Neural Semantic Parser

Abstract

- Semantic Parsing is the task of converting a natural language utterance to a logical form: a machine-understandable representation of its meaning.
- Neural semantic parsing is a fascinating area under natural language understanding (NLU).
- Applications of semantic parsing include machine translation, question answering, ontology induction,automated reasoning, and code generation.
- In this project,we have built a deep-learning model using LSTM(Long-Short-Term_Memory) neural network which is so far proven to be one of the best neural networks for natural language understanding on different assertive and interrogative statements.
- The tools will be used in chatbots, conversational AI agents etc.

Input to output example

Keywords

- Natural Language Processing (NLP)
- Neural Semantic Parsing
- Grammar
- LSTM
- Attention

Datasets

1) Spider dataset : Large scale complex and cross - domain semantic parsing and text to SQL dataset annotated by 11 Yale students. Consists of 10,181 questions and 5,693 unique complex SQL queries on 200 databases with multiple tables. Spider is distinct from most of the previous semantic parsing tasks because they all use a single database and the exact same programs in the train set and the test set.

Scope

Assertive and Interrogative English language sentences will be the input for the neural network to obtain a grammar in order to parse the sentence and obtain a derivative which on further computation would translate into behaviour/logical form.

ALGORITHMS USED

Our system mainly consists of 4 components :

- Encoder : The encoder computes feature vector representation of a input sentence representation.This representation is used by the decoder to predict each output sentence representation and also to apply attention weights.

- Decoder : The encoder outputs are passed to the decoder which predicts one output word per time frame.The previous output from decoder is passed as an input to get next predicted word.The attention mechanism multiplies attention weights with encoder outputs to get attention information.

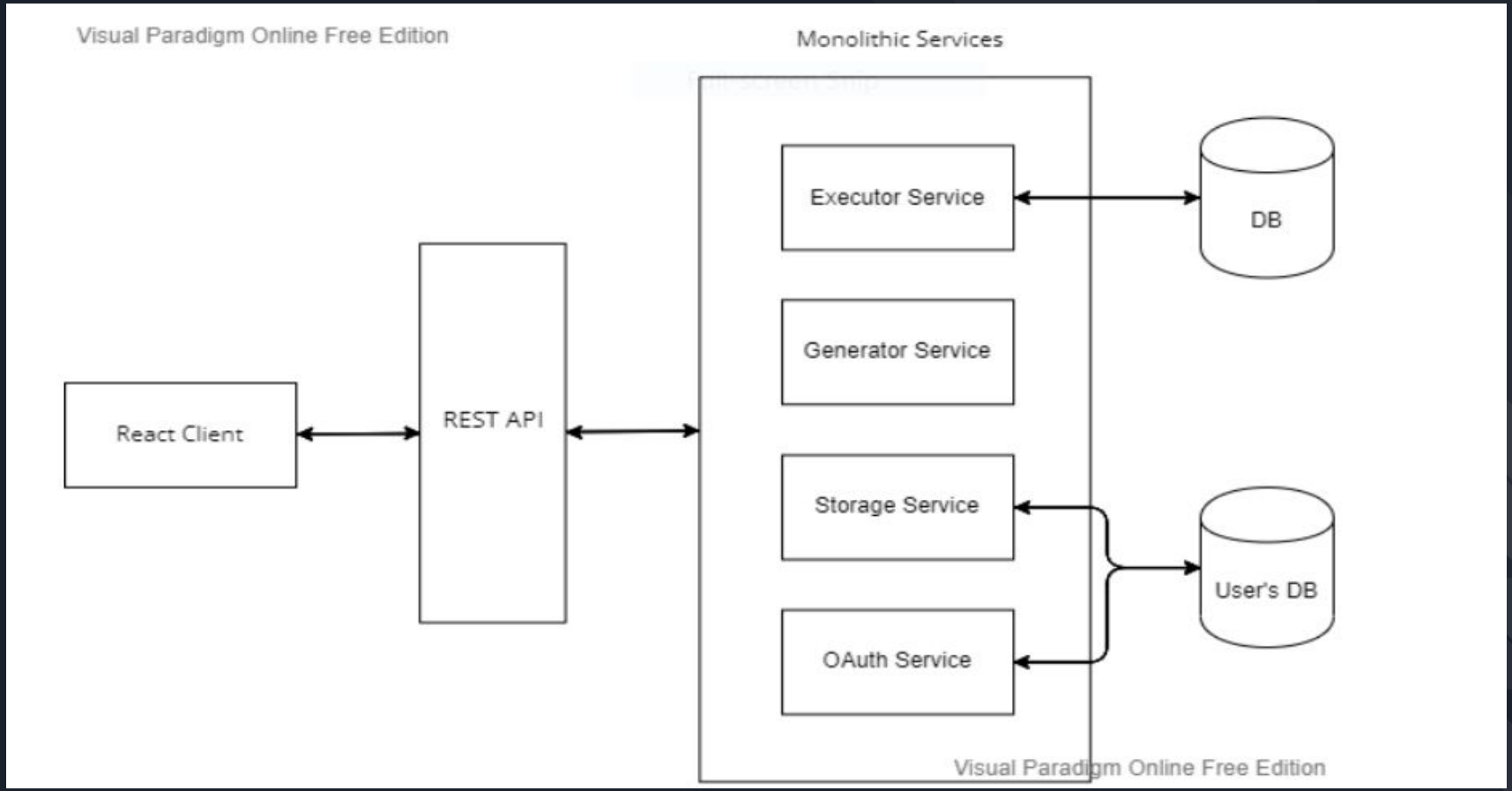
- Table predictor : The output SQL query semantics rely heavily on table information from which data is extracted. The list of available tables is used as classes for multi-class classification. The classifier takes sentence encoded information as input and applies activation to give a probabilistic vector output representation. The class corresponding to the highest probability is the table name from which data is to be extracted. The input sentence is sequentially encoded by a LSTM layer and the final encoding is given to the classifier as a input.

Proposed System

- The end goal is to have a web-server/command line script running where we feed in utterances and it shows us the result/behaviour of the semantic parser using the logical form as the intermediary.
- An user-friendly GUI where the user can input assertive and interrogative English sentences which would show the output by running an ML model present at the back end for both the semantic parsers.
- The system is also enabled with authentication service (including Log in and Registration) and also we can save the previous queries in the database using MongoDB

- Columns Ranker : Columns Ranker is the final module of our architecture. It ranks all the possible final queries with the input sentence using cosine similarity concept. Cosine similarity is a scalar quantity gives the magnitude of closeness of two vectors projected in the given feature space. Higher the cosine similarity, higher is the probability that the sentences have similar meanings.

System Architecture



Proposed Outcome

- An SQL query equivalent of the desired question user seeks the answer for.

Thank you!