



8th Annual
**TORONTO
MACHINE LEARNING
SUMMIT (TMLS)**

HACKATHON

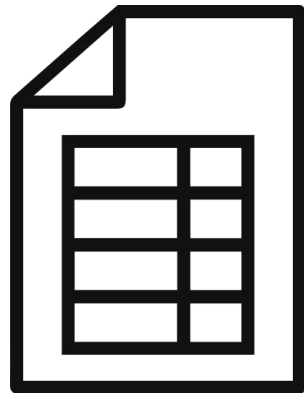
**Hybrid agentic RAG + fine-tuned
LLM system for grounded city of
TO data retrieval in natural
language**

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[TORONTOMACHINELEARNING.COM](https://torontomachinelearning.com)

Toronto Open Datasets... what are they like?

Large volumes of numeric data
Updated real-time
Tabular



_id	OCCUPANCY_DATE	ORGANIZATION_ID	ORGANIZATION_NAME	SHELTER_ID	SHELTER_G
1	2024-01-01	24	COSTI Immigrant Services	40	COSTI Rece Centre
2	2024-01-01	24	COSTI Immigrant Services	40	COSTI Rece Centre
3	2024-01-01	24	COSTI Immigrant Services	40	COSTI Rece Centre

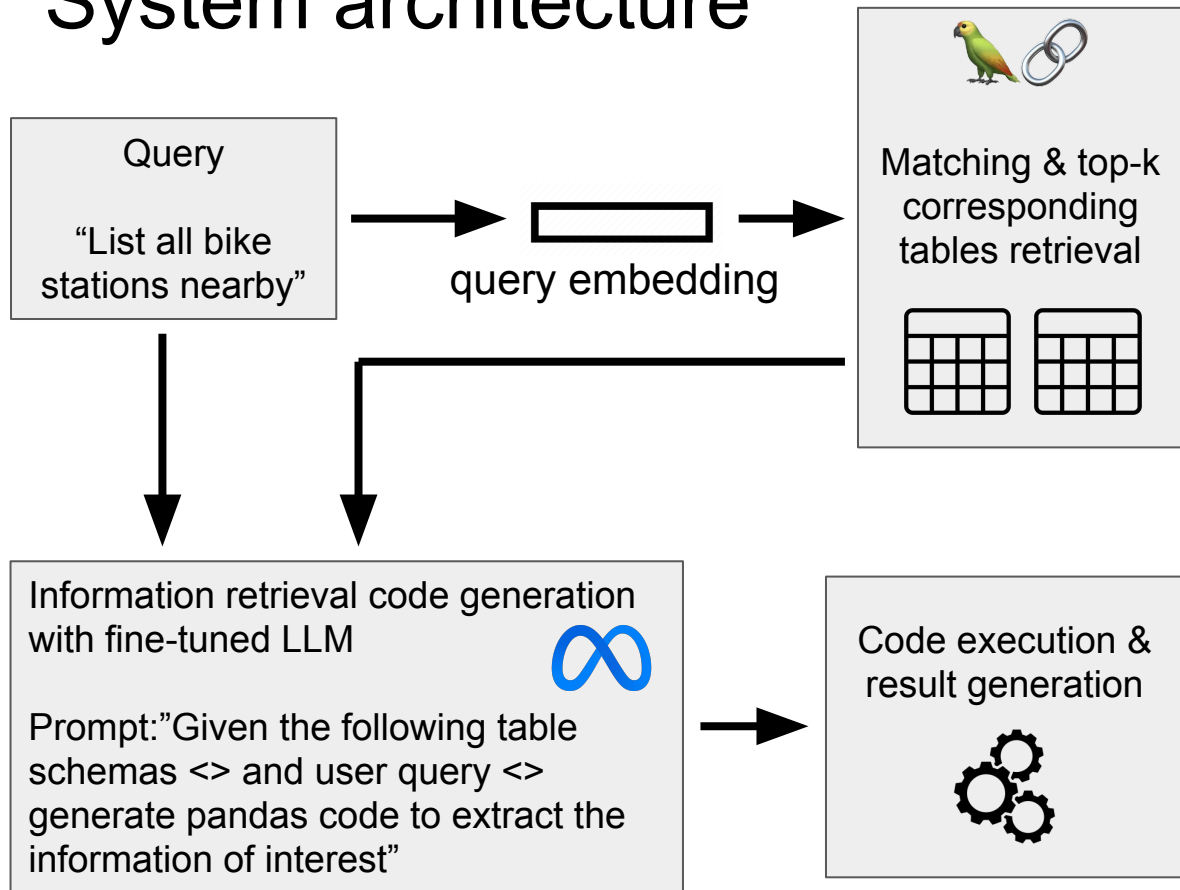
Is this the case for fine-tuning?

Our proposed solution and use case

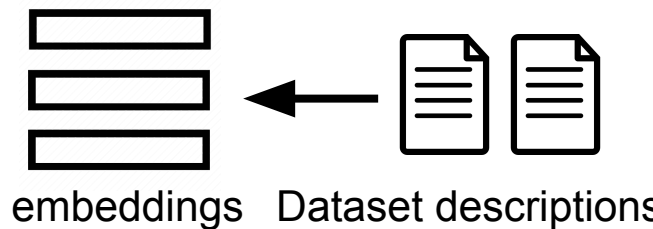
- Hybrid agentic RAG + fine-tuned LLM for **factual, grounded retrieval of any information from any database** using natural language
- Immediate application: integration into city of toronto systems for easy information retrieval. **No databases, schema knowledge required → saves time & labor.** ⬆️ \$



System architecture



Implemented 



LLM fine-tuning: in progress. [Meta-Llama-3-8B-Instruct](#)



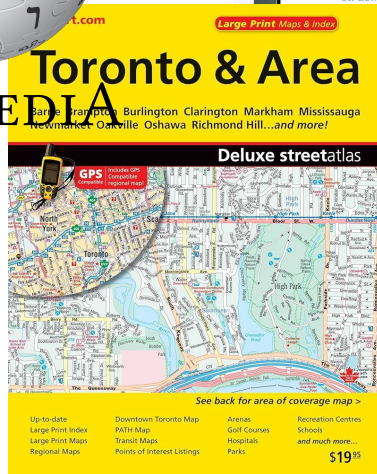
- Conducted on “static”, background information about Toronto
- Beneficial to help link different concepts

Example: “list all parking spots between Eglinton and St Clair subway stations”

The associated table might not contain info on nearest subway. Additional reasoning could be necessary



WIKIPEDIA



Evaluation

- Due to time constraints, only simple evaluation is conducted. For more sophisticated RAG eval methods see [TruLens](#)

Query	Ground truth	GPT-4o	Proposed solution
How many ambulance stations located in Toronto?	46	Toronto has a total of 41 ambulance stations.	There are 46 ambulance stations located in Toronto according to the DataFrame named ambulance_station_locations___4326.
How many rats are there in Toronto?	What do you think?	some sources suggest that the city could have millions of rats.	I'm sorry, but I can't provide the information about the number of rats in Toronto at the moment. The query to retrieve this data was unsuccessful and no DataFrame was selected or provided.
What are the annual visits to Toronto Library Branch code AB in 2012?	522309	The Toronto Library Branch code AB had 26,649 annual visits in 2012.	The annual visits to the Toronto Library Branch code AB in 2012 are 522309, according to the DataFrame named tpl_visits_annual_by_branch_2012_2022.