NLP
Assignment N.3

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1 Medical RAG

2 In-Context Learning

3 Pre-trained Transformers (Bonus Question)

a. Report your model's accuracy on the dev set:

Ans:

FineTune without Pretrain - Correct: 8.0 out of 500.0: 1.6

b. As a reference point, we want to also calculate the accuracy the model would have achieved if it had just predicted "London" as the birth place for everyone in the dev set. Fill in london baseline.py to calculate the accuracy of that approach and report your result in your write-up.

Ans:

London baseline - Correct: 25.0 out of 500.0: 5.0

c. Pretrain your model on wiki.txt, finetune it on NameDataset and evaluate it.

Report the accuracy on the dev set:

Ans:

Pretrain + Finetune - Correct: 122.0 out of 500.0: 24.4

d. succinctly explain why the pretrained (vanilla) model was able to achieve an accuracy of above 10%, whereas the non-pretrained model was not

Ans:

Pretraining on `wiki.txt` provided the model with a rich understanding of character-level patterns, such as common sequences of characters, frequently occurring words, and how characters combine to form meaningful substrings. This knowledge is crucial for tasks involving character-level tokenization, as it allows the model to develop a strong foundation in recognizing and encoding meaningful subunits from raw character input.

During pretraining, the model also learned to encode long-range dependencies and patterns across characters, which are essential for understanding proper nouns, like names of people and places. For example, it could learn that certain character sequences (e.g., "New ", "York") are associated with place names. This general understanding of character sequences significantly reduced the burden during finetuning, as the model could focus on adapting this knowledge specifically to birthplaces.

In contrast, the non-pretrained model started with randomly initialized weights, meaning it had no prior understanding of character patterns or how these patterns relate to names and locations. As a result, it had to learn the relationships between character sequences and birthplaces entirely from the `NameDataset`, which is small and task-specific. This made it challenging for the non-pretrained model to capture generalizable patterns and often led to overfitting on the limited data.

Moreover, the pretrained model could leverage its learned representations to generalize better to unseen names and birthplaces during evaluation. For example, it might recognize that certain character combinations often appear in geographical locations, even if those specific places were not part of the training data. This ability to generalize gave the pretrained model a significant advantage over the non-pretrained one.

Finally, pretraining helps with weight initialization, leading to faster convergence during finetuning. The non-pretrained model, on the other hand, suffered from inefficient learning dynamics and struggled to achieve meaningful accuracy given the complexity of the task and the limited data.