**Fine-tuning the GPT-2 345M Model on Ubuntu Conversation data**

This model was trained on the implementation of GPT-2 345M to allow training as acquired from the following url:’ <https://github.com/tenoke/gpt-2>’. The model was trained on subsets of the Ubuntu-dialogue-corpus. Each csv file was significantly longer than would be normally read into memory had we directly read the frames so we used the ‘chunksize’ attribute to allow us to read the entire data. This was then passed on to a function to just select the date/time, sender and message sent and write that information into a txt file. Having done so, the corresponding text files were encoded into ‘.npz’ format and passed along to the model to be trained on.

Training was done in at least 2 steps, the initial step using the default Tensorflow learning rate of 0.001 and stopping after 1500 steps. The second step used a modified training rate reduced by a factor of 100 and ran up to 3500 steps. This was done to be able to get an idea of how the learning rate affected the loss on each step.

The 'loss' calculated on each step taken as an average and when training on all the data we averaged about 1.74 after 1500 steps. Heading towards 3500, we approached an average of 1.68; the difference was not all that significant A general trend our research and testing revealed was in similar projects carried out by others the most significant way to improve the generated samples by the model required modifying the learning rate and increasing the number of steps trained for. This is an area we fell short – due to physical constraints we could only consistently train up to 3500 steps at most.

Generally, the conversations looked similar after the first 1500 steps; conversations weren't as sequenced and only a few portions looked completely coherent - this may be because of the nature of the data and as earlier stated the number of steps trained for. Evidence of this was seen in what were generally grammatically correct sentences but a lack of contextual accuracy. An example went along the lines of an individual asking if he could install 'ls’ – we know this to be the command for listing files in a directory.

Given the nature of the data used, while possible that the model could generate texts akin to fake articles it would not be at a good enough level as the data used for training comprises of ‘chats’. They normally do not follow the same rules applied to the full article writing.

**Predictions**

In spite of the maintenance of a common thread - we see that there are issues with repeating individuals making multiple statements before a single alternate response alongside gaps in context at times. An example is below.

This was a sample generated while training for 1750 steps:  
-14-20 05:54:00+00:00) almox: thanks for your help.

(2009-04-14 05:55:00+00:00) almox: yes i believe so

(2009-04-14 05:56:00+00:00) almox: did you just do it from a shell or what?

(2009-04-14 05:56:00+00:00) almox: i know

(2009-04-14 05:56:00+00:00) almox: that's a pain in the neck lol

(2009-04-14 05:57:00+00:00) jimbe: are you using kde? or ubuntu?

(2009-04-14 05:58:00+00:00) almox: kde... i know i haven't been online for days.. but that's what i am using right now

(2009-04-14 05:58:00+00:00) jimbe: then you have to change /etc/apt/sources.list.d/\* to the contents of /etc/apt/sources.list.d/repo-2.6.11\_ubuntu-desktop-i386

(2009-04-14 05:59:00+00:00) almox: and i was to change only a single line?

(2009-04-14 05:59:00+00:00) jimbe: thats odd.

(2009-04-14 06:02:00+00:00) almox: im trying to change everything but that one line

(2009-04-14 06:03:00+00:00) jimbe: that's what i think you are doing. then i recommend to reinstall the package, and then you can do a fresh install

A good thing to note is time seems to move forward in the conversations, but the focus should be on the fact that the first 5 statements are by almox and in some of them he appears to be responding to something we can't see (lack of context). On line 7 we see a direct response to the question asked by Jimbe. From this we can extrapolate the model should be capable of question answering within context. However, addressing the detail of the conversation it becomes obvious it is not a human conversation. The use of ‘changing a single line’ as said by almox is strange as the actual detail implied is changing of the content of an entire folder - so there are limitations to how much the model is able to 'comprehend' that isn't explicitly stated.

Something that can also be seen is a clear example of the model making use of the ‘chat’ language – lack of proper contraction shows in the generated sample. I’m is not normally equal to ‘im’. We can however, see that when a sample is generated the model acts for ‘im’ in a similar way to ‘I’m’ – it approximates the following word to be ‘trying’

Below is another sample that is just a single individual talking - time moves forward but there is no response:

(2008-08-25 23:53:00+00:00) nathalie: How do I find out how many of the installed packages are installed at once?

(2008-08-25 23:54:00+00:00) nathalie: Thanks,

(2008-08-25 23:55:00+00:00) nathalie: And how do I do that?

(2008-08-25 23:55:00+00:00) nathalie: I can only view the files in the /var dir, only one package is installed at a time?

(2008-08-25 23:55:00+00:00) nathalie: And then what?

(2008-08-25 23:56:00+00:00) nathalie: What would be the best way to get to these files if I were to run 'ls -lat > /tmp'?

(2008-08-25 23:56:00+00:00) nathalie: That's what i was using before

(2008-08-25 23:57:00+00:00) nathalie: I have one for every package

(2008-08-25 23:58:00+00:00) nathalie: Ok, then I'm trying to get to that folder at a time, will there be a problem?

(2008-08-25 23:59:00+00:00) nathalie: Thanks.

(2008-08-26 00:01:00+00:00) nathalie: Did you do some other kind of test, like the 'apt-get update' thing?

(2008-08-26 00:01:00+00:00) nathalie: Oh! Then just do 'sudo apt-get update'

(2008-08-26 00:01:00+00:00) nathalie: I guess I could try it after the update fails, but not sure.

(2008-08-26 00:01:00+00:00) nathalie: Anyhoo, thanks again, it helped.

(2008-08-26 00:02:00+00:00) nathalie: I'll install them now, now if it fails I might do a fresh install or do it from an external, no worries though.

This sequence appears to consist solely of nathalie's response to an unknown individual and unkown statements. And a third situation that arose with responses looking like a conversation but all from the same individual - the equivalent of talking to yourself on Discord i.e. you supply both question and answer.

The greatest challenge faced in the fine tuning was time it took to train the model. Even while using a GPU or TPU via Google Colab, it still took a large amount of time especially if using the full data. Furthermore, full network connectivity and electrical power is needed for that duration. An area where the process could be improved was the processing of the data. The csv file was split into chunks which were in turn extracted from into text files. These may have shortened conversations and made them appear to be separate to the model where they may very well be one and the same. It might have been more beneficial to perhaps merge the text files together.