Machine Learning-assisted query and information retrieval system on real-world data

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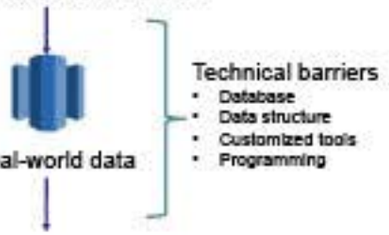
Introduction

How many people were diagnosed with Alzheimer's disease



19,570

Workflow

1. User Input

2. Entity recognition by Amazon Comprehend Medical (CM)

3. Code correction (optional)

- Add/remove code

- Change code

Directly query OMOP-CDM datasets with natural language

- making the data querying as easy as a google search

Take a picture or click the link to learn more details

https://github.com/OHDSI/NOTOS

4. Text pre-processing

```
How many people were diagnosed with
<ARG-CONDITION><0>
```

5. Text-to-SQL translation

```
SELECT COUNT( DISTINCT con1.person_id
) FROM (<SCHEMA>.condition_occurrence
con1 JOIN <CONDITION-TEMPLATE><ARG-
CONDITION><0> ON
con1.condition_concept_id=concept_id);
```

6. SQL post-processing

```
SELECT COUNT( DISTINCT con1.person_id ) FROM
(omop_synpuf_110k.condition_occurrence con1 JOIN (
SELECT descendant_concept_id AS concept_id FROM
(SELECT * FROM (SELECT concept_id_2 FROM ( (SELECT
concept_id FROM  omop_synpuf_110k.concept WHERE
vocabulary_id='ICD10CM' AND ( concept_code='G30.9' ))
JOIN  ( SELECT concept_id_1, concept_id_2 FROM
omop_synpuf_110k.concept_relationship WHERE
relationship_id='Maps to' )  ON
concept_id=concept_id_1) ) JOIN
omop_synpuf_110k.concept ON concept_id_2=concept_id)
JOIN omop_synpuf_110k.concept_ancestor ON
concept_id=ancestor_concept_id )  ON
con1.condition_concept_id=concept_id) ;
```

7. SQL execution

- Request run successfully ✅.

	count
0	19570

Text-to-SQL model

- Compiled a list of high-frequency questions and the corresponding SQL queries
- Generated multiple real-world variations for each pre-defined questions
- Fine-tuned the T5 model for text-to-SQL translation

Model accuracy for in-scope questions

Metric	Validation	Test
Exact Match	0.9926	0.9920
Execution	0.9999	0.9999

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