoices DESC
LIMIT 1
SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices
FROM  "invoices"
GROUP BY CustomerId
ORDER BY NumOfInvoices DESC
LIMIT 1
   CustomerId  NumOfInvoices
0           1             7
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n     Find the customer with the most invoices \n'\n\nThe Dat
aFrame was produced using this query: SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM  \"invoice
s\"\nGROUP BY CustomerId\nORDER BY NumOfInvoices DESC\nLIMIT 1\n\nThe following is information about the re
sulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n CustomerId       int64\nNumOfInvoices    int64
\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the result
s of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the
dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the
code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:10:13.133751625Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport pandas as pd\nimport plotly.express as px\n\n# Assuming your DataFrame is named
'df' and it has two columns: 'CustomerId' and 'NumOfInvoices'\nfig = px.bar(df, x='CustomerId', y='NumOfInv
oices', color='NumOfInvoices',\n              title='Customer with the Most Invoices')\nfig.update_layout(x
axis_title='Customer Id', yaxis_title='Number of Invoices')\nfig.show()\n```"}, 'done_reason': 'stop', 'don
e': True, 'total_duration': 33633313758, 'load_duration': 41227286, 'prompt_eval_count': 193, 'prompt_eval_
duration': 8891968000, 'eval_count': 114, 'eval_duration': 24645906000}
```


Customer with the Most Invoices
Number of Invoices
0
1
2
3
4
5
6
7
0.6
0.8
1
1.2
1.4
Customer Id
NumOfInvoices
7.4
7.2
7
6.8
6.6

Out[37]:
```
('SELECT CustomerId, COUNT(InvoiceId) as NumOfInvoices\nFROM  "invoices"\nGROUP BY CustomerId\nORDER BY Nu
mOfInvoices DESC\nLIMIT 1',
    CustomerId  NumOfInvoices
 0           1             7,
 Figure({
     'data': [{'alignmentgroup': 'True',
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               'legendgroup': '',
               'marker': {'color': array([7]), 'coloraxis': 'coloraxis', 'pattern': {'shape': ''}},
               'name': '',
               'offsetgroup': '',
               'orientation': 'v',
               'showlegend': False,
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               'type': 'bar',
               'x': array([1]),
               'xaxis': 'x',
               'y': array([7]),
               'yaxis': 'y'}],
     'layout': {'barmode': 'relative',
                'coloraxis': {'colorbar': {'title': {'text': 'NumOfInvoices'}},
                              'colorscale': [[0.0, '#0d0887'], [0.1111111111111111,
                                             '#46039f'], [0.2222222222222222,
                                             '#7201a8'], [0.3333333333333333,
                                             '#9c179e'], [0.4444444444444444,
                                             '#bd3786'], [0.5555555555555556,
                                             '#d8576b'], [0.6666666666666666,
                                             '#ed7953'], [0.7777777777777778,
                                             '#fb9f3a'], [0.8888888888888888,
                                             '#fdca26'], [1.0, '#f0f921']]},
                'legend': {'tracegroupgap': 0},
                'template': '...',
                'title': {'text': 'Customer with the Most Invoices'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Customer Id'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Number of Invoices'}}}
 }))
```

In [ ]:

Advanced SQL questions

In [38]:
```
question = """
     Find the customer who bought the most albums in total quantity (across all invoices):
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "artists"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_

items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------
----------'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items,
\n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoice
s):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFRO
M "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY Tota
lAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_item
s, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoice
s):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "inv
oices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbum
s DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n
\n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'r
ole': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJO
IN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMI
T 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent
the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using i
nvoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM
(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.C
ustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': '
\n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerI
d, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerI
d\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Fin
d the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on inv
oices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'conte
nt': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerI
d = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'content': '
\n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be fo
und on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistan
t', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i O
N c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'use
r', 'content': ' \n   Find the customer who bought the most albums in total quantity (across all invoice
s): \n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREM
ENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT
NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n
Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\"

(AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres
\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES
\"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"invoic
e_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER N
OT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGE
R NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTI
ON ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMEN
T NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (Ar
tistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE IN
DEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE TABLE \"invoices\"\r\n(\r\n   InvoiceId INTEGER P
RIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NU
LL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(4
0),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2)
NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE IN
DEX IFK_InvoiceLineInvoiceId ON \"invoice_items\" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"in
voices\" (CustomerId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE TABLE \"artists
\"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===
Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the pro
vided context is sufficient, please generate a valid SQL query without any explanations for the question.
\n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particul
ar column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend t
he query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explai
n why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been aske
d and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "con
tent": " \n   Find the customer who bought the most albums in total quantity (across all invoices):
\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"custo
mers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = i
i.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n
Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most al
bums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, C
OUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\n
JOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\n
LIMIT 5"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quan
tity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId)
AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.Cu
stomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------------------------"}, {"role": "user", "content": "
\n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the m
ost albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.Custome
rId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId
= ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": "

\n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n------------------------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n------------------------"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:11:54.460004919Z', 'message': {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, 'done_reason': 'stop', 'done': True, 'total_duration': 101216919787, 'load_duration': 712294, 'prompt_eval_count': 1927, 'prompt_eval_duration': 87957431000, 'eval_count': 59, 'eval_duration': 12656171000}
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SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums
FROM "invoices" i
JOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId
GROUP BY i.CustomerId
ORDER BY TotalAlbums DESC
LIMIT 1
SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums
FROM "invoices" i
JOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId
GROUP BY i.CustomerId
ORDER BY TotalAlbums DESC
```
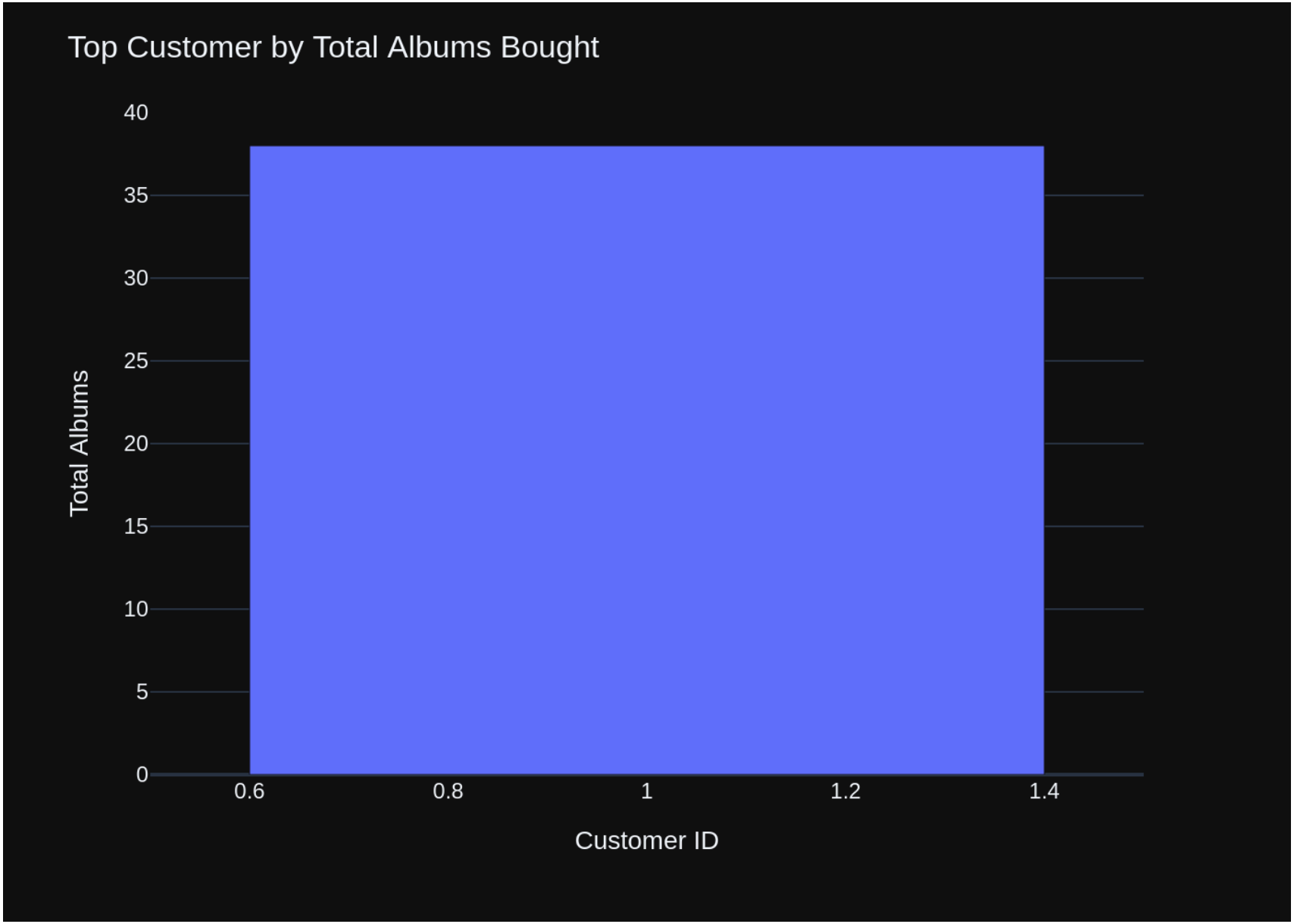

```
LIMIT 1
   CustomerId  TotalAlbums
0           1           38
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n     Find the customer who bought the most albums in total q
uantity (across all invoices): \n'\n\nThe DataFrame was produced using this query: SELECT i.CustomerId, COU
NT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId
\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n\nThe following is information about the resul
ting pandas DataFrame 'df': \nRunning df.dtypes gives:\n CustomerId     int64\nTotalAlbums    int64\ndtype:
object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of the
dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the datafram
e, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the cod
e."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:12:23.109286184Z', 'message': {'role': 'assistant', 'c
ontent': '```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x="CustomerId",
y="TotalAlbums")\n\n# Add title and labels\nfig.update_layout(\n    title="Top Customer by Total Albums Bou
ght",\n    xaxis_title="Customer ID",\n    yaxis_title="Total Albums"\n)\n\n# Show the chart\nfig.show()\n`
``'}, 'done_reason': 'stop', 'done': True, 'total_duration': 28621525296, 'load_duration': 41795270, 'promp
t_eval_count': 224, 'prompt_eval_duration': 8958782000, 'eval_count': 95, 'eval_duration': 19566274000}
```


Top Customer by Total Albums Bought
Total Albums
40
35
30
25
20
15
10
5
0
0.6
0.8
1
1.2
1.4
Customer ID

Out[38]:
```
('SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.I
nvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1',
    CustomerId  TotalAlbums
 0           1           38,
 Figure({
     'data': [{'alignmentgroup': 'True',
               'hovertemplate': 'CustomerId=%{x}<br>TotalAlbums=%{y}<extra></extra>',
               'legendgroup': '',
               'marker': {'color': '#636efa', 'pattern': {'shape': ''}},
               'name': '',
               'offsetgroup': '',
               'orientation': 'v',
               'showlegend': False,
               'textposition': 'auto',
               'type': 'bar',
               'x': array([1]),
               'xaxis': 'x',
               'y': array([38]),
               'yaxis': 'y'}],
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                'legend': {'tracegroupgap': 0},
                'margin': {'t': 60},
                'template': '...',
                'title': {'text': 'Top Customer by Total Albums Bought'},
                'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Customer ID'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Total Albums'}}}
 }))
```

In [39]:
```
question = """
    Hint: album quantity is found in invoice_items,

    Find the top 5 customers who bought the most albums in total quantity (across all invoices):
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

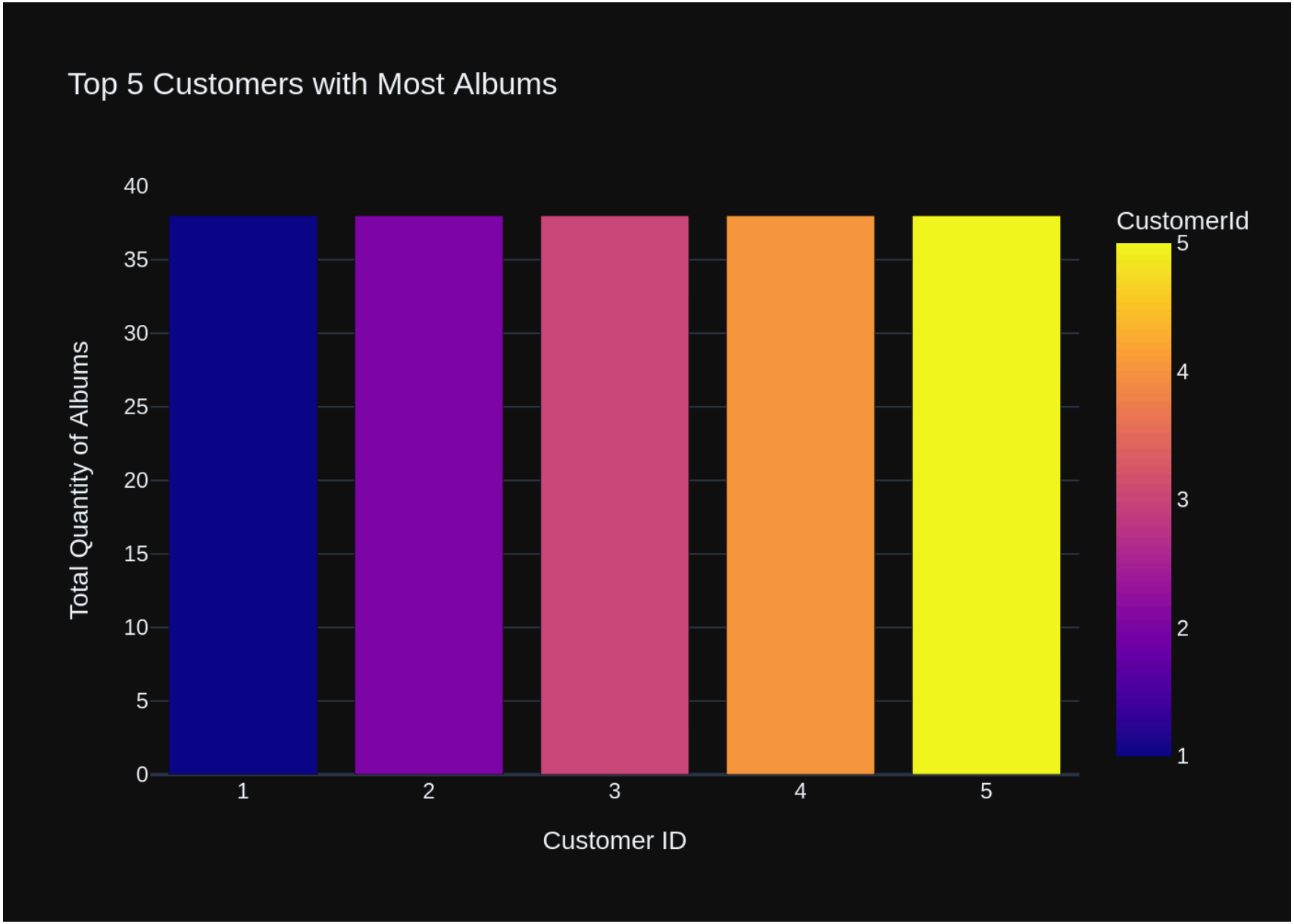
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "artists"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'conten

t': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON
i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n----------
-----'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   F
ind the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role':
'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "in
voice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'},
{'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity (acros
s all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlb
ums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.Inv
oiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1'}, {'role': 'user', 'conte
nt': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'},
{'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i
\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\n
LIMIT 1'}, {'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quan
tity (across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId)
AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.Custom
erId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------------------------'}, {'role': 'user', 'content': ' \n
Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on
invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'co
ntent': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.Custom
erId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'},
{'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n
Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessa
ry \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customer
s" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLI
MIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall,
\n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail tabl
e is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending
\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY Tot
alSpending DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_i
tems, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoice
s):\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoice_items\"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY K
EY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   Uni
tPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCE

S \"invoices\" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) RE
FERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"tracks
\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n
AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(22
0),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NUL
L,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO AC
TION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO
ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTI
ON ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMEN
T NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (Ar
tistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE IN
DEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON \"invoice_items
\" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"invo
ices\"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NUL
L,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(4
0),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR
(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES \"customers\" (Custo
merId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invo
ices\" (CustomerId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE TABLE \"artists\"\r
\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Addi
tional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provide
d context is sufficient, please generate a valid SQL query without any explanations for the question. \n2.
If the provided context is almost sufficient but requires knowledge of a specific string in a particular co
lumn, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the qu
ery with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why
it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and
answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content":
" \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought th
e most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.Cust
omerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.Cus
tomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbu
ms DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n
\n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"r
ole": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM \"invoices
\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums
DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n
\n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"r
ole": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\n
JOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\n
LIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Hint: album quantity is found in
invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across al
l invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\n

FROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n----------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n----------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:14:02.627686998Z', 'message': {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, 'done_reason': 'stop', 'done': True, 'total_duration': 99430760525, 'load_duration': 1769703, 'prompt_eval_count': 1952, 'prompt_eval_duration': 82824362000, 'eval_count': 77, 'eval_duration': 15991516000}
```
SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums
FROM  "customers" c
JOIN  "invoices" i ON c.CustomerId = i.CustomerId
JOIN  "invoice_items" ii ON i.InvoiceId = ii.InvoiceId
GROUP BY c.CustomerId
ORDER BY TotalAlbums DESC
LIMIT 5
SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums
```

```
FROM  "customers" c
JOIN  "invoices" i ON c.CustomerId = i.CustomerId
JOIN  "invoice_items" ii ON i.InvoiceId = ii.InvoiceId
GROUP BY c.CustomerId
ORDER BY TotalAlbums DESC
LIMIT 5
   CustomerId  TotalAlbums
0           1           38
1           2           38
2           3           38
3           4           38
4           5           38
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n    Hint: album quantity is found in invoice_items, \n    \n
Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'\n\nThe Data
Frame was produced using this query: SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums\nFROM  \"customer
s\" c\nJOIN  \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN  \"invoice_items\" ii ON i.InvoiceId = ii.
InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n\nThe following is information about
the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n CustomerId     int64\nTotalAlbums    int6
4\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the resul
ts of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in th
e dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just t
he code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:14:33.031287618Z', 'message': {'role': 'assistant', 'c
ontent': "```python\nimport plotly.express as px\n\n# Assuming 'CustomerId' and 'TotalAlbums' are columns i
n the 'df' dataframe\nfig = px.bar(df, x='CustomerId', y='TotalAlbums', color='CustomerId',\n             t
itle='Top 5 Customers with Most Albums')\nfig.update_layout(xaxis_title='Customer ID', yaxis_title='Total Q
uantity of Albums')\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 30375856025, 'load_durat
ion': 42170593, 'prompt_eval_count': 256, 'prompt_eval_duration': 10663963000, 'eval_count': 94, 'eval_dura
tion': 19613313000}
```


Top 5 Customers with Most Albums
Total Quantity of Albums
0
5
10
15
20
25
30
35
40
1
2
3
4
5
Customer ID
CustomerId
5
4
3
2
1

```
Out[39]: ('SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums\nFROM  "customers" c\nJOIN  "invoices" i ON c.Custo
         merId = i.CustomerId\nJOIN  "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER
         BY TotalAlbums DESC\nLIMIT 5',
             CustomerId  TotalAlbums
          0           1           38
          1           2           38
          2           3           38
          3           4           38
          4           5           38,
          Figure({
              'data': [{'alignmentgroup': 'True',
                        'hovertemplate': 'CustomerId=%{marker.color}<br>TotalAlbums=%{y}<extra></extra>',
                        'legendgroup': '',
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         ''}},
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                        'offsetgroup': '',
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                        'textposition': 'auto',
                        'type': 'bar',
                        'x': array([1, 2, 3, 4, 5]),
                        'xaxis': 'x',
                        'y': array([38, 38, 38, 38, 38]),
                        'yaxis': 'y'}],
              'layout': {'barmode': 'relative',
                         'coloraxis': {'colorbar': {'title': {'text': 'CustomerId'}},
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                                                      '#46039f'], [0.2222222222222222,
                                                      '#7201a8'], [0.3333333333333333,
                                                      '#9c179e'], [0.4444444444444444,
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                                                      '#d8576b'], [0.6666666666666666,
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                                                      '#fdca26'], [1.0, '#f0f921']]},
                         'legend': {'tracegroupgap': 0},
                         'template': '...',
                         'title': {'text': 'Top 5 Customers with Most Albums'},
                         'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Customer ID'}},
                         'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Total Quantity of Album
```

```
s'}}}
 }))
```

```sql
SELECT c.CustomerId, SUM(il.Quantity) AS TotalAlbums
FROM Customers c
JOIN invoices i  ON c.CustomerId = i.CustomerId
JOIN invoice_items il ON i.InvoiceId = il.InvoiceId
GROUP BY c.CustomerId
ORDER BY TotalAlbums DESC
LIMIT 5
```

In [40]:
```
question = """
     Find the top 5 customers who spent the most money overall,

     Hint: order total can be found on invoices table, calculation using invoice_items detail table is unne
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "invoices"\r\n(\r\n   InvoiceId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   CustomerId INTEGER NOT NULL,\r\n   InvoiceDate DATETIME NOT NULL,\r\n   BillingAddress NVARCHAR(70),\r\n   BillingCity NVARCHAR(40),\r\n   BillingState NVARCHAR(40),\r\n   BillingCountry NVARCHAR(40),\r\n   BillingPostalCode NVARCHAR(10),\r\n   Total NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (CustomerId) REFERENCES "customers" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "invoice_items"\r\n(\r\n   InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   InvoiceId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   Quantity INTEGER NOT NULL,\r\n   FOREIGN KEY (InvoiceId) REFERENCES "invoices" (InvoiceId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON "invoice_items" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON "invoices" (CustomerId)\n\nCREATE INDEX IFK_InvoiceLineTrackId ON "invoice_items" (TrackId)\n\nCREATE TABLE "customers"\r\n(\r\n   CustomerId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   FirstName NVARCHAR(40) NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   Company NVARCHAR(80),\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60) NOT NULL,\r\n   SupportRepId INTEGER,\r\n   FOREIGN KEY (SupportRepId) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "employees"\r\n(\r\n   EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   LastName NVARCHAR(20) NOT NULL,\r\n   FirstName NVARCHAR(20) NOT NULL,\r\n   Title NVARCHAR(30),\r\n   ReportsTo INTEGER,\r\n   BirthDate DATETIME,\r\n   HireDate DATETIME,\r\n   Address NVARCHAR(70),\r\n   City NVARCHAR(40),\r\n   State NVARCHAR(40),\r\n   Country NVARCHAR(40),\r\n   PostalCode NVARCHAR(10),\r\n   Phone NVARCHAR(24),\r\n   Fax NVARCHAR(24),\r\n   Email NVARCHAR(60),\r\n   FOREIGN KEY (ReportsTo) REFERENCES "employees" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON "employees" (ReportsTo)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please r

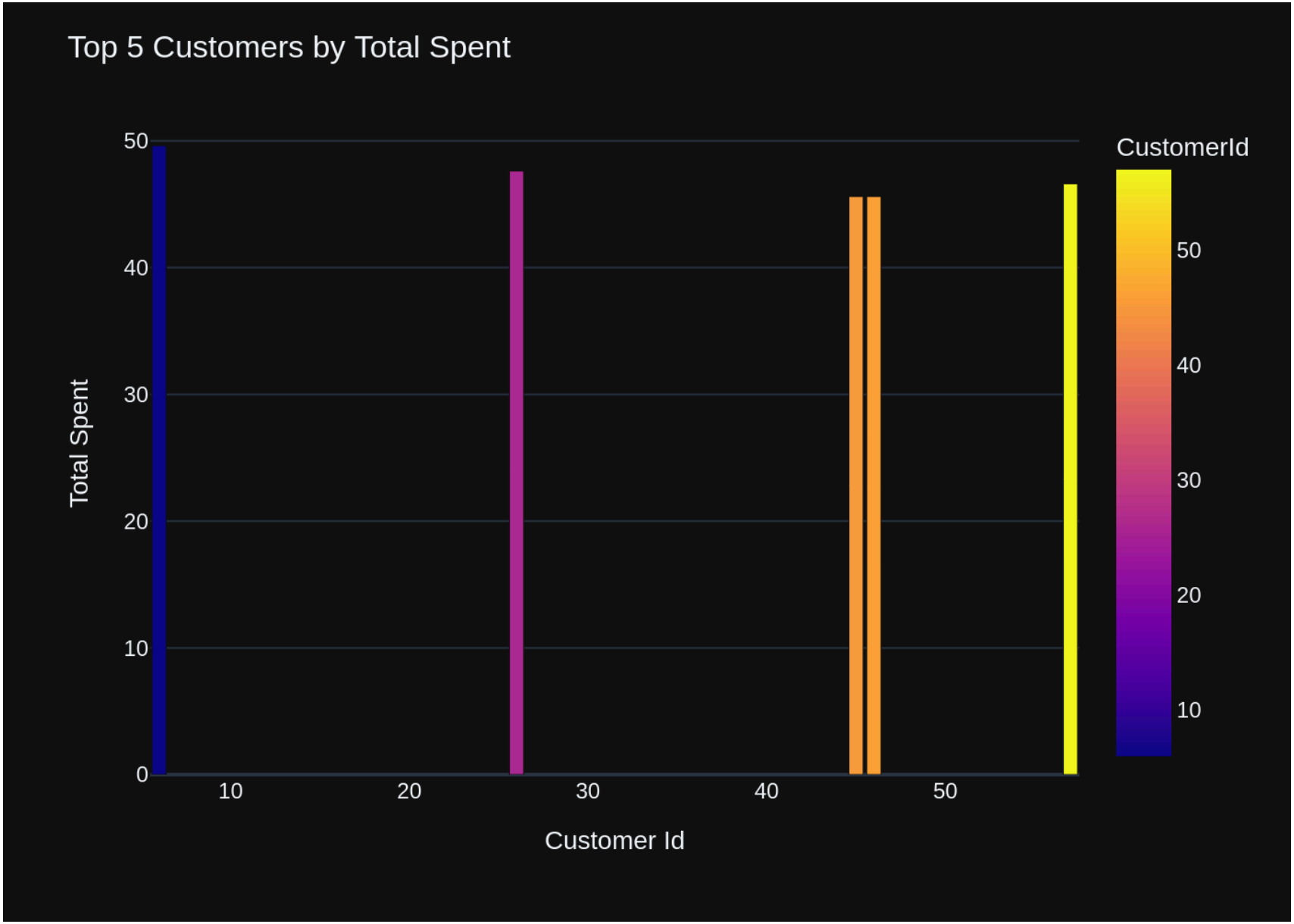
epeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   Find the customer with the most invoices \n'}, {'role': 'assistant', 'content': 'SELECT c.CustomerId, COUNT(i.InvoiceId) AS TotalInvoices\nFROM "customers" c\nJOIN "invoices" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity (across all invoices): \n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n-------------------------'}, {'role': 'user', 'content': ' \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calcu

```
lation using invoice_items detail table is unnecessary \n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE TABLE \"invoices\"\r\n(\r\n    InvoiceId INTEGER PRIMARY KEY AUTOIN
CREMENT NOT NULL,\r\n    CustomerId INTEGER  NOT NULL,\r\n    InvoiceDate DATETIME  NOT NULL,\r\n    Billin
gAddress NVARCHAR(70),\r\n    BillingCity NVARCHAR(40),\r\n    BillingState NVARCHAR(40),\r\n    BillingCou
ntry NVARCHAR(40),\r\n    BillingPostalCode NVARCHAR(10),\r\n    Total NUMERIC(10,2)  NOT NULL,\r\n    FORE
IGN KEY (CustomerId) REFERENCES \"customers\" (CustomerId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE TABLE \"invoice_items\"\r\n(\r\n    InvoiceLineId INTEGER PRIMARY KEY AUTOINCREMENT NOT NUL
L,\r\n    InvoiceId INTEGER  NOT NULL,\r\n    TrackId INTEGER  NOT NULL,\r\n    UnitPrice NUMERIC(10,2)  NO
T NULL,\r\n    Quantity INTEGER  NOT NULL,\r\n    FOREIGN KEY (InvoiceId) REFERENCES \"invoices\" (InvoiceI
d) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n    FOREIGN KEY (TrackId) REFERENCES \"tracks\" (Tra
ckId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_InvoiceLineInvoiceId ON \"in
voice_items\" (InvoiceId)\n\nCREATE INDEX IFK_InvoiceCustomerId ON \"invoices\" (CustomerId)\n\nCREATE INDE
X IFK_InvoiceLineTrackId ON \"invoice_items\" (TrackId)\n\nCREATE TABLE \"customers\"\r\n(\r\n    CustomerI
d INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    FirstName NVARCHAR(40)  NOT NULL,\r\n    LastName NVAR
CHAR(20)  NOT NULL,\r\n    Company NVARCHAR(80),\r\n    Address NVARCHAR(70),\r\n    City NVARCHAR(40),\r\n
State NVARCHAR(40),\r\n    Country NVARCHAR(40),\r\n    PostalCode NVARCHAR(10),\r\n    Phone NVARCHAR(2
4),\r\n    Fax NVARCHAR(24),\r\n    Email NVARCHAR(60)  NOT NULL,\r\n    SupportRepId INTEGER,\r\n    FOREI
GN KEY (SupportRepId) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION
\r\n)\n\nCREATE TABLE \"employees\"\r\n(\r\n    EmployeeId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n
LastName NVARCHAR(20)  NOT NULL,\r\n    FirstName NVARCHAR(20)  NOT NULL,\r\n    Title NVARCHAR(30),\r\n
ReportsTo INTEGER,\r\n    BirthDate DATETIME,\r\n    HireDate DATETIME,\r\n    Address NVARCHAR(70),\r\n
City NVARCHAR(40),\r\n    State NVARCHAR(40),\r\n    Country NVARCHAR(40),\r\n    PostalCode NVARCHAR(1
0),\r\n    Phone NVARCHAR(24),\r\n    Fax NVARCHAR(24),\r\n    Email NVARCHAR(60),\r\n    FOREIGN KEY (Repo
rtsTo) REFERENCES \"employees\" (EmployeeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE
TABLE \"tracks\"\r\n(\r\n    TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n    Name NVARCHAR(200)
NOT NULL,\r\n    AlbumId INTEGER,\r\n    MediaTypeId INTEGER  NOT NULL,\r\n    GenreId INTEGER,\r\n    Comp
oser NVARCHAR(220),\r\n    Milliseconds INTEGER  NOT NULL,\r\n    Bytes INTEGER,\r\n    UnitPrice NUMERIC(1
0,2)  NOT NULL,\r\n    FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON
UPDATE NO ACTION,\r\n    FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION
ON UPDATE NO ACTION,\r\n    FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON D
ELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n    PlaylistId INTEGER
NOT NULL,\r\n    TrackId INTEGER  NOT NULL,\r\n    CONSTRAINT PK_PlaylistTrack PRIMARY KEY  (PlaylistId, Tr
ackId),\r\n    FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION O
N UPDATE NO ACTION,\r\n    FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTIO
N ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_EmployeeReportsTo ON \"employees\" (ReportsTo)\n\n\n===Addit
```

ional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n----------"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the top 5 customers who spent the most money overall, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(i.Total) AS TotalSpending\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.CustomerId\nORDER BY TotalSpending DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, SUM(ii.Quantity) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5\n-------------------------"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.InvoiceLineId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Hint: album quantity is found in invoice_items, \n   \n   Find the top 5 customers who bought the most albums in total quantity (across all invoices):\n"}, {"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 5"}, {"role": "user", "content": " \n   Find the customer with the most invoices \n"}, {"role": "assistant", "content": "SELECT c.CustomerId, COUNT(i.Invoice

```
Id) AS TotalInvoices\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nGROUP BY c.
CustomerId\nORDER BY TotalInvoices DESC\nLIMIT 1"}, {"role": "user", "content": "  \n     Find the customer
who bought the most albums in total quantity (across all invoices): \n"}, {"role": "assistant", "content":
"SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON
i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1\n----------------------
-----"}, {"role": "user", "content": "  \n     Find the top 5 customers who spent the most money overall,
\n     \n     Hint: order total can be found on invoices table, calculation using invoice_items detail tabl
e is unnecessary \n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:16:17.152796179Z', 'message': {'role': 'assistant', 'c
ontent': 'SELECT c.CustomerId, SUM(ii.UnitPrice * ii.Quantity) AS TotalSpent\nFROM  "customers" c\nJOIN "in
voices" i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY
c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5'}, 'done_reason': 'stop', 'done': True, 'total_duration': 1
04006532246, 'load_duration': 657165, 'prompt_eval_count': 1990, 'prompt_eval_duration': 85764614000, 'eval
_count': 82, 'eval_duration': 17405277000}
SELECT c.CustomerId, SUM(ii.UnitPrice * ii.Quantity) AS TotalSpent
FROM  "customers" c
JOIN "invoices" i ON c.CustomerId = i.CustomerId
JOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId
GROUP BY c.CustomerId
ORDER BY TotalSpent DESC
LIMIT 5
SELECT c.CustomerId, SUM(ii.UnitPrice * ii.Quantity) AS TotalSpent
FROM  "customers" c
JOIN "invoices" i ON c.CustomerId = i.CustomerId
JOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId
GROUP BY c.CustomerId
ORDER BY TotalSpent DESC
LIMIT 5
   CustomerId  TotalSpent
0           6       49.62
1          26       47.62
2          57       46.62
3          45       45.62
4          46       45.62
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n     Find the top 5 customers who spent the most money overa
```

ll, \n   \n   Hint: order total can be found on invoices table, calculation using invoice_items detail table is unnecessary \n'\n\nThe DataFrame was produced using this query: SELECT c.CustomerId, SUM(ii.UnitPrice * ii.Quantity) AS TotalSpent\nFROM \"customers\" c\nJOIN \"invoices\" i ON c.CustomerId = i.CustomerId\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.CustomerId\nORDER BY TotalSpent DESC\nLIMIT 5\n\nThe following is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n CustomerId   int64\nTotalSpent   float64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:16:51.100336731Z', 'message': {'role': 'assistant', 'content': "```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x='CustomerId', y='TotalSpent', color='CustomerId')\n\n# Update layout\nfig.update_layout(\n   title='Top 5 Customers by Total Spent',\n   xaxis_title='Customer Id',\n   yaxis_title='Total Spent',\n   showlegend=True\n)\n\n# Render the figure\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 33919966171, 'load_duration': 41270151, 'prompt_eval_count': 268, 'prompt_eval_duration': 11436326000, 'eval_count': 106, 'eval_duration': 22397497000}


Top 5 Customers by Total Spent
Total Spent
0
10
20
30
40
50
10
20
30
40
50
Customer Id
CustomerId
10
20
30
40
50

```
Out[40]: ('SELECT c.CustomerId, SUM(ii.UnitPrice * ii.Quantity) AS TotalSpent\nFROM  "customers" c\nJOIN "invoices"
         i ON c.CustomerId = i.CustomerId\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY c.Custom
         erId\nORDER BY TotalSpent DESC\nLIMIT 5',
             CustomerId  TotalSpent
          0           6       49.62
          1          26       47.62
          2          57       46.62
          3          45       45.62
          4          46       45.62,
          Figure({
              'data': [{'alignmentgroup': 'True',
                        'hovertemplate': 'CustomerId=%{marker.color}<br>TotalSpent=%{y}<extra></extra>',
                        'legendgroup': '',
                        'marker': {'color': array([ 6, 26, 57, 45, 46]), 'coloraxis': 'coloraxis', 'pattern': {'sha
         pe': ''}},
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                        'offsetgroup': '',
                        'orientation': 'v',
                        'showlegend': False,
                        'textposition': 'auto',
                        'type': 'bar',
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                        'xaxis': 'x',
                        'y': array([49.62, 47.62, 46.62, 45.62, 45.62]),
                        'yaxis': 'y'}],
              'layout': {'barmode': 'relative',
                         'coloraxis': {'colorbar': {'title': {'text': 'CustomerId'}},
                                       'colorscale': [[0.0, '#0d0887'], [0.1111111111111111,
                                                      '#46039f'], [0.2222222222222222,
                                                      '#7201a8'], [0.3333333333333333,
                                                      '#9c179e'], [0.4444444444444444,
                                                      '#bd3786'], [0.5555555555555556,
                                                      '#d8576b'], [0.6666666666666666,
                                                      '#ed7953'], [0.7777777777777778,
                                                      '#fb9f3a'], [0.8888888888888888,
                                                      '#fdca26'], [1.0, '#f0f921']]},
                         'legend': {'tracegroupgap': 0},
                         'margin': {'t': 60},
                         'showlegend': True,
                         'template': '...',
                         'title': {'text': 'Top 5 Customers by Total Spent'},
                         'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Customer Id'}},
```

```
                    'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Total Spent'}}}
})
```

In [41]:
```
question = """
     Get all playlists containing at least 10 tracks and the total duration of those tracks:
"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE TABLE "playlists"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Get all playlists containing at least 10 tracks and the total duration of those tracks:\n'}, {'role': 'assistant', 'content': 'SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM "playlists" p\nJOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId\nJOIN "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC'}, {'role': 'user', 'content': ' \n   Get all playlists containing at least 10 tracks and the total duration of those tracks:\n'}, {'role': 'assistant', 'content': 'SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Milliseconds) AS TotalDuration\nFROM "playlist_track" pt\nJOIN "playlists" p ON pt.PlaylistId = p.PlaylistId\nJOIN "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Nam

e, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY
g.Name\nORDER BY TotalTracks DESC'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, album
s and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n
Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'cont
ent': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "al
bums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Nam
e\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists,
albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumI
d,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistan
t', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.Art
istId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC
\nLIMIT 10'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing
in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFRO
M "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n
FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.G
enreId) > 1\n)\nGROUP BY a.ArtistId, a.Name'}, {'role': 'user', 'content': ' \n   Identify artists who h
ave albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.Ar
tistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.Artis
tId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP B
Y g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'rol
e': 'user', 'content': ' \n   Find the customer who bought the most albums in total quantity (across all
invoices): \n'}, {'role': 'assistant', 'content': 'SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nF
ROM "invoices" i\nJOIN "invoice_items" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY To
talAlbums DESC\nLIMIT 1'}, {'role': 'user', 'content': ' \n   Get all playlists containing at least 10 t
racks and the total duration of those tracks:\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the
question. Your response should ONLY be based on the given context and follow the response guidelines and fo
rmat instructions. \n===Tables \nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_track\" (TrackId)\n\nC
REATE TABLE \"playlists\"\r\n(\r\n   PlaylistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NV
ARCHAR(120)\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackI
d INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN
KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n
FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)
\n\nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVA
RCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGE
R,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitP
rice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELET

E NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DE
LETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeI
d) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackGenreId ON \"tracks\" (Gen
reId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE INDEX IFK_TrackMediaTypeId ON \"tr
acks\" (MediaTypeId)\n\nCREATE INDEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE TABLE \"albums
\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r
\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tO
N DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE TABLE \"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY
KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\n\n===Additional Context \n\nIn the SQLite dat
abase invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please gene
rate a valid SQL query without any explanations for the question. \n2. If the provided context is almost su
fficient but requires knowledge of a specific string in a particular column, please generate an intermediat
e SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermedia
te_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please
use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the
answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Get all playlists contai
ning at least 10 tracks and the total duration of those tracks:\n"}, {"role": "assistant", "content": "SELE
CT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM \"playlists\" p\nJOIN \"playlist_
track\" pt ON p.PlaylistId = pt.PlaylistId\nJOIN \"tracks\" t ON pt.TrackId = t.TrackId\nGROUP BY p.Playlis
tId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC"}, {"role": "user", "cont
ent": " \n   Get all playlists containing at least 10 tracks and the total duration of those track
s:\n"}, {"role": "assistant", "content": "SELECT pt.PlaylistId, p.Name AS PlaylistName, SUM(t.Milliseconds)
AS TotalDuration\nFROM \"playlist_track\" pt\nJOIN \"playlists\" p ON pt.PlaylistId = p.PlaylistId\nJOIN
\"tracks\" t ON pt.TrackId = t.TrackId\nGROUP BY pt.PlaylistId, p.Name\nHAVING COUNT(pt.TrackId) >= 10"},
{"role": "user", "content": " \n   List all genres and the number of tracks in each genre:\n"}, {"role":
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t ON g.GenreId = t.GenreId\nGROUP BY g.Name"}, {"role": "user", "content": " \n   List all genres and the
number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS T
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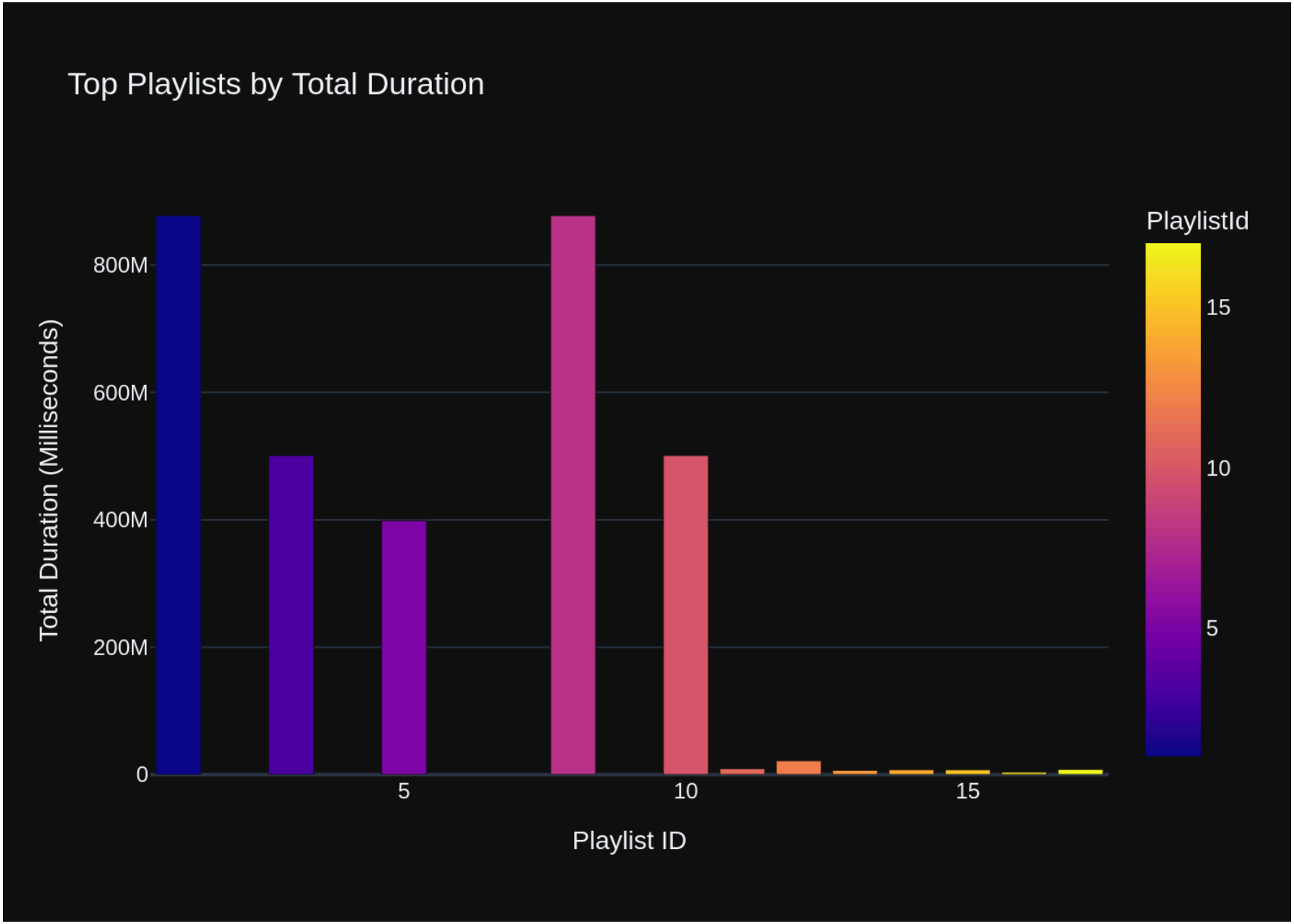
racks DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all genres and the number of tracks in eac
h genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"gen
res\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC"}, {"rol
e": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are
linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular arti
sts based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS Artis
tName, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId
\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMI
T 10"}, {"role": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums an
d artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 mos
t popular artists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT
(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"trac
ks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user",

"content": " \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"},
{"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name"}, {"role": "user", "content": " \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName"}, {"role": "user", "content": " \n   Find the customer who bought the most albums in total quantity (across all invoices): \n"},
{"role": "assistant", "content": "SELECT i.CustomerId, COUNT(ii.TrackId) AS TotalAlbums\nFROM \"invoices\" i\nJOIN \"invoice_items\" ii ON i.InvoiceId = ii.InvoiceId\nGROUP BY i.CustomerId\nORDER BY TotalAlbums DESC\nLIMIT 1"}, {"role": "user", "content": " \n   Get all playlists containing at least 10 tracks and the total duration of those tracks:\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:18:33.580723434Z', 'message': {'role': 'assistant', 'content': 'SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM "playlists" p\nJOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId\nJOIN "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC;'}, 'done_reason': 'stop', 'done': True, 'total_duration': 102379992467, 'load_duration': 717212, 'prompt_eval_count': 1886, 'prompt_eval_duration': 82153533000, 'eval_count': 93, 'eval_duration': 19608469000}
SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds
FROM "playlists" p
JOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId
JOIN "tracks" t ON pt.TrackId = t.TrackId
GROUP BY p.PlaylistId
HAVING COUNT(pt.PlaylistId) >= 10
ORDER BY TotalDurationInMilliseconds DESC;
Output from LLM: SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds
FROM "playlists" p
JOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId
JOIN "tracks" t ON pt.TrackId = t.TrackId
GROUP BY p.PlaylistId
HAVING COUNT(pt.PlaylistId) >= 10
ORDER BY TotalDurationInMilliseconds DESC;
Extracted SQL: SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds
FROM "playlists" p
JOIN "playlist_track" pt ON p.PlaylistId = pt.PlaylistId
JOIN "tracks" t ON pt.TrackId = t.TrackId
GROUP BY p.PlaylistId
HAVING COUNT(pt.PlaylistId) >= 10
ORDER BY TotalDurationInMilliseconds DESC

```
SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds
FROM  "playlists" p
JOIN  "playlist_track" pt ON p.PlaylistId = pt.PlaylistId
JOIN  "tracks" t ON pt.TrackId = t.TrackId
GROUP BY p.PlaylistId
HAVING COUNT(pt.PlaylistId) >= 10
ORDER BY TotalDurationInMilliseconds DESC
    PlaylistId  TotalDurationInMilliseconds
0            1                    877683083
1            8                    877683083
2            3                    501094957
3           10                    501094957
4            5                    398705153
5           12                     21770592
6           11                      9486559
7           17                      8206312
8           14                      7575051
9           15                      7439811
10          13                      6755730
11          16                      4122018
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query
that answers the question the user asked: '  \n     Get all playlists containing at least 10 tracks and the
total duration of those tracks:\n'\n\nThe DataFrame was produced using this query: SELECT p.PlaylistId, SUM
(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM  \"playlists\" p\nJOIN  \"playlist_track\" pt ON p.Pl
aylistId = pt.PlaylistId\nJOIN  \"tracks\" t ON pt.TrackId = t.TrackId\nGROUP BY p.PlaylistId\nHAVING COUNT
(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC\n\nThe following is information about the
resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n PlaylistId                     int64\nTotalDu
rationInMilliseconds    int64\ndtype: object"}, {"role": "user", "content": "Can you generate the Python pl
otly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If t
here is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not answer wit
h any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:19:08.88830933Z', 'message': {'role': 'assistant', 'co
ntent': "```python\nimport pandas as pd\nimport plotly.express as px\n\n# Assuming the 'df' DataFrame has c
olumns 'PlaylistId' and 'TotalDurationInMilliseconds'\nfig = px.bar(df, x='PlaylistId', y='TotalDurationInM
illiseconds', color='PlaylistId',\n             title='Top Playlists by Total Duration')\nfig.update_xaxes
(title='Playlist ID')\nfig.update_yaxes(title='Total Duration (Milliseconds)')\nfig.update_layout(barmode
```

='stack')\nfig.show()\n```"}, 'done_reason': 'stop', 'done': True, 'total_duration': 35279205269, 'load_duration': 44466320, 'prompt_eval_count': 260, 'prompt_eval_duration': 10508878000, 'eval_count': 122, 'eval_duration': 24680742000}



```
Out[41]: ('SELECT p.PlaylistId, SUM(t.Milliseconds) AS TotalDurationInMilliseconds\nFROM  "playlists" p\nJOIN  "pla
         ylist_track" pt ON p.PlaylistId = pt.PlaylistId\nJOIN  "tracks" t ON pt.TrackId = t.TrackId\nGROUP BY p.Pl
         aylistId\nHAVING COUNT(pt.PlaylistId) >= 10\nORDER BY TotalDurationInMilliseconds DESC',
              PlaylistId  TotalDurationInMilliseconds
          0            1                   877683083
          1            8                   877683083
          2            3                   501094957
          3           10                   501094957
          4            5                   398705153
          5           12                    21770592
          6           11                     9486559
          7           17                     8206312
          8           14                     7575051
          9           15                     7439811
          10          13                     6755730
          11          16                     4122018,
          Figure({
              'data': [{'alignmentgroup': 'True',
                        'hovertemplate': 'PlaylistId=%{marker.color}<br>TotalDurationInMilliseconds=%{y}<extra></ex
         tra>',
                        'legendgroup': '',
                        'marker': {'color': array([ 1,  8,  3, 10,  5, 12, 11, 17, 14, 15, 13, 16]),
                                   'coloraxis': 'coloraxis',
                                   'pattern': {'shape': ''}},
                        'name': '',
                        'offsetgroup': '',
                        'orientation': 'v',
                        'showlegend': False,
                        'textposition': 'auto',
                        'type': 'bar',
                        'x': array([ 1,  8,  3, 10,  5, 12, 11, 17, 14, 15, 13, 16]),
                        'xaxis': 'x',
                        'y': array([877683083, 877683083, 501094957, 501094957, 398705153,  21770592,
                                    9486559,   8206312,   7575051,   7439811,   6755730,   4122018]),
                        'yaxis': 'y'}],
              'layout': {'barmode': 'stack',
                         'coloraxis': {'colorbar': {'title': {'text': 'PlaylistId'}},
                                       'colorscale': [[0.0, '#0d0887'], [0.1111111111111111,
                                                      '#46039f'], [0.2222222222222222,
                                                      '#7201a8'], [0.3333333333333333,
                                                      '#9c179e'], [0.4444444444444444,
                                                      '#bd3786'], [0.5555555555555556,
```

```
                                                '#d8576b'], [0.6666666666666666,
                                                '#ed7953'], [0.7777777777777778,
                                                '#fb9f3a'], [0.8888888888888888,
                                                '#fdca26'], [1.0, '#f0f921']]},
                    'legend': {'tracegroupgap': 0},
                    'template': '...',
                    'title': {'text': 'Top Playlists by Total Duration'},
                    'xaxis': {'anchor': 'y', 'domain': [0.0, 1.0], 'title': {'text': 'Playlist ID'}},
                    'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Total Duration (Millisec
onds)'}}}
 }))
```

In [42]:
```
question = """
     Identify artists who have albums with tracks appearing in multiple genres:


"""

vn.ask(question=question)
```

```
Number of requested results 10 is greater than number of elements in index 1, updating n_results = 1
```

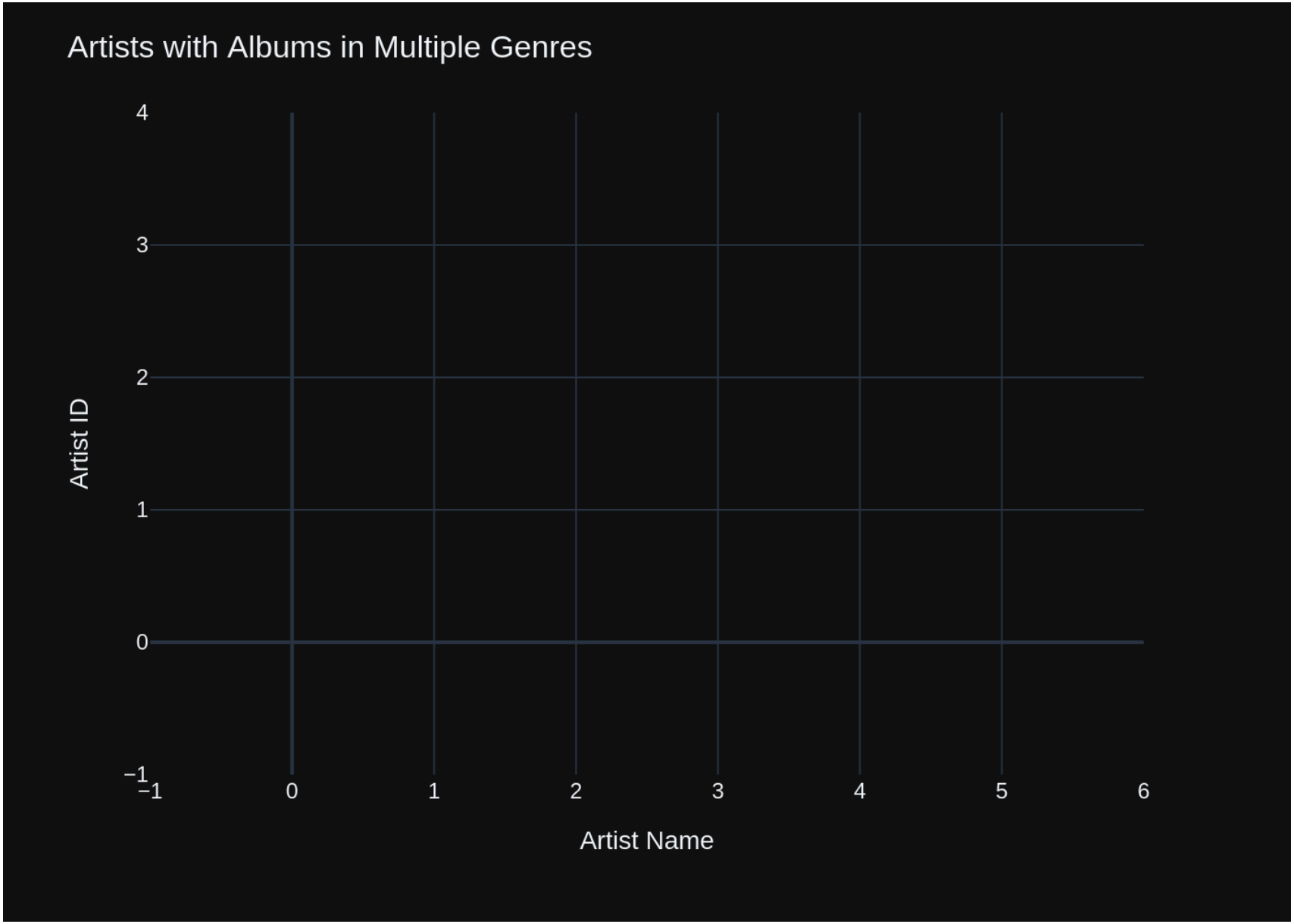
[{'role': 'system', 'content': 'You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE "tracks"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES "albums" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES "genres" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES "media_types" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON "albums" (ArtistId)\n\nCREATE INDEX IFK_TrackGenreId ON "tracks" (GenreId)\n\nCREATE INDEX IFK_TrackAlbumId ON "tracks" (AlbumId)\n\nCREATE TABLE "albums"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES "artists" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackMediaTypeId ON "tracks" (MediaTypeId)\n\nCREATE TABLE "genres"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON "playlist_track" (TrackId)\n\nCREATE TABLE "artists"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE "playlist_track"\r\n(\r\n   PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES "playlists" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES "tracks" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can\'t be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM "genres" g2\n JOIN "tracks" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   There are 3 tables: artists, albums and tracks, where albums and artists are

linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n'}, {'role': 'assistant', 'content': 'SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM "artists" a\nJOIN "albums" al ON a.ArtistId = al.ArtistId\nJOIN "tracks" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10'}, {'role': 'user', 'content': ' \n   List all albums and their corresponding artist names \n'}, {'role': 'assistant', 'content': 'SELECT a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId = ar.ArtistId'}, {'role': 'user', 'content': ' \n   List all albums and their corresponding artist names \n'}, {'role': 'assistant', 'content': 'SELECT a.Title, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId = ar.ArtistId'}, {'role': 'user', 'content': ' \n   List all albums and their corresponding artist names \n'}, {'role': 'assistant', 'content': 'SELECT a.Title, ar.Name AS ArtistName\nFROM "albums" a\nJOIN "artists" ar ON a.ArtistId = ar.ArtistId\n-------------------------'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5'}, {'role': 'user', 'content': ' \n   List all genres and the number of tracks in each genre:\n'}, {'role': 'assistant', 'content': 'SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM "genres" g\nJOIN "tracks" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC'}, {'role': 'user', 'content': ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'}]
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
[{"role": "system", "content": "You are a SQLite expert. Please help to generate a SQL query to answer the question. Your response should ONLY be based on the given context and follow the response guidelines and format instructions. \n===Tables \nCREATE TABLE \"tracks\"\r\n(\r\n   TrackId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(200) NOT NULL,\r\n   AlbumId INTEGER,\r\n   MediaTypeId INTEGER NOT NULL,\r\n   GenreId INTEGER,\r\n   Composer NVARCHAR(220),\r\n   Milliseconds INTEGER NOT NULL,\r\n   Bytes INTEGER,\r\n   UnitPrice NUMERIC(10,2) NOT NULL,\r\n   FOREIGN KEY (AlbumId) REFERENCES \"albums\" (AlbumId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (GenreId) REFERENCES \"genres\" (GenreId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (MediaTypeId) REFERENCES \"media_types\" (MediaTypeId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_AlbumArtistId ON \"albums\" (ArtistId)\n\nCREATE INDEX IFK_TrackGenreId ON \"tracks\" (GenreId)\n\nCREATE INDEX IFK_TrackAlbumId ON \"tracks\" (AlbumId)\n\nCREATE TABLE \"albums\"\r\n(\r\n   AlbumId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Title NVARCHAR(160) NOT NULL,\r\n   ArtistId INTEGER NOT NULL,\r\n   FOREIGN KEY (ArtistId) REFERENCES \"artists\" (ArtistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\nCREATE INDEX IFK_TrackMediaTypeId ON \"tracks\" (MediaTypeId)\n\nCREATE TABLE \"genres\"\r\n(\r\n   GenreId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE INDEX IFK_PlaylistTrackTrackId ON \"playlist_track\" (TrackId)\n\nCREATE TABLE \"artists\"\r\n(\r\n   ArtistId INTEGER PRIMARY KEY AUTOINCREMENT NOT NULL,\r\n   Name NVARCHAR(120)\r\n)\n\nCREATE TABLE \"playlist_track\"\r\n(\r\n

PlaylistId INTEGER NOT NULL,\r\n   TrackId INTEGER NOT NULL,\r\n   CONSTRAINT PK_PlaylistTrack PRIMARY KEY (PlaylistId, TrackId),\r\n   FOREIGN KEY (PlaylistId) REFERENCES \"playlists\" (PlaylistId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION,\r\n   FOREIGN KEY (TrackId) REFERENCES \"tracks\" (TrackId) \r\n\t\tON DELETE NO ACTION ON UPDATE NO ACTION\r\n)\n\n\n===Additional Context \n\nIn the SQLite database invoice means order\n\n===Response Guidelines \n1. If the provided context is sufficient, please generate a valid SQL query without any explanations for the question. \n2. If the provided context is almost sufficient but requires knowledge of a specific string in a particular column, please generate an intermediate SQL query to find the distinct strings in that column. Prepend the query with a comment saying intermediate_sql \n3. If the provided context is insufficient, please explain why it can't be generated. \n4. Please use the most relevant table(s). \n5. If the question has been asked and answered before, please repeat the answer exactly as it was given before. \n"}, {"role": "user", "content": " \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name"}, {"role": "user", "content": " \n Identify artists who have albums with tracks appearing in multiple genres:\n\n\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name\nORDER BY ArtistName"}, {"role": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.ArtistId, a.Name AS ArtistName, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.ArtistId, a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   There are 3 tables: artists, albums and tracks, where albums and artists are linked by ArtistId, albums and tracks are linked by AlbumId,\n   Can you find the top 10 most popular artists based on the number of tracks\n"}, {"role": "assistant", "content": "SELECT a.Name, COUNT(t.TrackId) AS TotalTracks\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nJOIN \"tracks\" t ON al.AlbumId = t.AlbumId\nGROUP BY a.Name\nORDER BY TotalTracks DESC\nLIMIT 10"}, {"role": "user", "content": " \n   List all albums and their corresponding artist names \n"}, {"role": "assistant", "content": "SELECT a.Title, a.ArtistId, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.ArtistId"}, {"role": "user", "content": " \n   List all albums and their corresponding artist names \n"}, {"role": "assistant", "content": "SELECT a.Title, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.ArtistId"}, {"role": "user", "content": " \n List all albums and their corresponding artist names \n"}, {"role": "assistant", "content": "SELECT a.Title, ar.Name AS ArtistName\nFROM \"albums\" a\nJOIN \"artists\" ar ON a.ArtistId = ar.ArtistId\n----------"}, {"role": "user", "content": " \n   List all genres and the number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name"}, {"role": "user", "content": " \n   List all genres and the number of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS TotalTracks\nFROM \"genres\" g\nJOIN \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTracks DESC\nLIMIT 5"}, {"role": "user", "content": " \n   List all genres and the numb

```
er of tracks in each genre:\n"}, {"role": "assistant", "content": "SELECT g.Name, COUNT(t.GenreId) AS Total
Tracks\nFROM  \"genres\" g\nJOIN  \"tracks\" t ON g.GenreId = t.GenreId\nGROUP BY g.Name\nORDER BY TotalTra
cks DESC"}, {"role": "user", "content": "  \n     Identify artists who have albums with tracks appearing in
multiple genres:\n\n\n"}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:20:48.292270826Z', 'message': {'role': 'assistant', 'c
ontent': 'SELECT a.ArtistId, a.Name AS ArtistName\nFROM  "artists" a\nJOIN  "albums" al ON a.ArtistId = al.
ArtistId\nWHERE a.ArtistId IN (\n  SELECT g2.GenreId\n  FROM  "genres" g2\n  JOIN  "tracks" t2 ON g2.GenreI
d = t2.GenreId\n  GROUP BY g2.GenreId\n  HAVING COUNT(DISTINCT g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.N
ame ORDER BY ArtistName'}, 'done_reason': 'stop', 'done': True, 'total_duration': 99309355580, 'load_durati
on': 695941, 'prompt_eval_count': 1713, 'prompt_eval_duration': 72941843000, 'eval_count': 122, 'eval_durat
ion': 25767649000}
SELECT a.ArtistId, a.Name AS ArtistName
FROM  "artists" a
JOIN  "albums" al ON a.ArtistId = al.ArtistId
WHERE a.ArtistId IN (
  SELECT g2.GenreId
  FROM  "genres" g2
  JOIN  "tracks" t2 ON g2.GenreId = t2.GenreId
  GROUP BY g2.GenreId
  HAVING COUNT(DISTINCT g2.GenreId) > 1
)
GROUP BY a.ArtistId, a.Name ORDER BY ArtistName
SELECT a.ArtistId, a.Name AS ArtistName
FROM  "artists" a
JOIN  "albums" al ON a.ArtistId = al.ArtistId
WHERE a.ArtistId IN (
  SELECT g2.GenreId
  FROM  "genres" g2
  JOIN  "tracks" t2 ON g2.GenreId = t2.GenreId
  GROUP BY g2.GenreId
  HAVING COUNT(DISTINCT g2.GenreId) > 1
)
GROUP BY a.ArtistId, a.Name ORDER BY ArtistName
Empty DataFrame
Columns: [ArtistId, ArtistName]
Index: []
Ollama parameters:
model=aya:latest,
options={},
keep_alive=None
Prompt Content:
```

[{"role": "system", "content": "The following is a pandas DataFrame that contains the results of the query that answers the question the user asked: ' \n   Identify artists who have albums with tracks appearing in multiple genres:\n\n\n'\n\nThe DataFrame was produced using this query: SELECT a.ArtistId, a.Name AS ArtistName\nFROM \"artists\" a\nJOIN \"albums\" al ON a.ArtistId = al.ArtistId\nWHERE a.ArtistId IN (\n SELECT g2.GenreId\n FROM \"genres\" g2\n JOIN \"tracks\" t2 ON g2.GenreId = t2.GenreId\n GROUP BY g2.GenreId\n HAVING COUNT(DISTINCT g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name ORDER BY ArtistName\n\nThe following is information about the resulting pandas DataFrame 'df': \nRunning df.dtypes gives:\n ArtistId   object\nArtistName   object\ndtype: object"}, {"role": "user", "content": "Can you generate the Python plotly code to chart the results of the dataframe? Assume the data is in a pandas dataframe called 'df'. If there is only one value in the dataframe, use an Indicator. Respond with only Python code. Do not answer with any explanations -- just the code."}]
Ollama Response:
{'model': 'aya:latest', 'created_at': '2024-06-14T12:21:22.563619697Z', 'message': {'role': 'assistant', 'content': '```python\nimport plotly.express as px\n\n# Create a bar chart\nfig = px.bar(df, x="ArtistName", y="ArtistId", color="ArtistName")\n\n# Add labels and title\nfig.update_xaxes(title="Artist Name")\nfig.update_yaxes(title="Artist ID")\nfig.update_layout(title="Artists with Albums in Multiple Genres")\n\n# Show the chart\nfig.show()\n```'}, 'done_reason': 'stop', 'done': True, 'total_duration': 34268888635, 'load_duration': 43028180, 'prompt_eval_count': 279, 'prompt_eval_duration': 12069928000, 'eval_count': 105, 'eval_duration': 22102998000}


Artists with Albums in Multiple Genres
Artist ID
Artist Name
4
3
2
1
0
−1
−1
0
1
2
3
4
5
6

Out[42]:
```
('SELECT a.ArtistId, a.Name AS ArtistName\nFROM  "artists" a\nJOIN  "albums" al ON a.ArtistId = al.ArtistI
d\nWHERE a.ArtistId IN (\n  SELECT g2.GenreId\n  FROM  "genres" g2\n  JOIN  "tracks" t2 ON g2.GenreId = t
2.GenreId\n  GROUP BY g2.GenreId\n  HAVING COUNT(DISTINCT g2.GenreId) > 1\n)\nGROUP BY a.ArtistId, a.Name
ORDER BY ArtistName',
 Empty DataFrame
 Columns: [ArtistId, ArtistName]
 Index: [],
 Figure({
     'data': [],
     'layout': {'barmode': 'relative',
                'legend': {'tracegroupgap': 0},
                'margin': {'t': 60},
                'template': '...',
                'title': {'text': 'Artists with Albums in Multiple Genres'},
                'xaxis': {'anchor': 'y',
                          'categoryarray': [],
                          'categoryorder': 'array',
                          'domain': [0.0, 1.0],
                          'title': {'text': 'Artist Name'}},
                'yaxis': {'anchor': 'x', 'domain': [0.0, 1.0], 'title': {'text': 'Artist ID'}}}
 }))
```

Check completion time

In [ ]:
```
```

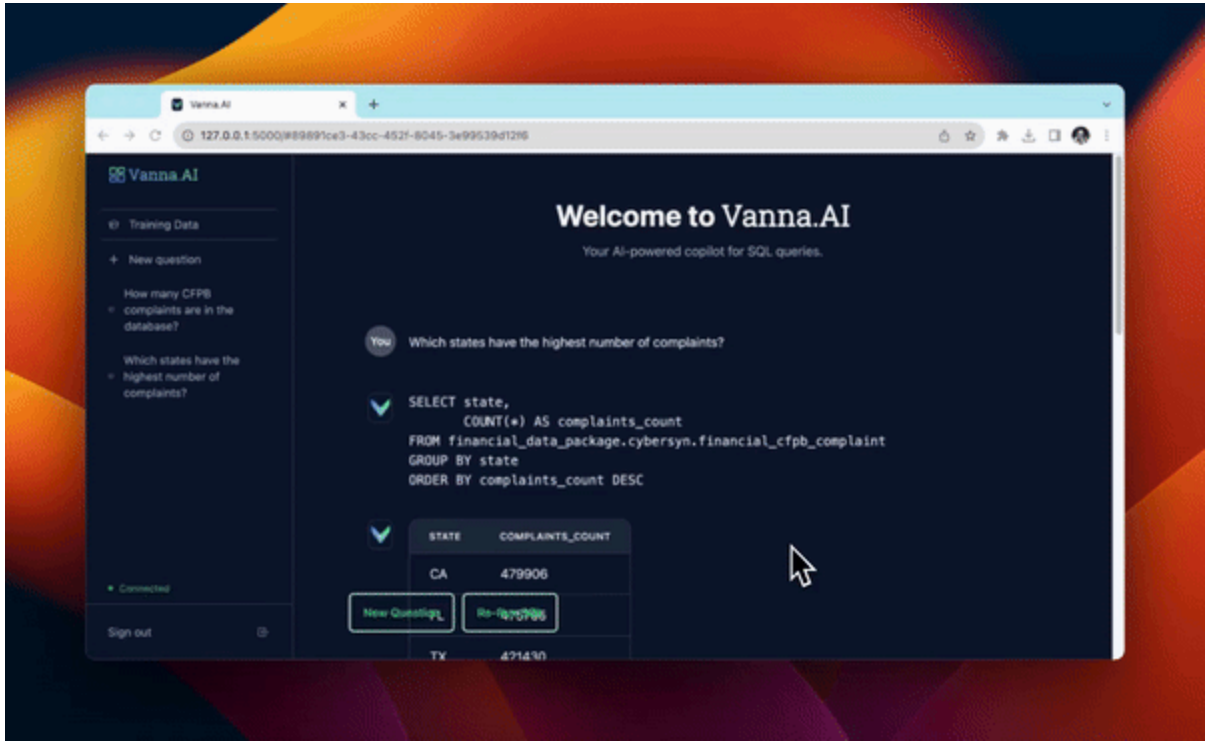
In [43]:
```
ts_stop = time()

elapsed_time = ts_stop - ts_start
print(f"test running on '{hostname}' with '{model_name}' LLM took : {elapsed_time:.2f} sec")
```

```
test running on 'ducklover1' with 'aya' LLM took : 2988.49 sec
```

In [ ]:
```
```

Launch the User Interface



from vanna.flask import VannaFlaskApp app = VannaFlaskApp(vn) app.run()

Next Steps

Using Vanna via Jupyter notebooks is great for getting started but check out additional customizable interfaces like the

- Streamlit app
- Flask app
- Slackbot