

# ADL HW3

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## *Q1: LLM Tuning*

### **Describe:**

- How much training data did you use?

We used all the data (10,000 entries) in train.json for training. We tried training with 5,000 and 7,000 entries, but the performance decreased.

- How did you tune your model?

We referenced the qlora.py of FIN-LLAMA ([github](#)) and modified it according to my requirements and data types.

Modified the prompt according to Gemma 2's prompt template to:

"<start\_of\_turn>你是繁體中文與文言文互相翻譯的人工智能助理，以下是你的翻譯任務  
user:{instruction} model:<end\_of\_turn>"。

Please refer to the following code for QLoRA parameter settings:

```
BitsAndBytesConfig(  
    load_in_4bit=True,  
    bnb_4bit_quant_type="nf4",  
    bnb_4bit_compute_dtype=torch.float16,  
    bnb_4bit_use_double_quant=True,  
    llm_int8_enable_fp32_cpu_offload=True  
)
```

```
LoraConfig(  
    r=8,  
    lora_alpha=16,  
    bias="none",  
    lora_dropout=0.05,  
    task_type="CAUSAL_LM",  
)
```

- What hyper-parameters did you use?

Please refer to the following table for hyper-parameters settings:

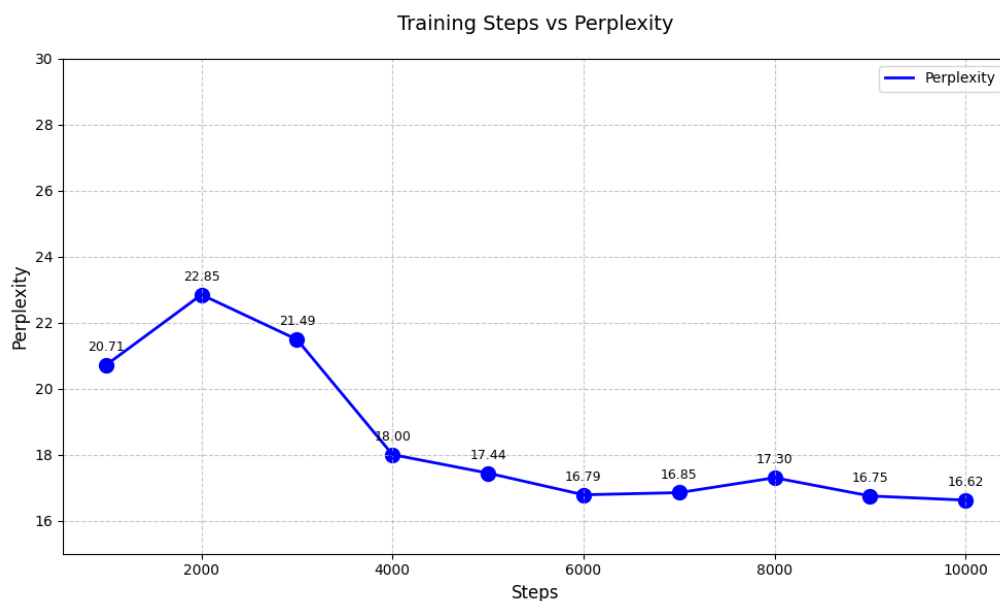
num_train_epochs	4
per_device_train_batch_size	4
per_device_eval_batch_size	8
lr_scheduler_type	cosine_with_restarts
learning_rate	7e-4
weight_decay	0.1
warmup_ratio	0.15
max_grad_norm	1.0
source_max_len	1024
target_max_len	256
gradient_accumulation_steps	8

## Show your performance:

- What is the final performance of your model on the public testing set?

Mean perplexity: 16.624452232837676

- Plot the learning curve on the public testing set



## ***Q2 LLM Inference Strategies***

### **Zero-Shot:**

- What is your setting?

Removed the LoRA code section from ppl.py, keeping other settings consistent with the original model.

- How did you design your prompt?

We used the same prompt as QLoRA training.

### **Few-Shot (In-context Learning):**

- What is your setting? How did you design your prompt?

We removed the LoRA code section from the original ppl.py, keeping other settings consistent with the original model.

For each instruction preparation, examples of translation are selected from other data and combined with the original prompt to construct the model input. The input example is as follows:

```
"<start_of_turn>你是繁體中文與文言文互相翻譯的人工智能助理，首先我會給予你幾個正確翻譯的例子:\n{examples_text} 以下是你的翻譯任務 user:\n{instruction}\n model: <end_of_turn>"。
```

The examples\_text is as follows:

```
"範例 {i}:\n user: {example['instruction']}\n model:\n {example['output']}\n\n".
```

- How many in-context examples are utilized? How you select them?

4 in-context examples are used, selected randomly from the available data.

## Comparison:

- What's the difference between the results of zero-shot, few-shot, and LoRA?

Result	Mean perplexity:
zero-shot	9342.65
few-shot	3680.27
QLoRA	16.62

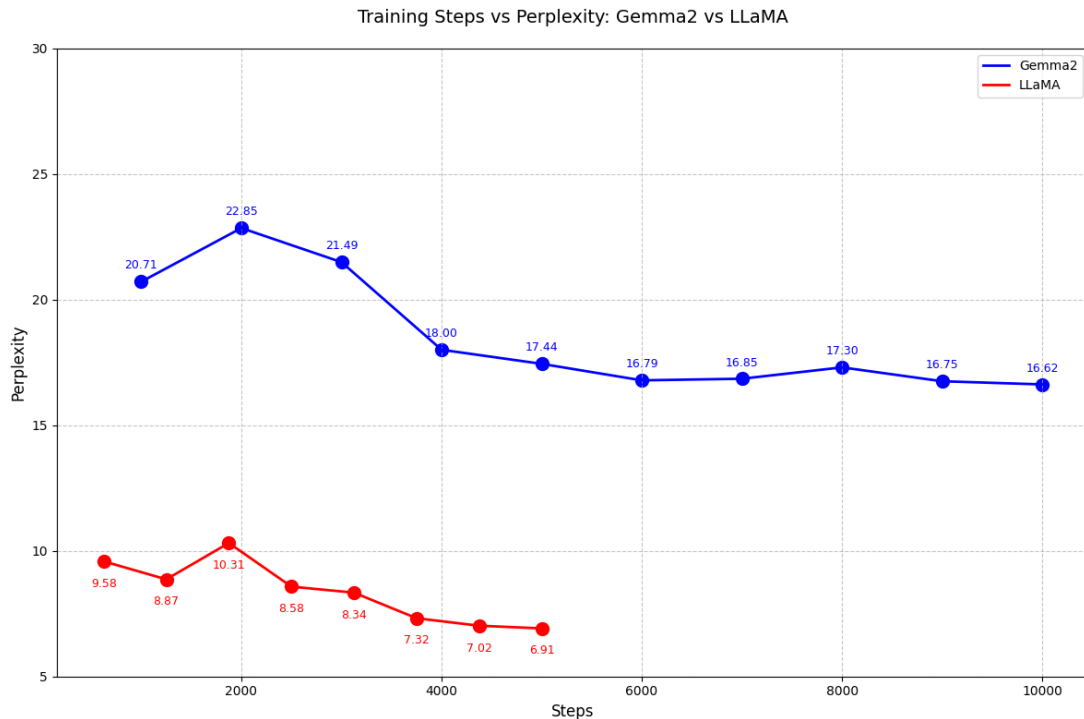
Observing the table above, we can see that zero-shot performed very poorly since it hadn't seen any data. Few-shot performed somewhat better as it had seen examples of other translations. Of course, the best performance came from the QLoRA results, which met the baseline standard."

## ***Q3 Bonus: Try Llama3-Taiwan (8B)***

- Describe your experimental settings

We are fine-tuning with QLoRA using the model yentinglin/Llama-3-Taiwan-8B-Instruct. All hyperparameters, QLoRA parameters, and prompt were kept the same as the original model, except that num\_train\_epochs was set to 2 because this model is larger.

- Compare the results to those obtained from your original methods.



We can observe that even with only half the training steps, Llama3-Taiwan significantly outperforms Gemma-2-2b-it-chinese-kyara-dpo. This may be due to differences in model size and pre-training data between the two models. If chinese-kyara-dpo were fine-tuned on Gemma-2-9b-it, I believe the results would be better.

But Gemma-2-2b-it-chinese-kyara-dpo is more lightweight, making it a viable option in resource-limited environments or for simpler tasks.

## Reference:

[Gemma-2-2b-it-chinese-kyara-dpo](#)

[Llama-3-Taiwan-8B-Instruct](#)

[FIN-LLAMA](#)

[Claude](#)

[ChatGPT](#)