# RelGraphRAG: SCREENSHOTS

1. Schema to Ontology conversion using Gemini:

```
(.venv) suryaps@Suryas-MacBook-Air RelGraphRAG % python3 src/schema_to_ontology.py
/Users/suryaps/Documents/Extra Curriculum/Hackathons/LYZR/RelGraphRAG/.venv/lib/python3.9/site-p
 2.8.3'. See: https://github.com/urllib3/urllib3/issues/3020
   warnings.warn(
Extracting relational schema...
{
  "tables": {
    "Album": {
      "columns": [
        {
          "name": "AlbumId",
          "type": "INTEGER"
        },
        {
          "name": "Title",
          "type": "NVARCHAR(160)"
        },
        {
          "name": "ArtistId",
          "type": "INTEGER"
        }
      ],
      "foreign_keys": [
        {
          "constrained_column": "ArtistId",
          "referred_table": "Artist"
        }
      ]
    },
    "Artist": {
      "columns": [
        {
          "name": "ArtistId",
          "type": "INTEGER"
        },
        {
          "name": "Name",
          "type": "NVARCHAR(120)"
        }
      ],
      "foreign_keys": []
    },
```

Generating ontology:

```
Generating ontology...
WARNING: All log messages before absl::Initial
E0000 00:00:1760503951.070478 3454673 alts_cre
Raw response preview: ```json
{
  "classes": {
    "Album": {
      "label": "Product",
      "properties": [
        "AlbumId",
        "Title",
        "ArtistId"
      ]
    },
    "Artist": {
      "label": "Creator",
...
✓ Successfully parsed JSON response
Generated ontology for 2 tables
✓ Ontology saved to data/ontology.json
```
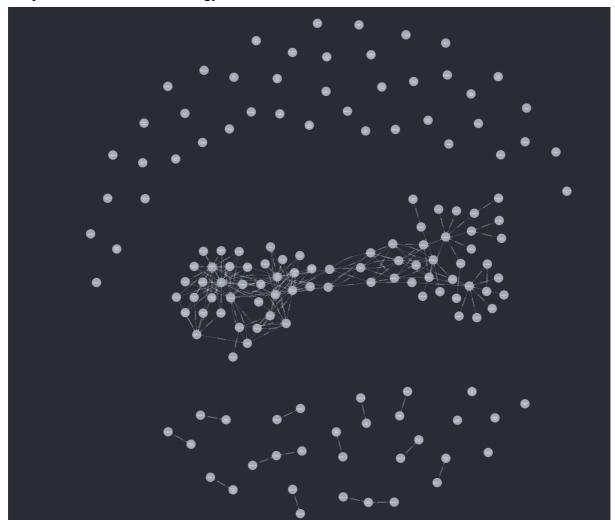
File saved in `data/ontology.json`

```
[(.venv) suryaps@Suryas-MacBook-Air RelGraphRAG % cat data/ontology.json
{
  "classes": {
    "Album": {
      "label": "Product",
      "properties": [
        "AlbumId",
        "Title",
        "ArtistId"
      ]
    },
    "Artist": {
      "label": "Creator",
      "properties": [
        "ArtistId",
        "Name"
      ]
    },
    "Customer": {
      "label": "Person",
      "properties": [
        "CustomerId",
        "FirstName",
        "LastName",
        "Company",
        "Address",
        "City",
        "State",
        "Country",
        "PostalCode",
        "Phone",
        "Fax",
        "Email",
        "SupportRepId"
      ]
    },
    "Employee": {
      "label": "Person",
      "properties": [
        "EmployeeId",
        "LastName",
        "FirstName",
        "Title",
        "ReportsTo",
        "BirthDate",
        "HireDate",
        "Address",
        "City",
        "State",
        "Country",
        "PostalCode",
        "Phone",
        "Fax",
        "Email"
      ]
    },
    "Genre": {
      "label": "Category",
      "properties": [
        "GenreId",
        "Name"
      ]
    },
    "Invoice": {
      "label": "Transaction",
      "properties": [
        "InvoiceId",
        "CustomerId",
        "InvoiceDate",
        "BillingAddress",
        "BillingCity",
        "BillingState",
        "BillingCountry",
        "BillingPostalCode",
        "Total"
      ]
    },
```

2. Transformation to Graph:

```
(.venv) suryaps@Suryas-MacBook-Air RelGraphRAG % python3 src/transform_to_graph.py
/Users/suryaps/Documents/Extra Curriculum/Hackathons/LYZR/RelGraphRAG/.venv/lib/python3.9/site-packages/urllib3/__init__.py:35: NotOpenSSLWarning: urllib3 v2 only supports OpenSSL 1.1.1+, currently the 'ssl' module is compiled with 'LibreSSL
2.8.3'. See: https://github.com/urllib3/urllib3/issues/3020
  warnings.warn(
Using device: mps
 Cleaning database before rebuild...
 Cleared existing graph data
Creating clean nodes: 100%|                                                                                   | 10/10 [00:05<00:00,  1.93it/s]
Creating ontology relationships...
Creating ontology relationships: 100%|                                                                        | 10/10 [00:00<00:00, 12.15it/s]
Creating foreign key relationships...
 Clean graph successfully constructed!
Node counts by label:
   Product: 39
   Person: 28
   Category: 25
   Creator: 20
   Transaction: 18
   Collection: 17
   TransactionItem: 2
Relationship counts:
   REFERENCES: 121
   CONTAINS: 24
   PURCHASED: 9
   SUPPORTS: 9
   HAS_TYPE: 9
   HAS_GENRE: 9
   CREATED: 9
Total: 149 nodes, 190 relationships
Nodes with embeddings: 149
Sample nodes:
   Creator (Artist_3): Alanis Morissette, embedding: 384 dims
   Creator (Artist_4): Alice In Chains, embedding: 384 dims
   Creator (Artist_5): Antônio Carlos Jobim, embedding: 384 dims
(.venv) suryaps@Suryas-MacBook-Air RelGraphRAG % ▮
```

Graph created based on ontology:

3. Retrieval server which helps you to search data by querying:

```
(.venv) suryaps@Suryas-MacBook-Air RelGraphRAG % python3 src/retrieval_server.py
/Users/suryaps/Documents/Extra Curriculum/Hackathons/LYZR/RelGraphRAG/.venv/lib/python3.9/site-packages/urllib3/__init__.py:35: NotOpenSSLWarning: urllib3 v2 only supports OpenSSL 1.1.1+, currently the 'ssl' module is compiled with 'LibreSSL
2.8.3'. See: https://github.com/urllib3/urllib3/issues/3020
  warnings.warn(
Loaded SentenceTransformer for retrieval.
INFO:     Started server process [36279]
INFO:     Waiting for application startup.
INFO:     Application startup complete.
INFO:     Uvicorn running on http://0.0.0.0:8000 (Press CTRL+C to quit)
```

There are 3 categories

- Vector similarity search:

```
suryaps@Suryas-MacBook-Air RelGraphRAG % curl -s -X POST http://127.0.0.1:8000/query \
    -H "Content-Type: application/json" \
    -d '{"query": "Show songs similar to Spellbound"}' | jq
{
  "mode": "vector",
  "results": [
    {
      "id": "Track_13",
      "name": "Spellbound",
      "score": 0.48676951690711967
    },
    {
      "id": "Playlist_4",
      "name": "90's Music",
      "score": 0.43990474403442537
    },
    {
      "id": "Track_8",
      "name": "Snowballed",
      "score": 0.4071322448533486
    },
    {
      "id": "Track_0",
      "name": "For Those About To Rock (We Salute You)",
      "score": 0.388154188022902
    },
    {
      "id": "Genre_9",
      "name": "Soundtrack",
      "score": 0.38744860785216123
    }
  ]
}
```

- Graph retrieval:

```
suryaps@Suryas-MacBook-Air RelGraphRAG % curl -s -X POST http://127.0.0.1:8000/query \
    -H "Content-Type: application/json" \
    -d '{"query": "Show albums related to AC/DC"}' | jq
{
  "mode": "graph",
  "results": [
    {
      "n": {
        "labels": [
          "Creator"
        ],
        "name": "AC/DC"
      },
      "m": {
        "labels": [
          "Product"
        ],
        "name": "For Those About To Rock (We Salute You)"
      },
      "rel_types": [
        {}
      ]
    },
    {
      "n": {
        "labels": [
          "Creator"
        ],
        "name": "AC/DC"
      },
      "m": {
        "labels": [
          "Product"
        ],
        "name": "Balls to the Wall"
      },
      "rel_types": [
        {}
      ]
    },
```

- Hybrid retrieval:

```
suryaps@Suryas-MacBook-Air RelGraphRAG % curl -X POST http://127.0.0.1:8000/query \
    -H "Content-Type: application/json" \
    -d '{"query": "Find songs about rock"}' | jq
  % Total    % Received % Xferd  Average Speed   Time    Time     Time  Current
                                 Dload  Upload   Total   Spent    Left  Speed
100  1405  100  1371  100    34   3029     75 --:--:-- --:--:-- --:--:--  3108
{
  "mode": "hybrid",
  "vector_hits": [
    {
      "id": "Track_0",
      "name": "For Those About To Rock (We Salute You)",
      "score": 0.5539231590153283
    },
    {
      "id": "Genre_0",
      "name": "Rock",
      "score": 0.5217717435481075
    },
    {
      "id": "Genre_4",
      "name": "Rock And Roll",
      "score": 0.496845307414161
    }
  ],
  "graph_context": [
    {
      "n": {
        "labels": [
          "Category"
        ],
        "name": "Rock"
      },
      "m": {
        "labels": [
          "Collection"
        ],
        "name": "Music"
      },
      "rel_types": [
        {}
      ]
    },
```

4. Agent Retriever for evaluation:

```
[suryaps@Suryas-MacBook-Air RelGraphRAG % python3 src/agent_retriever.py
/Users/suryaps/Library/Python/3.9/lib/python/site-packages/urllib3/__init__.py:35: NotOpenSSLW
ib3/issues/3020
  warnings.warn(

🧠 Find songs about rock
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 10 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Show artists similar to AC/DC
Used vector similarity because query mentioned semantic similarity.
Found 0 top vector hits and 0 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Show all musical genres
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 10 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 List albums created by artists
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 0 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Show tracks belonging to genre Rock
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 10 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Which employees support customers?
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 0 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Find tracks created by artists
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 10 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Show albums related to AC/DC
Used graph traversal to explore relationships explicitly.
Found 0 top vector hits and 0 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------

🧠 Customers who bought rock music
Hybrid mode: combined semantic similarity and relationship reasoning.
Found 3 top vector hits and 3 connected graph entities.
Expanded each high-similarity node to its neighbors to provide context.
Final answer derived from merged multi-hop reasoning graph.
---------------------------------------------------------------
```

Shows what mode of retrieval, number of vector hits and number of connected entities

Agent Evaluation:

```
                    GraphRAG Agent Evaluation

 Query                                Mode      Latency (ms)    Hits

 Find songs about rock               hybrid          356.5       3

 Show artists similar to AC/DC       vector          140.8       0

 Show all musical genres             hybrid          123.3       3

 List albums created by artists      hybrid           87.5       3

 Show tracks belonging to genre Rock hybrid          124.9       3

 Which employees support customers?  hybrid           88.7       3

 Find tracks created by artists      hybrid          113.0       3

 Show albums related to AC/DC        graph            36.3       0

 Customers who bought rock music     hybrid           92.2       3

 ✅ Evaluation report saved to docs/evaluation_report.md
```

Evaluation report saved in `docs/evaluation_report.md`:

```
[suryaps@Suryas-MacBook-Air RelGraphRAG % cat docs/evaluation_report.md
# Evaluation Report

**Average Latency:** 129.24 ms
**Hybrid Queries:** 7
**Vector Queries:** 1
**Graph Queries:** 1

---
```