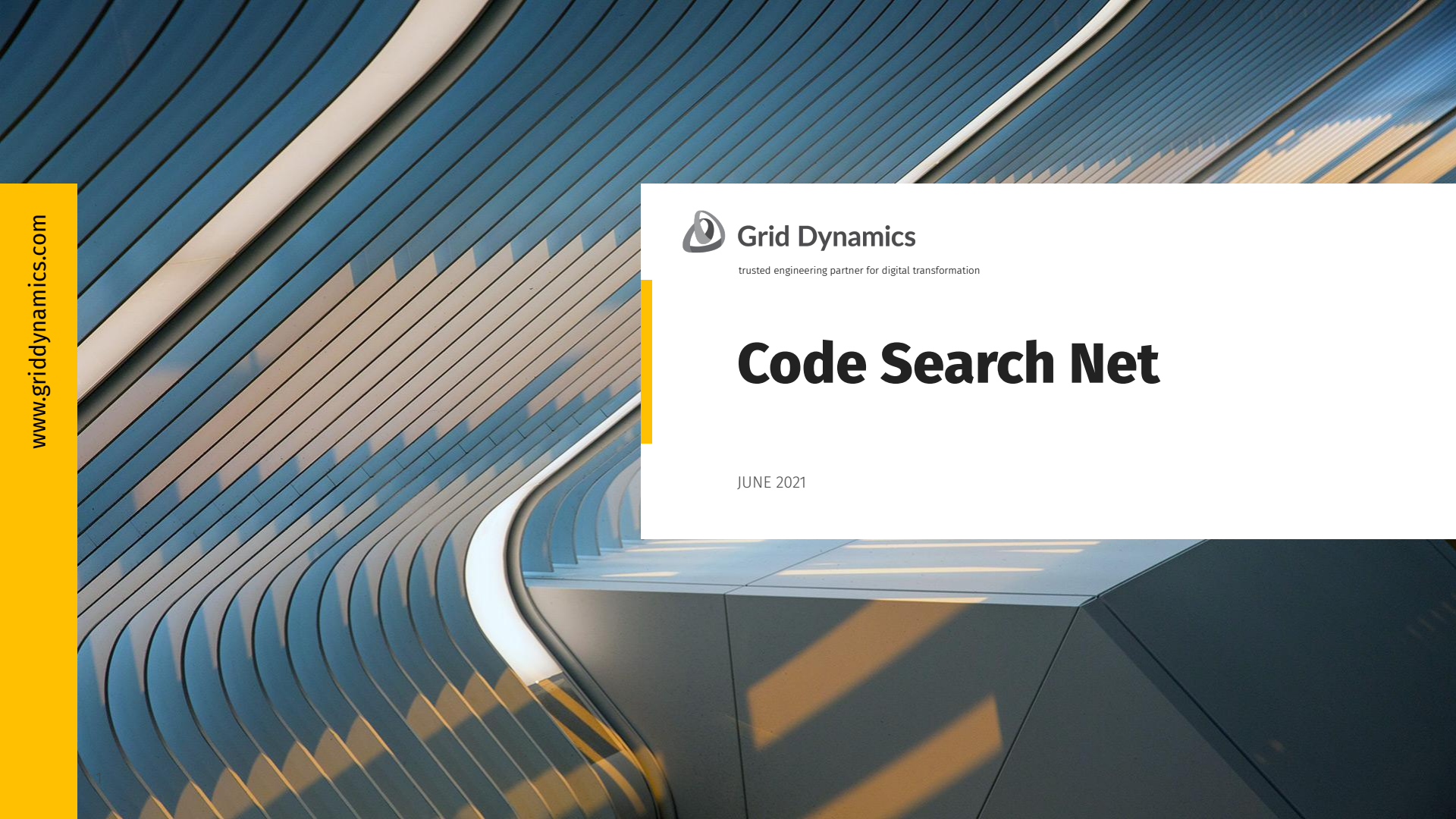

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Code Search Net

JUNE 2021

Exploring the dataset

In our Dataset 1,50,000 rows and 12 columns are present . Columns are dosctring , code ,github link, url ,language, function name . original_string and code column are same , language in the dataset is python only , code_tokens and docstring_tokens are not required as processing to be done on docstring. Only useful columns for our use case is only docstring and code , with zero null value present in the dataset.

Example

func_name	original_string	language	code	code_tokens	docstring	docstring_tokens
pipe	def pipe(*args):\n """\n Takes as parame...	python	def pipe(*args):\n """\n Takes as parame...	[def, pipe, (, *, args,), :, if, len, (, args...	Takes as parameters several dicts, each with t...	[Takes, as, parameters, several, dicts, each, ...
GdsLibrary.top_level	def top_level(self):\n """\n Out...	python	def top_level(self):\n """\n Out...	[def, top_level, (, self,), :, top, =, list, ...	Output the top level cells from the GDSII data...	[Output, the, top, level, cells, from, the, GD...
synchronize	def synchronize():\n """\n Helper functi...	python	def synchronize():\n """\n Helper functi...	[def, synchronize, (,), :, if, not, dist, ., ...	Helper function to synchronize (barrier) among...	[Helper, function, to, synchronize, (, barrier...
_get_data_versions	def _get_data_versions(data):\n """Retrieve...	python	def _get_data_versions(data):\n """Retrieve...	[def, _get_data_versions, (, data,), :, genom...	Retrieve CSV file with version information for...	[Retrieve, CSV, file, with, version, informati...
HistoryAwareReferenceField.retrieve_version	def retrieve_version(self, obj, version):\n ...	python	def retrieve_version(self, obj, version):\n ...	[def, retrieve_version, (, self, ,, obj, ,, ve...	Retrieve the version of the object	[Retrieve, the, version, of, the, object]

Removing all rows with a language other than English.

- Docstring is present in more than 1 language.
- We want only English as a language.
- Removing all the rows that has language other than English.
- After removing all the other languages the size of dataset is 1,15,643.

7991	Returns an optional configuration value, as an...	def get_int(self, key: str) -> Optional[int]:\...
64640	Touch every point on an object 'numInitialTrav...	def doExperiment(numColumns, l2Overrides, obje...
53573	为task新建一个后台下载线程, 并开始下载.	def start_worker(self, row):\n '''为task...
121907	Test whether a key is a label reference for a ...	def _is_label_reference(self, key, axis=0):\n ...
7031	move source to destination. Can handle uploadi...	def move_to_destination(source, destination, j...

Processing the Data

- Converting all text in the lower case.
- Removing all numeric and extra spaces in the text.
- Removing all stop word like (is , the , a) from english vocabulary.
- Lemmatizing the word like converting happiest -> happy with proper meaning in English vocabulary
- Tokenizing the text and making new column with these tokenized docstring.
- After doing tokenization removing all the rows that has size of 3 or less than 3. The shape of dataset after doing the processing is [113884 , 4] .

	docstring	code	tokenized_docstring	tokenized_code
0	Cleanly shutdown the router socket	def close(self):\n '''\n Cleanly...	cleanly shutdown router socket	def close self cleanly shutdown router socket ...
1	Pre-fork we need to create the zmq router devi...	def pre_fork(self, process_manager):\n ...	pre fork need create zmq router device param f...	def pre_fork self process_manager pre fork nee...
2	After forking we need to create all of the loc...	def post_fork(self, payload_handler, io_loop):...	forking need create local socket listen router...	def post_fork self payload_handler io_loop for...
3	Handle incoming messages from underlying TCP s...	def handle_message(self, stream, payload):\n ...	handle incoming message underlying tcp stream ...	def handle_message self stream payload handle ...
4	Bind to the interface specified in the configu...	def _publish_daemon(self, log_queue=None):\n ...	bind interface specified configuration file	def _publish_daemon self log_queue none bind i...

Embedding

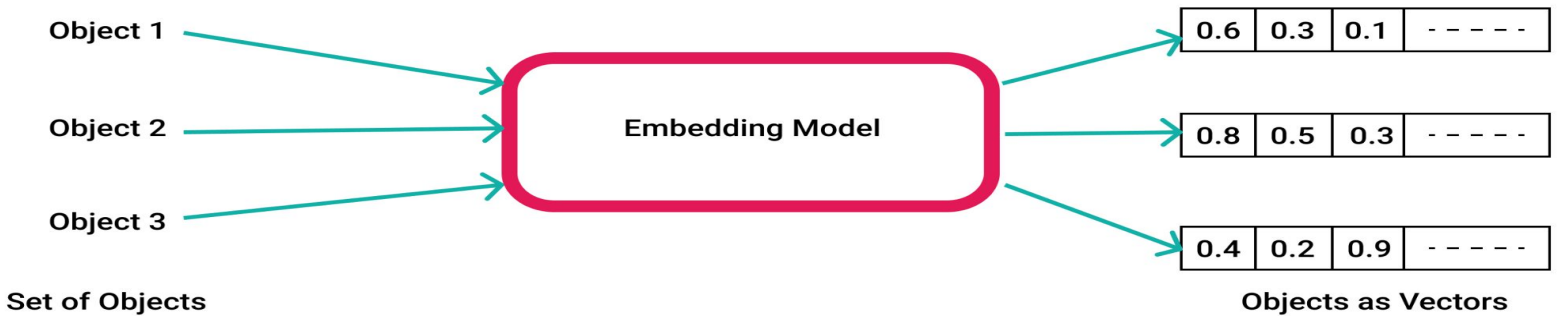
- Embedding or Word Vector is a numeric vector input that represents a word in a lower-dimensional space.
- The representation is a real-valued vector that encodes the meaning of the word in such a way that the words that are closer in the vector space are expected to be similar in meaning.
- Different embedding model have different vector size.

Need for Embedding?

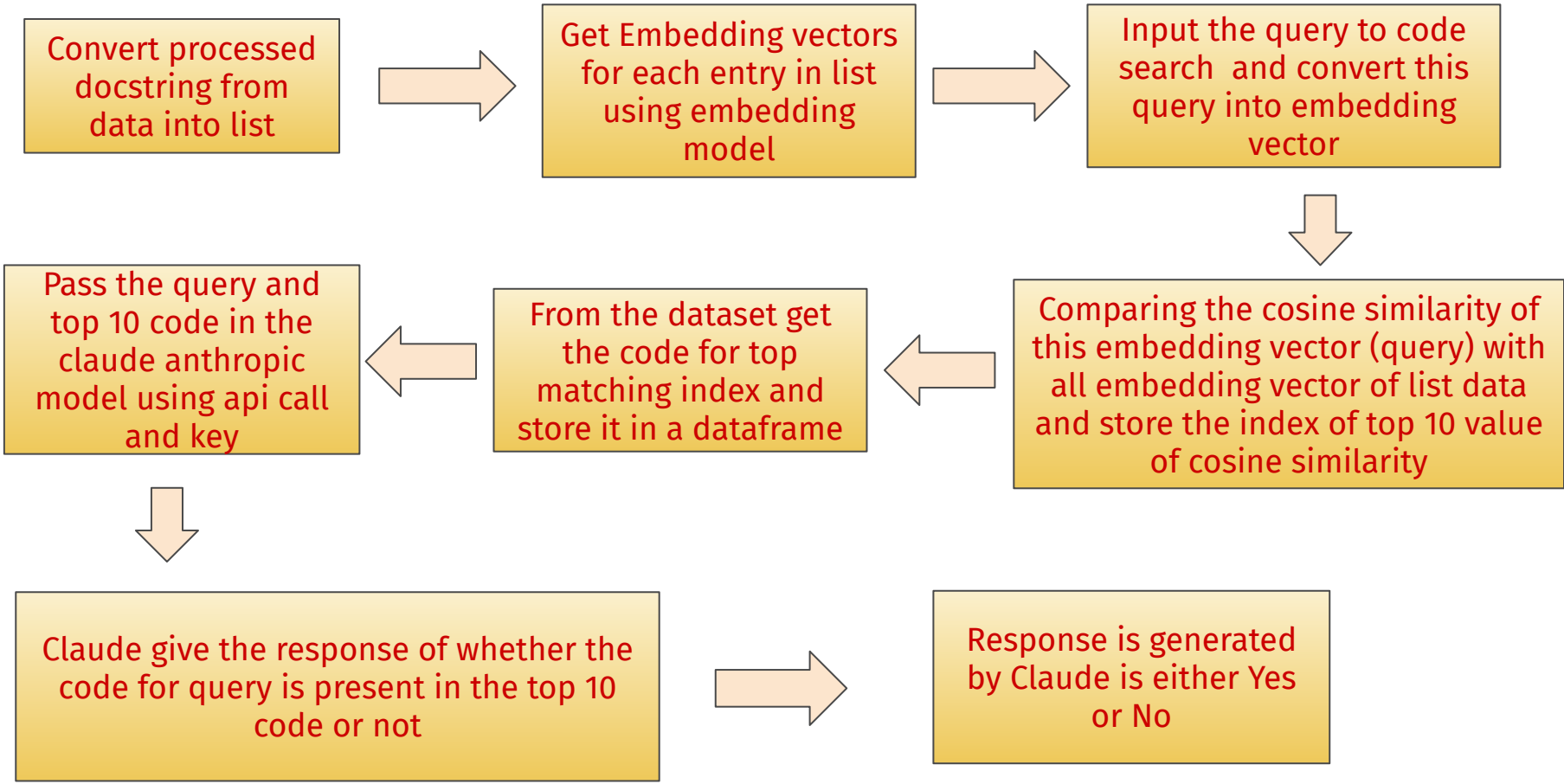
- To reduce dimensionality
- To use a word to predict the words around it.
- Inter-word semantics must be captured.

How are Word Embeddings used?

- Take the words —-> Give their numeric representation —-> Use in training or inference.
- To represent or visualize any underlying patterns of usage in the corpus that is used to train them.



Work Flow


Convert processed docstring from data into list
Get Embedding vectors for each entry in list using embedding model
Input the query to code search and convert this query into embedding vector
Comparing the cosine similarity of this embedding vector (query) with all embedding vector of list data and store the index of top 10 value of cosine similarity
From the dataset get the code for top matching index and store it in a dataframe
Pass the query and top 10 code in the claude anthropic model using api call and key
Claude give the response of whether the code for query is present in the top 10 code or not
Response is generated by Claude is either Yes or No

Claude Anthropic model

- The query from user and top 10 code are passed into Claude.
- Top 10 code are converted to dataframe as it is the data in this case.
- Human response is the query in this case.
- We have to the define the system prompt like what we want from the claude do with our data.
- Like In this we are matching the code for query is present in top code or not accordingly we define the system .

```
chat = ChatAnthropic(anthropic_api_key=key ,temperature=0, model_name="claude-3-opus-20240229")

system = (
""" Your task is to provide a response of only 'YES' if there is a 75 percentage matching of human input in the
    or only 'No' if there isn't,
    when comparing the data to human input.

data: {data}
human: {human}
"""
)
prompt = ChatPromptTemplate.from_messages([("system", system), ("human",human)])

chain = prompt | chat
response=chain.invoke(
{
     "data": data,
    "human": human,
}
)
```

Example :

Input from user and get the top 10 code for this query and pass this query to the claude api.

```
questions ='binary search function with complexity log n'
```

```
top_match_code=get_top_10_code(questions,embeddings_multilingual_e5_large_instruct,model_2)
```

Response from the claude api after matching the query with top code

```
print(check_response(questions,top_match_code))
```

```
AIMessage(content='YES')
```

Testing data:

- Testing data is generated by our own .
- Testing data is docstring and it is generated by rephrasing and changing some words in the docstring.
- Number of query is testing data is 57.
- The accuracy of testing is measured on the basis of how many times the response from the claude is yes for 57 queries ,means for each query the code is correctly retrieved or not.
- Accuracy of model = (Total Number of Yes / size of testing data) *100

Embeddings Model

Model 1 : sentence-transformers/all-mpnet-base-v2

- The embedding vector size is 768.
- Token size is 514.
- Accuracy of model 1 :78.94

Model 2 : intfloat/multilingual-e5-large-instruct

- This model has 24 layers and the embedding vector size is 1024.
- Token size is 514.
- Accuracy of model 2 : 75.43

Embeddings Model

Model 3 : intfloat/e5-base-v2

- This model has 12 layers and the embedding vector size is 768.
- Token size is 512.
- Accuracy of model 3 : 78.94

Model 4 : mixedbread-ai/mxbai-embed-2d-large-v1

- The embedding vector size is 1024.
- Token size is 512.
- Accuracy of model 4 : 87.71