Understanding Siri

Using BERT Classification Models

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Consider this:

- This is a high pressure environment.
- You've got lasagna in the oven,
  your eyes water from the onion,
  and you need to get on with your husslin'

Suddenly...

- The phone starts ringing!
- It’s a friend, trying to find the address.
- It stresses you out, but the only thing you can do is focus on your onion.
- You can’t accept the call. You turn your back on your friend. (Literally you face the opposite direction.)

Why are virtual assistants important?

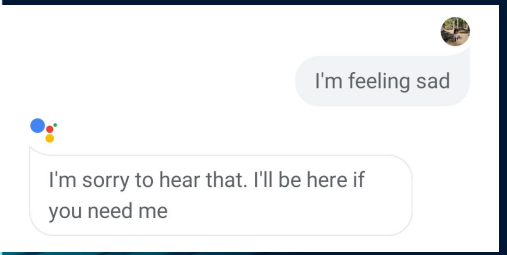
Life would just not be the same without them.

- Utility: easy for people that don't want to engage their hands
- ✨Free therapy✨ and endless chatter for the socially anxious

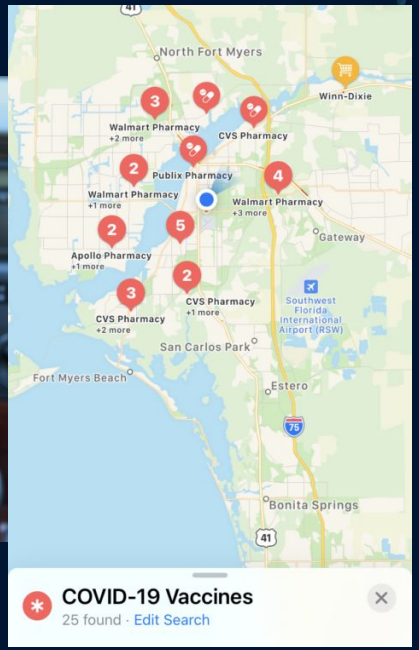
- Even I used my Google Assistant to set alarms for this class

Real-World Applications

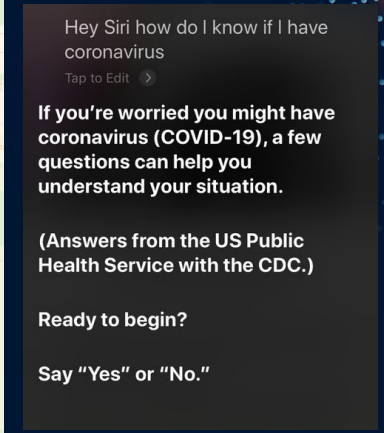
SUPPORT



DISTRACTED DRIVING



COVID-19



How did we do it?

WEEK 6

Figured out the type of data we were going to be dealing with.

WEEK 7

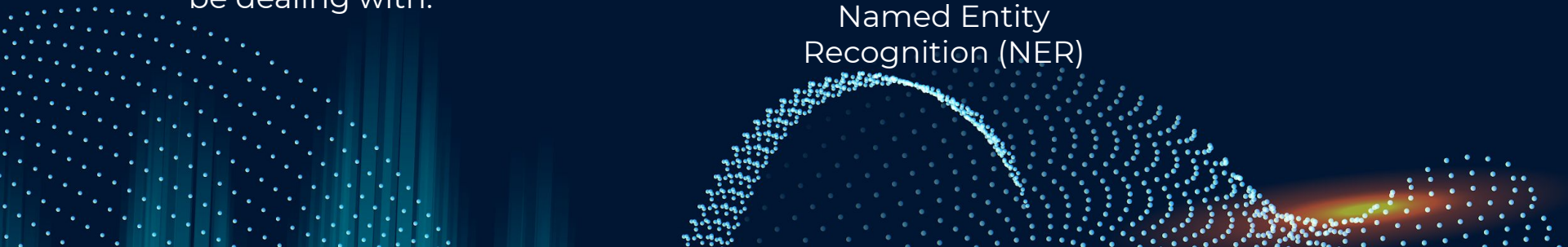
Discovered sentence level intent classifiers + BERT

WEEK 8

Learned about token level classification and Named Entity Recognition (NER)

WEEK 9

Assimilated all of our learnings in this presentation!



Two really important parts

Sentence Level Intent Classification

- Preprocess dataset
- Implement a pre trained BERT model.

Named Entity Recognition

- Every token gets categorized as something
- Use a BERT model to build our joint sequence and token classification model.

Intentions

Intentions of the model

- Add To PlayList
- Book Restaurant
- Get Weather
- Play Music
- Rate Book
- Search Creative Work
- Search Screening Event

There could be more intentions added to the model

Named Entity Recognition (NER)

Input : Sentence

BIO tagging the sentence

- B : Beginning
- I : Inside
- O : Outside

Leads to one of the intent label

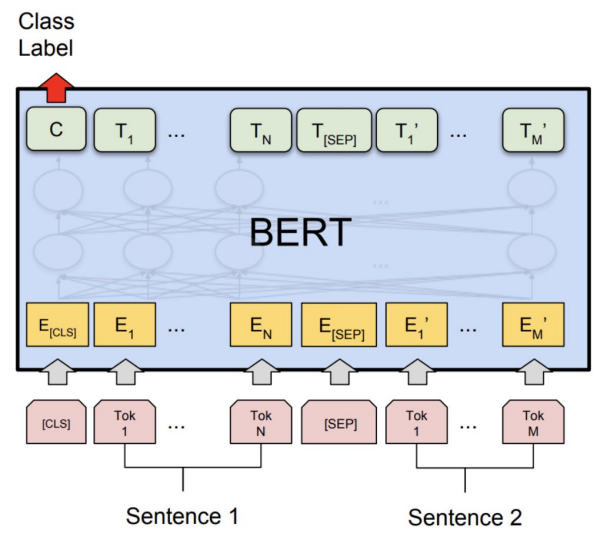
```
  Book : O
     a : O
 table : O
   for : O
   two : B-party_size_number
    at : O
    Le : B-restaurant_name
     R : I-restaurant_name
 ##itz : I-restaurant_name
   for : O
Friday : B-timeRange
 night : I-timeRange
     ! : O
```

Our final output for “Book a table for two at Le Ritz for Friday night” should look like this:

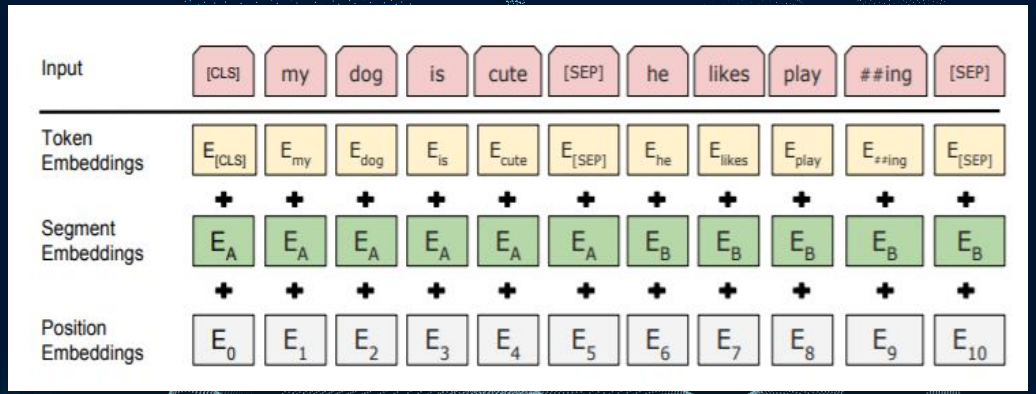
```
{
    'intent': 'BookRestaurant',
    'slots': {
        'party_size_number': 'two',
        'restaurant_name': 'Le Ritz',
        'timeRange': 'Friday night'
    }
}
```

What is BERT?

BERT (Bidirectional Encoder Representations from Transformers) is a model which uses the context from the words on the left and right to generate embeddings for each of the sequence's tokens.



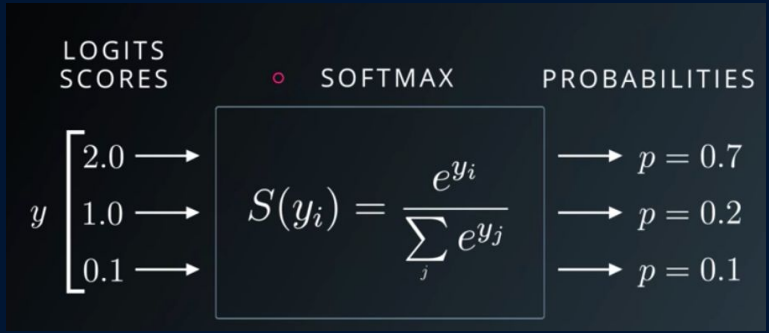
Preparing Data for BERT



1. Tokenize the sequence using BERT's pretrained tokenizer.
2. Embed each token with BERT's pretrained encoder.
3. Add [PAD] tokens to the end of each sequence so that they would all be the same length.

ML Model

- Pretrained Tensor Flow BERT model
- Joint sequence (intent) and token (entity) classification model
- Outputs logit scores for each intent and entity classification
- Final softmax normalization layer in the loss function to determine classification probabilities



Real-World Implementation

Voice → Text → Tokens → Meaning → Actions

For our project to be fully operational, we would need:

- A speech recognition system
- To translate speech to English as BERT is trained in English
- Data for intents which we have not included in our model yet
- Our model to adapt to the individual
- To give the OS the necessary BIO tags as information to complete tasks

Onion Man: the sequel

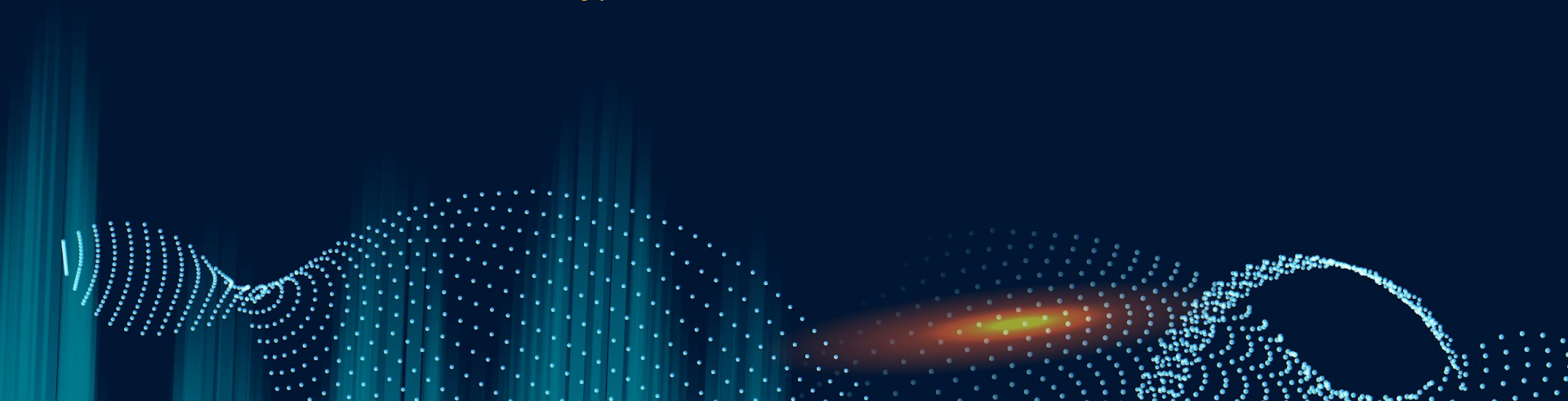
- With the advent of AI Virtual Assistants, you can comfortably take your friend's phone call by a mere magical command "Hey google, accept this call"

- GOLDEN RULE:

  More time for making lasagna = less time wasted

Talk to our *chatbot*

Type a command in the chat



THANKS!

We've learned a ton about AI these last 10 weeks, and we're left **INSPIR~~IT~~**ed, with a lot more to explore.

Special thanks to our project mentor, Jason
And to our earlier mentors, Sydney, Tanish, Khaled J