NTU ADL 2023 Fall HW3

Deadline: 2023/11/29 23:59:59

Update Logs

- Taiwan-LLaMa checkpoint reminder (<u>see Taiwan-LLaMa page</u>)
- Submission format (see <u>File Layout</u>)
- Arguments for run.sh (see <u>run.sh</u>)
- Question 2 Clarification (see <u>report Q2</u>)
- download.sh clarification (see <u>File Layout After downloading</u>)
- Command for grading with ppl.py (see <u>Grading ppl.py</u>)
- Command for run.sh (see <u>run.sh cont.</u>)

Links

• Homework 3 files (<u>link</u>)

Task Description

Instruction Tuning (Classical Chinese)

• Example 1

Instruction:

翻譯成文言文:

雅裏惱怒地說:從前在福山田獵時,你誣陷獵官,現在又說這種話。

答案:

Output:

雅裏怒曰: 昔畋於福山, 卿誣獵官, 今復有此言。

• Example 2

Instruction:

議雖不從,天下咸重其言。

翻譯成白話文:

Output:

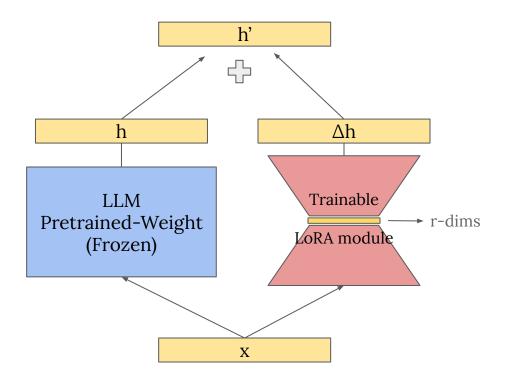
他的建議雖然不被采納,但天下都很敬重他的話。

Taiwan-LLaMa

- Traditional Mandarin support LLM based on <u>LLaMa 2</u>
- Github Repository
- Online Demo
- Due to the possibility of changes in the HuggingFace checkpoints, we recommend you to use the checkpoint we have downloaded (link) for this homework. If you still want to download the checkpoint from Huggingface, you can download it form this commit. (commit id: 5073b2bbc1aa5519acdc865e99832857ef47f7c9)



Low Rank Adaptation (LoRA)



QLoRA Fine-tuning

- QLoRA reduces the memory usage of LLM fine-tuning by employing 4-bit quantization to compress a LLM, while utilizing 16-bit float to perform computations
- Paper

Experiments

- Dataset
 - Training (train.json): 10000
 - o Testing (Public) (public_test.json): 250
 - Testing (Private) (private_test.json): 250

- Evaluation:
 - Perplexity (ppl.py)

Data Format

• json format

Rules

What You Can Do:

- LLM checkpoint:
 - o <u>yentinglin/Taiwan-LLM-7B-v2.0-chat</u>
- Packages:
 - torch==2.1.0, transformers==4.34.1, bitsandbytes==0.41.1, peft==0.6.0
 - Others: no limitation

What You Can NOT Do

- Use external training data
- Any means of cheating or plagiarism, including but not limited to:
 - Directly apply others' published / unpublished code..., including the codes written your classmates or public on the internet
 - Give/get trained model/predictions to/from others.
 - Give/get report answers or plots to/from others.
 - Publish your code before deadline.
- Violations may cause zero/negative score and punishment from school.

Submission

File Layout - Before downloading

• Zip your folder, which should be named as your student id (lower-cased) (ex. r11000000) and submit the .zip to NTU Cool.

download.sh

- **download.sh** should download or create a folder called **adapter_checkpoint** which contains peft configuration file (adapter_confi.json) and weights (adapter_model.bin).
 - o DO NOT download Taiwan-LLaMa checkpoint!!
- Do not modify your file after deadline, or it will be seen as cheating.
- Keep the URLs in download.sh valid for at least 3 weeks after deadline.
- You can download at most 4G, and download.sh should finish within 1 hour. (At csie dept with maximum 10MB/s bandwidth)
- Do not do things more than downloading. Otherwise, your **download.sh** may be killed.
- Do not pip install ANYTHING in your download.sh, you are not allowed to modify the testing environment
- We will execute **download.sh** before predicting scripts.

File Layout - After downloading

• After we run download.sh, the **adapter_config.json** and **adapter_model.bin** should be **in adapter_checkpoint**.

utils.py

- Two functions are required:
 - o def get_prompt(instruction: str) -> str:
 - return the prompt to input into the LLM
 - def get_bnb_config() -> BitsAndBytesConfig:
 - return your bnb configuration
- TAs will include "from utils import get_prompt, get_bnb_config" when testing.
- Make sure that your function's input and output fields are correct and can be used accurately

README.md

- README.md should contain step-by-step instructions on how to setup your environments and how to train your model with your codes/scripts.
- You will get a **-2** penalty if you have no or empty README.md.
- If necessary, you will be required to reproduce your results based on the README.md.
- If you cannot reproduce your result, you may lose points.

run.sh

- **run.sh** should perform text generation using your trained models and output predictions on testing file (.json)
- arguments
 - \$\)\ \$\)\ \$\)\ path to the Taiwan-LLaMa checkpoint folder
 - \$\(\sigma\) \\$\(\sigma\) path to the adapter_checkpoint downloaded under your folder
 - \${3}: path to the input file (.json)
 - \${4}: path to the output file (.json)
- TA will predict testing data as follow:
 - 1. bash ./download.sh
 - 2. bash ./run.sh /path/to/Taiwan-LLaMa-folder /path/to/adapter_checkpoint \ /path/to/input.json /path/to/output.json
- run.sh should finish within 2 hours. (See <u>environment details</u>)

run.sh - cont.

Command:

```
bash run.sh \
/path/to/Taiwan-Llama \
/path/to/adapter_checkpoint/under/your/folder \
/path/to/input \
/path/to/output
```

o example:

```
bash run.sh \
/home/Taiwan-LLM-7B-v2.0-chat \
/home/hw3/r11922000/adapter_checkpoint \
/home/data/public_test.json \
/home/output/r11922000_output.json
```

prediction.json

- Testing set (Private)
- DO NOT include any special tokens (<s>, </s>, ...) and your prompt in your output

Execution Environment

- We will run the testing codes on the computer with
 - o Ubuntu 20.04
 - o 32GB RAM, GTX 3070 8GB VRAM, and 20GB disk space available
- Python3.10
- Packages
 - o torch==2.1.0, transformers==4.34.1, bitsandbytes==0.41.1, peft==0.6.0

Grading

- Model Performance (5%)
 - Public baseline: $ppl = 4.000 \downarrow (2\%)$
 - Private baseline: ppl = 4.500↓ (2%)
 - o prediction.json: Human evaluation (1%)
- Report (15% + 2%)
- Format
 - You may lose (some or all) of your model performance score if your script is at wrong location, causes any error, etc.

Grading - ppl.py

- TA will use our own ppl.py (which is the same as we published), so you don't have to upload ppl.py
- Command:

```
python3 ppl.py \
    --base_model_path /path/to/Taiwan-Llama \
    --peft_path /path/to/adapter_checkpoint/under/your/folder \
    --test_data_path /path/to/input/data
```

o example:

```
python3 ppl.py \
    --base_model_path /home/Taiwan-LLM-7B-v2.0-chat \
    --peft_path /home/hw3/r11922000/adapter_checkpoiint \
    --test_data_path /home/data/public_test.json
```

Late Submission

- Late submission penalties:
 - 0 day < late submission ≤ 1 day: original score * 0.95
 - 1 day < late submission ≤ 3 day: original score * 0.90
 - $3 \text{ day} < \text{late submission} \le 4 \text{ day: original score} * 0.75$
 - 4 day < late submission ≤ 5 day: original score * 0.50
 - o 5 day < late submission ≤ 6 day: original score * 0.25
 - o 6 day < late submission: original score * 0.00
- Late submission is determined by the last submission.
 - Update your submission after deadline implies that you will get penalty.

Report

Q1: LLM Tuning

• Describe:

- How much training data did you use? (2%)
- How did you tune your model? (2%)
- What hyper-parameters did you use? (2%)

• Show your performance:

- What is the final performance of your model on the public testing set? (2%)
- Plot the learning curve on the public testing set (2%)

Q2: LLM Inference Strategies

- Zero-Shot
 - What is your setting? How did you design your prompt? (1%)
- Few-Shot (In-context Learning)
 - What is your setting? How did you design your prompt? (1%)
 - How many in-context examples are utilized? How you select them? (1%)
- Comparison:
 - What's the difference between the results of zero-shot, few-shot, and LoRA? (2%)

Note:

Please conduct zero-shot and few-shot experiments on Taiwan-LLaMa that has not been fine-tuned with QLoRA

Q3: Bonus: Other methods (2%)

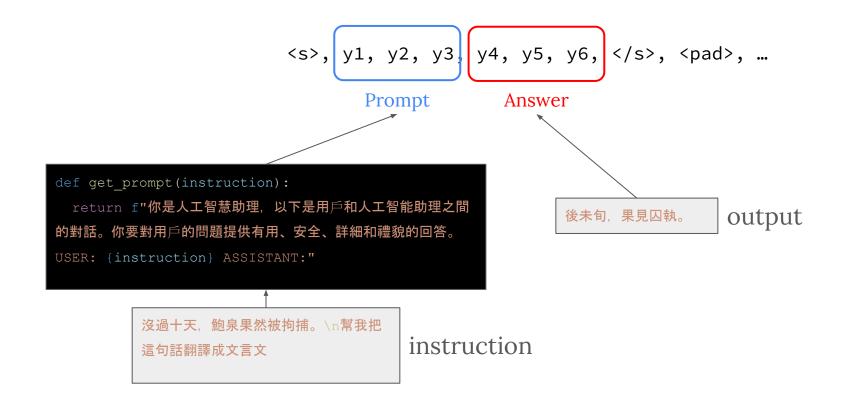
- Choose one of the following tasks for implementation
 - Experiments with different PLMs
 - Experiments with different LLM tuning methods

 Describe your experimental settings and compare the results to those obtained from your original methods

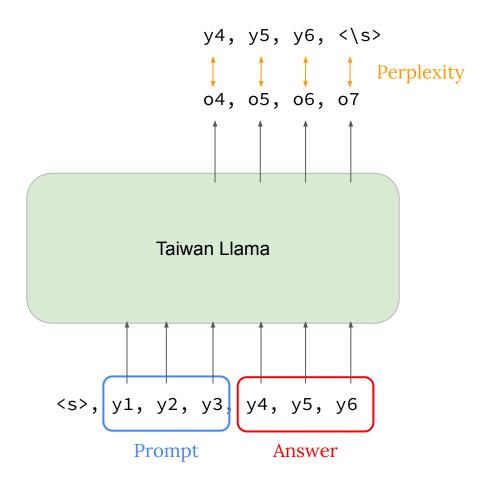
Guides

Instruction Tuning y4, y5, y6, <\s> 04, 05, 06, 07 Taiwan Llama <s>, y1, y2, y3, y4, y5, y6, </s>, <pad>, ... Prompt Answer

Instruction Tuning



Perplexity



Quantization (4 bit)

```
from utils import get bnb config
from peft import prepare model for kbit training
bnb config = get bnb config() # return a BitsAndBytesConfig
model = AutoModelForCausalLM.from pretrained(
  model name or path,
  quantization config=bnb config
if training:
  model = prepare model for kbit training(model)
```

Ref:

- 1. https://huggingface.co/blog/4bit-transformers-bitsandbytes
- https://huggingface.co/docs/ transformers/main_classes/qu antization#advanced-use-cases
- 3. https://github.com/artidoro/glora

Reference

- https://huggingface.co/docs/peft/index
- https://github.com/huggingface/peft
- 3. https://huggingface.co/blog/4bit-transformers-bitsandbytes
- 4. https://huggingface.co/docs/transformers/main_classes/quantization
 #advanced-use-cases
- 5. https://github.com/artidoro/qlora
- 6. https://github.com/huggingface/trl

Any questions

- NTU COOL discussion
- Email:
 - o <u>adl-ta@csie.ntu.edu.tw</u>
- TA hours
 - Tue. 11:00 ~ 12:00 @ 德田 524
 - o Fri. 14:00 ~ 15:00 @ 德田 524