

Configuration Manual

MSc Research Project
Data Analytics

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Project Submission Sheet
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Configuration Manual

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1 Google Collaboratory Setup

This sections elaborates on the steps to setup Google Collaboratory for execution of the python code. Firstly navigate to the Link <https://colab.research.google.com/>. Teeter and Barksdale (2011) Then click on New Notebook as mentioned in Figure 1. Once the new file opens we are ready to upload files , mount to share drive , install python libraries etc.

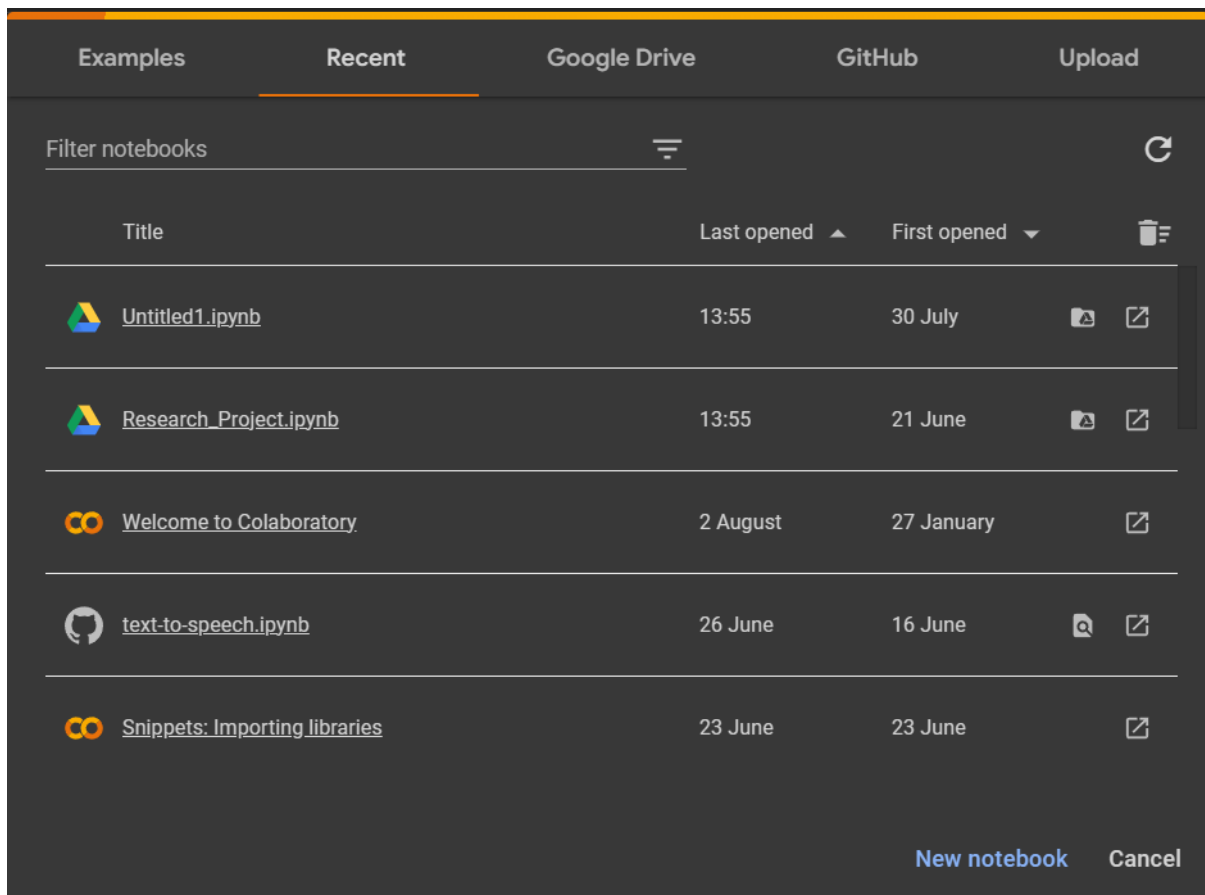


Figure 1: Opening New Collaboratory Session

2 Mounting to Google Drive

There are two ways to upload Data files, Trained Model folder. First approach requires to sign in with gmail id and then mount Google Collab notebook to Google drive. Second approach is to upload all the files in real time environment for a particular session and then the files need to be uploaded again for every run. Then Click on File followed with Open and then navigate to Upload and choose file ResearchProject.ipynb file. Then code file will open in new window. Figure 2

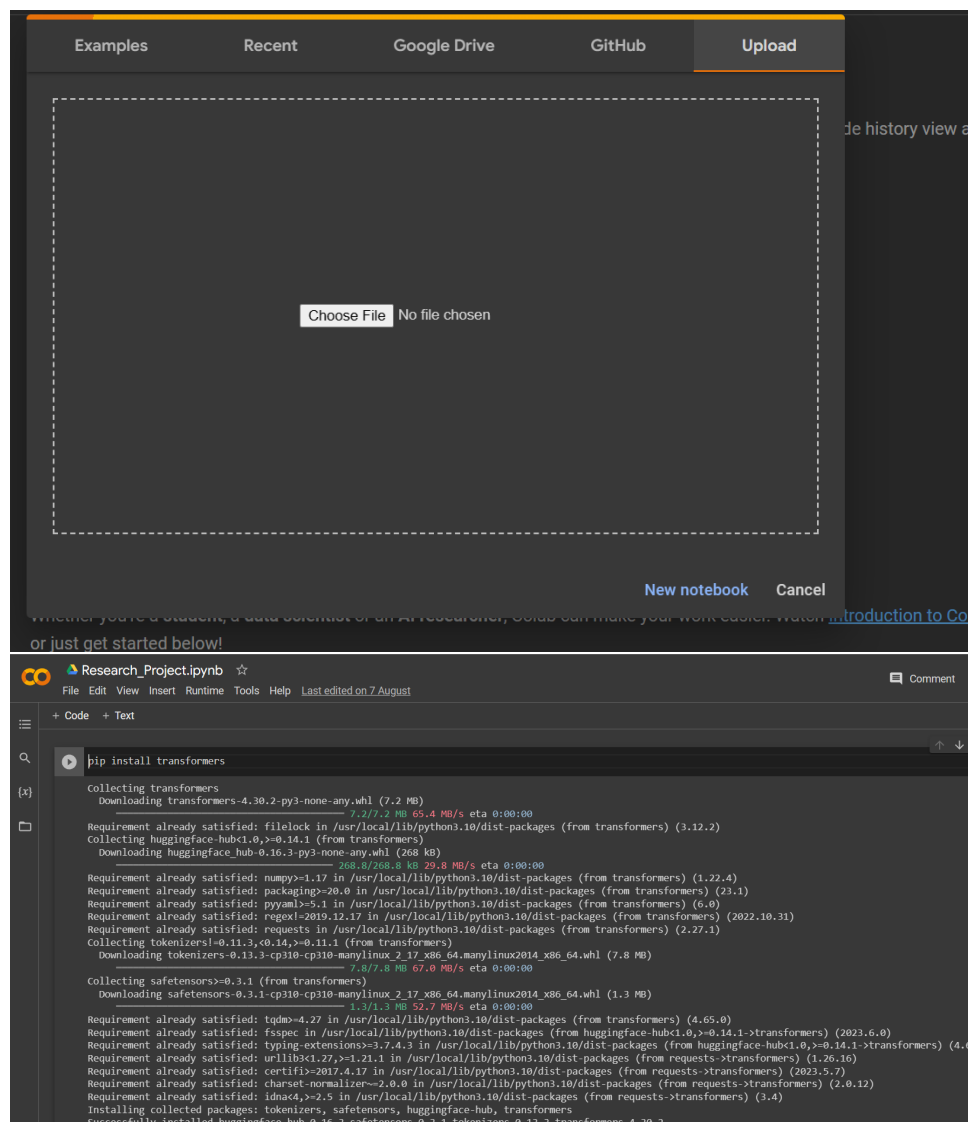


Figure 2: Opening and Uploading Python Code File

3 Uploading Data Files and Fine Tuned Model Folder Files

Click on the Folder icon on the left corner. Then click on upload files i.e upload to session storage for temporary storage. Upload all the below mentioned files from the folder. Please

refer Figure 3

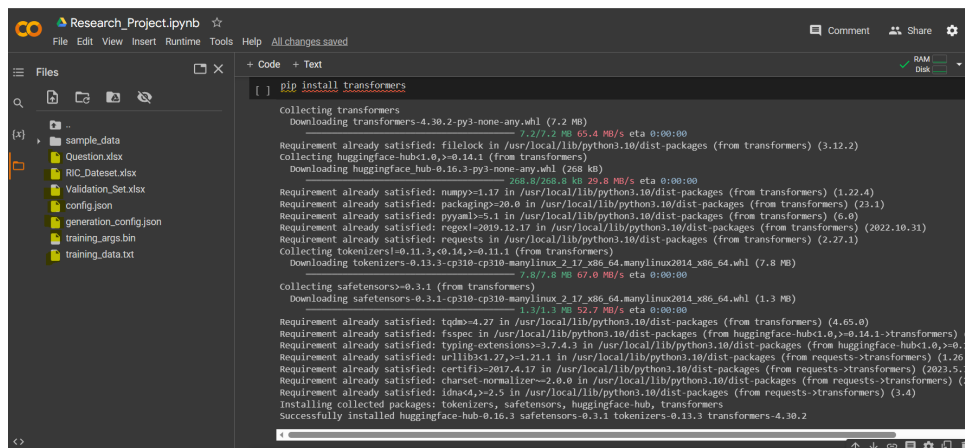


Figure 3: Uploading Data and Model Files

- RIC_Dataset.xlsx
- Question.xlsx
- training_data.txt
- training_args.bin
- generation_config.json
- config.json
- training_args.bin
- Validation_Set.xlsx
- Book.xlsx
- Logs Folder

4 Installing Python Libraries

A list of Python libraries needs to be installed before starting line by line code execution. Figure 4

5 Executing Code with Fine Tuned GPT Model

Once all the files are uploaded successfully and all the libraries are installed in the virtual engine. Next step is to execute the code line by line from the section "Model Fine Tuning & Visualisation". As suggested in Figure 5. The prior steps in the code are the fine tuning steps of GPT2 model. The overall code flow starts from Data pre-processing

```

Final Code : RIC

[ ] !pip install transformers
    !pip install pandas matplotlib openpyxl xlrd
    !pip install rouge-score
    !pip install rouge
    !pip install transformers[torch]
    !pip install transformers-integrations
    !pip install python-Levenshtein
    !pip install bert-score
    !pip install --upgrade transformers
    !pip install nltk
    !pip install nltk bert-score
    !pip install bert_score
    !pip install sentencepiece
    !pip install gtts

```

Figure 4: Installing Python Libraries

then model fine tuning followed with Hyper-parameter optimisation and then generating text based on prompts. Lastly comparison with baseline models like GPT2 and T5 is done on multiple metrics like BERTZhang et al. (2019),ROUGELin (2004) etc. with a visualisation piece added to give an high level overview on the data as well as the scores generated for output text responses with reference text.

```

ResearchProject.ipynb
File Edit View Insert Runtime Tools Help All changes saved

+ Code + Text

[ ] Requirement already satisfied: idna<4.0,>=2.5 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.27->gtts) (3.4)
Requirement already satisfied: urllib3<3,>=1.21.1 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.27->gtts) (2.0.4)
Requirement already satisfied: certifi>2017.4.17 in /usr/local/lib/python3.10/dist-packages (from requests<3,>=2.27->gtts) (2023.7.22)

Model Fine Tuning & Visualisation

[ ] import pandas as pd
import matplotlib.pyplot as plt

# Load the validation data
excel_file_path = './content/Question.xlsx'
val_df = pd.read_excel(excel_file_path)

# Calculate answer lengths
val_df['Answer_Length'] = val_df['Answer'].apply(len)

# Create a histogram of answer lengths
plt.figure(figsize=(8, 6))
plt.hist(val_df['Answer_Length'], bins=20, color='blue', alpha=0.7)
plt.xlabel('Answer Length')
plt.ylabel('Frequency')
plt.title('Histogram of Answer Lengths')
plt.show()

```

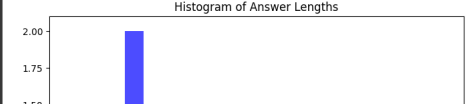


Figure 5: Code Execution Section

6 Outputs and Code Snippets

This Section captures the output visualisation once the code is executed in steps as follows:

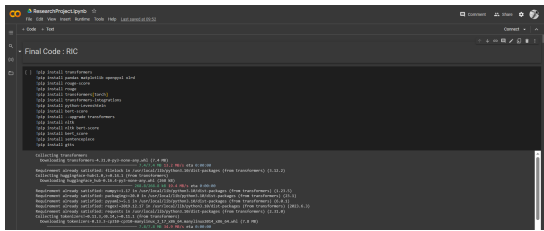


Figure 6: Installing Python Libraries

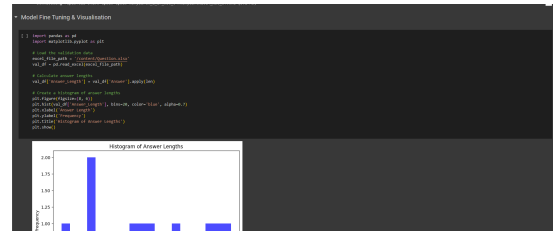


Figure 7: Visualisation

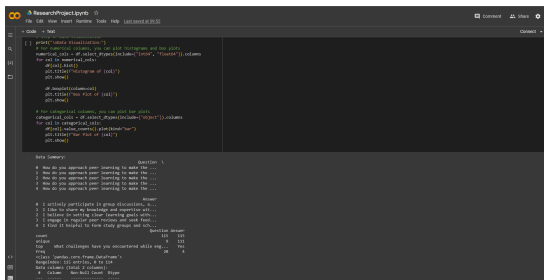


Figure 8: Data Overview

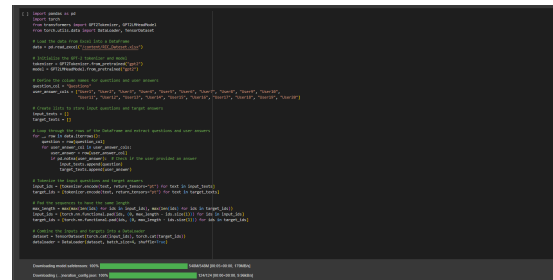


Figure 9: Combining data to dataloader

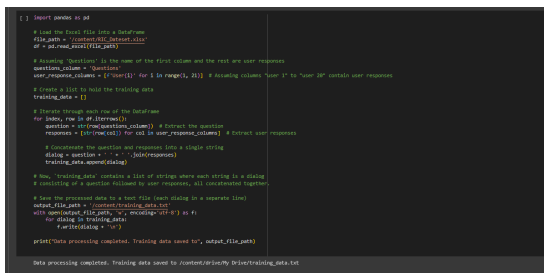


Figure 10: Creating the training set



Figure 11: Creating Tokenizer

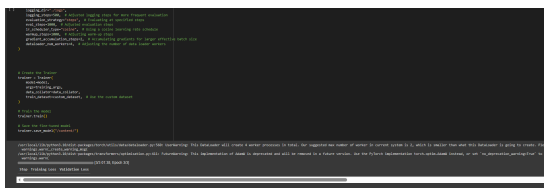


Figure 12: Fine Tuning the Model

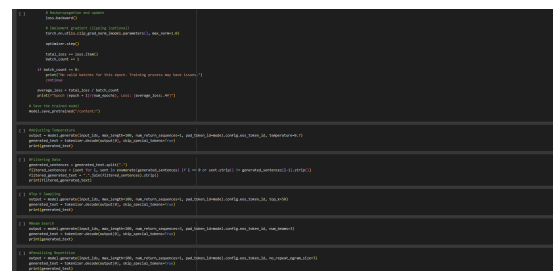


Figure 13: Hyper Parameter Tuning and Saving the Model

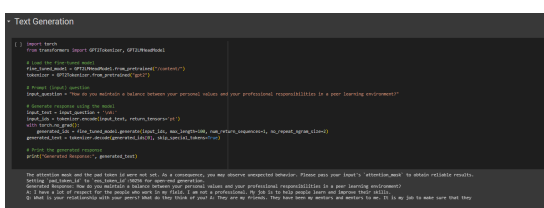


Figure 14: Text Generation

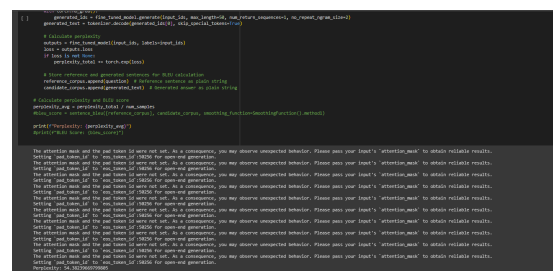


Figure 15: Calculating Perplexity

```

# Calculating Average Edit Distance
...
def calculate_avg_edit_distance(reference_scores, generated_scores, smoothing_function=SmoothingFunction().method)
  # Calculate average scores
  vector = vector_score(reference_scores, generated_scores)
  vector_scores.append(vector)
...
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (3.8.1)
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (from nltk) (3.8.1)
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer BLEU_Score METEOR_Score
8 balancing personal values with professional re... 0.000260 0.001388
9 reflecting on my peer learning journey, I encounter... 0.000211 0.001181
9 describing a situation during a challenge... 0.000209 0.001178
5 I recall a particularly rewarding experience... 0.000205 0.001167
4 Leveraging technology and online platform... 0.000202 0.001162
7 certainly, I identify myself as a peer learner... 0.000202 0.001162
9 I encountered a situation during a peer learni... 0.000207 0.001155

```

Figure 16: Calculating Average Edit Distance

```

# Calculating METEOR and BLEU Score
...
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (3.8.1)
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (from nltk) (3.8.1)
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer BLEU_Score METEOR_Score
8 balancing personal values with professional re... 0.000260 0.001388
9 reflecting on my peer learning journey, I encounter... 0.000211 0.001181
9 describing a situation during a challenge... 0.000209 0.001178
5 I recall a particularly rewarding experience... 0.000205 0.001167
4 Leveraging technology and online platform... 0.000202 0.001162
7 certainly, I identify myself as a peer learner... 0.000202 0.001162
9 I encountered a situation during a peer learni... 0.000207 0.001155

```

Figure 17: Calculating METEOR and BLEU Score

```

# Calculating BERT Score
...
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (3.8.1)
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (from nltk) (3.8.1)
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer BERT Score
8 balancing personal values with professional re... 0.834964
9 reflecting on my peer learning journey, I encounter... 0.830524
9 describing a situation during a challenge... 0.830530
5 I recall a particularly rewarding experience... 0.828811
4 Leveraging technology and online platform... 0.828770
7 certainly, I identify myself as a peer learner... 0.829227
9 I encountered a situation during a peer learni... 0.831241

```

Figure 18: Calculating BERT Score

```

# Calculating Average METEOR Score
...
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (3.8.1)
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (from nltk) (3.8.1)
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer Average METEOR Score
8 balancing personal values with professional re... 0.872680
9 reflecting on my peer learning journey, I encounter... 0.865328
9 describing a situation during a challenge... 0.865328
5 I recall a particularly rewarding experience... 0.862380
4 Leveraging technology and online platform... 0.862380
7 certainly, I identify myself as a peer learner... 0.862380
9 I encountered a situation during a peer learni... 0.862380

```

Figure 19: Average METEOR Score

```

# Text Comparison: Baseline and Fine Tuned Model
...
Baseline Model Output:
I have always found this model as a short-term task to be able to use it for predictions and inference.
Some weights of RobertaEmbedder were not initialized from the model checkpoint at roberta-large and are newly initialized: ['roberta.pooler.dense.weight']
You should probably flush this model as a short-term task to be able to use it for predictions and inference.

Fine-Tuned Model Output:
I have always found this model as a short-term task to be able to use it for predictions and inference.
Some weights of RobertaEmbedder were not initialized from the model checkpoint at roberta-large and are newly initialized: ['roberta.pooler.dense.weight']
You should probably flush this model as a short-term task to be able to use it for predictions and inference.

```

Figure 20: Text Comparison : Baseline and Fine Tuned Model

```

# Score Comparison
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer Baseline BLEU \
8 balancing personal values with professional re... 0.291220-04
9 reflecting on my peer learning journey, I encounter... 0.291220-04
9 describing a situation during a challenge... 0.291220-04
5 I recall a particularly rewarding experience... 0.291220-04
4 Leveraging technology and online platform... 0.291220-04
7 certainly, I identify myself as a peer learner... 0.291220-04
9 I encountered a situation during a peer learni... 0.291220-04
...
Answer Baseline METEOR \
8 balancing personal values with professional re... 0.872680
9 reflecting on my peer learning journey, I encounter... 0.865328
9 describing a situation during a challenge... 0.865328
5 I recall a particularly rewarding experience... 0.862380
4 Leveraging technology and online platform... 0.862380
7 certainly, I identify myself as a peer learner... 0.862380
9 I encountered a situation during a peer learni... 0.862380

```

Figure 21: Score Comparison

```

# BERT Score Comparison
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer Baseline BERT Score \
8 balancing personal values with professional re... 0.834964
9 reflecting on my peer learning journey, I encounter... 0.830524
9 describing a situation during a challenge... 0.830530
5 I recall a particularly rewarding experience... 0.828811
4 Leveraging technology and online platform... 0.828770
7 certainly, I identify myself as a peer learner... 0.829227
9 I encountered a situation during a peer learni... 0.831241
...
Answer FineTuned BERT Score \
8 balancing personal values with professional re... 0.834964
9 reflecting on my peer learning journey, I encounter... 0.830524
9 describing a situation during a challenge... 0.830530
5 I recall a particularly rewarding experience... 0.828811
4 Leveraging technology and online platform... 0.828770
7 certainly, I identify myself as a peer learner... 0.829227
9 I encountered a situation during a peer learni... 0.831241

```

Figure 22: BERT Score Comparison

```

# Average BERT and METEOR Score
...
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (3.8.1)
Requirement already satisfied: nltk in /usr/local/lib/python3.8/dist-packages (from nltk) (3.8.1)
...
Question \
8 How do you maintain a balance between your work...
9 Describe a situation where you managed conflict...
Answer Average BERT Score \
8 balancing personal values with professional re... 0.834964
9 reflecting on my peer learning journey, I encounter... 0.830524
9 describing a situation during a challenge... 0.830530
5 I recall a particularly rewarding experience... 0.828811
4 Leveraging technology and online platform... 0.828770
7 certainly, I identify myself as a peer learner... 0.829227
9 I encountered a situation during a peer learni... 0.831241
...
Answer Average METEOR Score \
8 balancing personal values with professional re... 0.872680
9 reflecting on my peer learning journey, I encounter... 0.865328
9 describing a situation during a challenge... 0.865328
5 I recall a particularly rewarding experience... 0.862380
4 Leveraging technology and online platform... 0.862380
7 certainly, I identify myself as a peer learner... 0.862380
9 I encountered a situation during a peer learni... 0.862380

```

Figure 23: Average BERT and METEOR Score

References

- Lin, C.-Y. (2004). Rouge: A package for automatic evaluation of summaries, *Text Summarization Branches Out: Proceedings of the ACL-04 Workshop*.
- Teeter, R. and Barksdale, K. (2011). *Google apps for dummies*, John Wiley & Sons.
- Zhang, T., Kishore, V., Wu, F., Weinberger, K. Q. and Artzi, Y. (2019). Bertscore: Evaluating text generation with bert, *Proceedings of the 2019 Conference on Empirical Methods in Natural Language Processing and the 9th International Joint Conference on Natural Language Processing (EMNLP-IJCNLP)*, pp. 3473–3483.