

# Dialog Systems Final Project

## Abstract

For the final project of the class "Dialog Systems" my goal was to create a conversation system that can converse in English. For this purpose I trained a chat bot model that who responds to inputs like Michael Scott from the famous American sitcom "The Office".

## 1 Introduction

My goal for this project is to design a conversational system which can converse in English. For this purpose, my idea was to design and train a chat bot that responds to inputs like Michael Scott from "The Office". I have chosen Michael Scott as the character for my chat bot because I had a great time watching "The Office" and I thought that it would be interesting to see how close the answers would be to the answers of Michael Scott in specific situations. In order to achieve my goal, I found a data set online from "kaggle.com" which includes every single line from the show. Then, I used Microsoft's DialogGPT(small) to build a model and trained it.

## 2 Related Work

For my model I have used Microsoft's DialogGPT which is a pre-trained model that was trained using reddit comments from 2005 through 2017. First, I found the movie scripts from "kaggle.com". Thankfully, the data was well organised. Secondly, I got rid of the irrelevant information in my dataset. For instance, season and episode numbers. In my case I did not need them because they don't help us training the model. They are completely irrelevant. Secondly, I split the data into training and testing data in order to test my model and see how correct it is. I cached and stored the data-points and built my model using DialogGPT-small. I used the small version of Microsoft's DialogGPT in order to save time and it was more appropriate for a relatively small project. After that, I trained and evaluated the model and started interacting with it.

## 3 Dataset

As I have mentioned in the previous part I found the dataset on "kaggle.com" ([www.kaggle.com/fabriziocominetti/the-office-lines](http://www.kaggle.com/fabriziocominetti/the-office-lines)). The dataset had 4 columns which are character, line, season number and episode number. Character contained the name of the character. Line contained the combination of sentences and reaction of the characters in parenthesis. Season number and episode number contained the season and episode numbers. Since season number and episode number were irrelevant for my project I removed them.

## 4 Issues Encountered

While doing the project I have encountered couple of issues. Firstly, since I don't have a Linux environment I was working on my Windows system using Jupyter Notebook. But for some reason, I couldn't import "Transformers" and some other libraries because of version incompatibility. First, I tried to create a virtual linux enviroment and started working there but since it is a virtual environment it was super slow compared to a real enviroment. I was looking for solutions online and I found out that Google collab notebook provides you a GPU for your runtime and it speeds up the process. I had no problems at all after I started working there.

Secondly, because Michael Scott has almost 12000 lines in the whole script. It took a lot of time (around 180 minutes) to train and evaluate the model. Even though it is not a really long time for a model to train itself, I had to find an alternative way to reduce the time. Because, I wanted to test my model and I wanted to see how it gives answers to different types of questions. For this purpose, I trained my model using the lines of "Stanley" which is a side character in the series and has less lines (around 900) than Michael. And I saw that my chatbot is working fine. So, as a final solution

I only used Michael Scott's lines from season 1 to season 4 at first but after changing my code and reducing the batch size I was able to use the whole 9 seasons.

## 5 Examples

As I have mentioned I tried to test my chat bot with Stanley first. Since, Stanley likes food (especially free food), has 2 daughters and wants a raise in his job. I tried to ask him a couple of questions related with food and his daughter. You can find the example below:

User: Do you want free cupcakes?

Stanley: I want free cupcakes.

User: How many cupcakes do you want?

Stanley: Four.

User: Okay here they are

Stanley: Four, three.

User: there is one more

Stanley: You know what? I'm not going to go to the doctor.

User: Why?

Stanley: Why?

User: Why are you not going to the doctor?

Stanley: !!!?!!

User: Wanna raise?

Stanley: "!!" "Dwight's gonna raise it!!

User: Do you like Michael?

Stanley:

User: Do you like Dwight?

Stanley: ??

User: Do you like your daughters?

Stanley: , you know what!! You're not the boss!!!! [everyone clapping]!!!,!!![!!]

For some reason after I asked Stanley whether he wants cupcakes he stated that he wants some cupcakes. But he made a typo. Instead of "cupcakes" he said "cupscakes". Moreover, I asked a question about his daughters and he gave me irrelevant answers again. Secondly, I tried to ask questions which are related to the previous answers and the chat-bot gave irrelevant answers. Thirdly, for some reason he answered some of my questions with only exclamation marks and question marks. I believe it is because the show transcript has information in parenthesis which shows the emotions of characters. It can be also because of the characteristics of Stanley as well. Because, he does not like talking a lot and answers some questions with just nodding his head or making different kinds of facial expressions. Lastly, I asked him whether he

wants a raise. Even though, he states that money is important for him and wants a raise during the whole 9 seasons he gave me an irrelevant answer instead of stating that he wants a raise.

Here is another example which I ran using "Andy Bernard" as my character. The perplexity was a little bit higher than 10 which shows that how confused our chatbot is.

User: Hello

Andy: Hey, Andy Bernard.

User: How are you Andy?

Andy: I'm fine.

User: Would you like to go out for a dinner sometime?

Andy: No.

User: Which university are you graduated from?

Andy: Dartmouth.

User: Do you like the people in the office?

Andy: Yeah, they're pretty nice.

User: How are things with Michael?

Andy: He's a pretty cool guy.

Andy: Would you like to go fishing tomorrow?

Andy: Yes.

User: What kinds of books do you like?

Andy: Anything?

User: Do you like Call of Duty?

Andy: Absolutely.

User: Then, would you like to play call of duty sometime?

Andy: Let's go.

User: I see you are really interested

Andy: Yeah.

User: Are you a Cornell University graduate?

Andy: Cornell, Cornell, right?

User: Okay

Andy: No, I've never heard of Cornell.

User: How is this possible?

Andy: Because I've been collecting intelligence from intelligence sites.

Andy was kinder compared to Stanley. Even though, we have a relatively higher perplexity he answered some of the questions right. There was a scene where the guys in the office was playing Call of Duty on LAN in the office. I asked whether he likes Call of Duty and he answered the question affirmatively and told me that he would be down playing Call of Duty with me someday. But for some reason, he doesn't accept the fact that he is graduated from the "Cornell University". Even though, he states proudly (basically in every episode) that he is graduated from "Cornell University". I believe

this is because he has a high perplexity. Overall, in spite of having a high perplexity I was generally satisfied with the answers from Andy.

Here is my third example with Michael. I used the transcript from season 1 through season 4. The perplexity was a little higher than 6 so, technically it should give more relevant answers than Andy.

User:Hey Michael

Michael: Hey, Jim.

User:Long time no see

Michael: You're back!

User:Yes, you guessed it right!

Michael: What?

User:How are you?

Michael: I'm good. How are you, Janet?

User:How do you know my name?

Michael: Oh, Michael.

User:You are the best boss ever

Michael: Thank you.

User:Do you miss Jan?

Michael: Yeah, I bet you wish you worked here.

User:Would you like to go out for a dinner today?

Michael: No, I'm busy. I-I-I have a party in a minute.

User:Can I come to the party?

Michael: Sure.

User:Is there a theme for the party?

Michael: It's a running joke.

User:Why are you giving me unrelated answers?

Michael: Because I know you'll get all of them.

As you can see, even though perplexity was lower and our chatbot is less confused. It gave me a few unrelated answers. For instance, I didn't state my name and the chatbot called me Jim and Janet. Other than that it was working okay for me.

For the example below I have used the script from season 1 through season 9. Even though, Michael had more lines for this run the perplexity was around 6.8 again.

User:Hey Michael

Michael: Hey, it's Jim.

User:How are you

Michael: Good to see you.

User:Oh thank you

Michael: So glad we finally got to do this with you guys.

User:What do you mean

Michael: So good to see ya?

User:Okay, it is good to see you too

Michael: So, did you do the thing I asked you to do about the chairs?

User:No I didn't

Michael: So did I do it?

User:I don't know you tell me

Michael: So I ask you, did I?

User:Did you?

Michael: Yes I did.

User:Oh very nice

Michael: So nice.

User:Would you like to go out for couple of beers tonight?

Michael: Yeah, definitely.

User:Which bar do you want to go?

Michael: Aquila sounds great.

User:Okay then it is a plan

Michael: Ok, good, let's do it.

User:You are the best boss!

Michael: You're the best man, man!

User:Cheers!

Michael: Holly

User:See you tonight at 6 PM

Michael: See you.

As you can see for this run my chat bot for Michael performed some jokes as well. He performed some word games. But for some reason he introduced himself at beginning as Jim again maybe he tried to perform some jokes again. In spite of using the whole 9 seasons as a script I still got an irrelevant answer from my chat bot. When the input was "Cheers!" the answer was Holly(who is a character which Michael was in love during a couple of seasons).

## 6 My Approach To the Problem and Process

Firstly, for the final project I had to find an idea and work around it. So, I went online and did a little web search about where chat-bots are used saw interesting and fun ideas. I was looking for videos and came up with the video which explains how to create a Discord bot which responds like a certain movie character using Python and Machine Learning. The video was really interesting and I decided to use it as a reference for my final project. First, I had to choose a fictional character from a movie or a TV show and it was the easy part. As I mentioned in the problems encountered part I had a hard time importing the libraries at first but after I started using Google Collab it was all fine. The other problem I faced was the memory issue and

I reduced the movie script into 4 seasons and also reduced the batch size and solve that problem as well. Other than that it is safe to say that my process was pretty straight forward. Since "The Office" was my favorite show I chose "Michael Scott" as my character. For the data part I had to find the whole show transcript. I went online again and saw that there was already a well organized data on kaggle.com. I downloaded the "csv" file and created my data frame. I started running the code for the first time and unfortunately, I had a GPU memory error because I tried to train the model with 12000 lines that Michael has. So I reduced the data frame and only used 4 seasons. After that, I used Microsoft's pre-trained model DialoGPT and deployed the model and tested with different situations.

## 7 Conclusion

In conclusion, while doing this project in spite of having no previous experience working with machine learning models I have learnt lots of things. I learned how can I train and deploy a model. How can I increase the accuracy of the model I use. And more importantly, creating a chat bot which is trained by machine learning models. At first I was a little overwhelmed because of the issues I had. But I managed to overcome them. I think my chat bot is not the best but I believe it is working fine. As you can see in the examples section I got some irrelevant answers but other than that it was working fine. Unfortunately, I wasn't satisfied with how the bot responds about people's characteristics (For example, our bot trained as Andy Bernard does not accept the fact that Andy Bernard is graduated from "Cornell University")

Also, I would like to mention that this project helped me to see how powerful and interesting those dialog systems tools are. I am very excited to see what can happen with this technologies in the future. Personally, I believe that it also helped me to see a different field in computer sciences. It is safe to say that it gave me a different perspective.

For future work idea, I think I can improve my bot adding expressions and emotions in parenthesis but I don't know how to implement that to my code.

### 7.1 References

(Zhang et al., 2019) (Wolf et al., 2020) (Li et al., 2016) (Mazaré et al., 2018) (Radford et al., 2019) (Rasooli and Tetreault, 2015) (Zhang et al., 2018)

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