

打造简单版本的 ChatGPT

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1 数据处理

我们使用了 HF hub 上开源的两个数据集：

- Alpaca-data：对话数据集，包含 instruction、input、output 三个字段。
- Daily-dialog：包含日常生活场景中的多轮对话的数据集，包含 dialog、act、emotion 三个字段。

我们把两个数据集的格式保持统一。对于 Alpaca-data 数据集，我们保留了原来的格式。对于 Daily-dialog 数据集，我们略去了 act 和 emotion 两个字段，只保留了 dialog 的第一回合对话，并将其拆分为 input 和 output 两个字段，添加了 instruction 字段为"Continue the daily dialog"，以表明来源于对话数据。处理后的示例数据如下：

```
1 Alpaca-data :  
2 {  
3     "instruction": "Analyze the given text for its tone.",  
4     "input": "The world has been greatly impacted by the  
        COVID-19 pandemic and it has drastically changed our  
        lives.",
```

```

5      "output": "The tone of the text is one of concern and
      recognition of the dramatic effects of the COVID-19
      pandemic on the world. It is an acknowledgment of
      the upheaval that the virus has caused and that our
      lives have been drastically changed."
6  }
7
8  Daily-dialog:
9  {
10     "instruction": "Continue the daily dialogue.",
11     "input": "It seems that you get antsy when you hear I
      praise another guy . ",
12     "output": "I get antsy not because you praise a guy,
      but because you may be taken for a ride by a guy
      like him."
13 }

```

为增加训练数据的多样性和覆盖范围，我们将分别使用这两个数据集以及合并数据集进行训练：

- data_alpaca: Alpaca-data 数据集，共 52002 条数据，
- data_dialog: Daily-dialog 数据集，共 13118 条数据，
- data_merge: 合并数据集，共 65120 条数据。

2 微调细节

我们在 LLMA 模型的基础上，使用 LoRA 方法进行微调，并且使用 4bit 降低精度来降低对 GPU 显存的要求，训练的所有模型都是 4bit 量化后的。对于 data_alpaca，我们训练了 7B 和 13B 的模型。对于 data_dialog 和 data_merge 训

练了 7B 的模型，lora 使用 peft 实现，具体训练使用 transformers module 中的类 Trainer 并使用 trainer() 训练。主要超参数 lora rank=8, lora alpha=256, epochs=3, learning rate=2e-4, batchsize=2.

3 结果评估

3.1 客观评价

当涉及到语言模型的性能评估时,perplexity(困惑度)是一个常用指标,perplexity 刻画的是语言模型预测一个语言样本的能力。在一个测试集上得到的 perplexity 值越低,说明语言模型性能越好,计算公式为

$$\text{perplexity} = \frac{1}{N} \sum_{i=1}^N \exp \left(-\frac{1}{n_i} \log P(\text{sentence}_i) \right)$$

对不同的模型,我们计算了 perplexity 值和训练时间。

表 1: Perplexity and Runtime

Model	Perplexity	Runtime
LLAMA7B-ALPACA	2.236	30003.422
LLAMA13B-ALPACA	2.160	56672.877
LLAMA7B-DIALOG	2.000	7313.302
LLAMA7B-MERGE	2.180	38253.576

LLAMA13B-ALPACA 与 LLAMA7B-ALPACA 相比,13B 的模型 perplexity 更小,因为它的参数更多,训练时间也更长。四个模型中,LLAMA7B-DIALOG 的 perplexity 最小,训练时间最短。主要因为 data_dialog 是日常对话数据,input 和 output 都比较短,且数据量小。

3.2 主观评价

Perplexity 作为一个客观指标，并不完全代表模型的质量。因此，我们人工去测试回答的准确率，对模型进行主观评价。我们使用 2 个类似 ALPACA 数据集的 instruction 和 1 个类似 DIALOG 数据集的 dialog 作为 prompt，评估 2 个 base model: LLAMA7B, LLAMA13B 和 4 个 finetuned model: LLAMA7B-ALPACA, LLAMA7B-DIALOG, LLAMA7B-MERGE, LLAMA13B-ALPACA。列举如下。

INSTRUCTION: What if time travel was possible?

LLAMA7B: If you were given the opportunity to go back in time and change the course of history by just a moment, would you? And if you did, what would you change? Re: what if time travel was possible? The past is history. We can't change that. What we can do is change the future. I'm a firm believer in "If you can't get it, take it" I'm not sure if this is the answer you were looking for... I would change the past. If you were given the opportunity to go back in time and change the course of history by just a moment, would you? And if you did, what would you change? Why would I want to? I would not change history, as we're all part of it. I'd rather not go back in time. I'd rather not go back

LLAMA13B: What if the government was allowed to keep secrets? What if there was a vaccine for the flu? What if we could eat pine needles? What if we had to wear helmets for driving? What if we didn't have to pay taxes? What if you could time travel, and you could go to any point in time? What if you could be invisible? What if you could fly? What if there was a disease that only the rich could get? What if you could clone yourself? What if there was a war with robots? What if you were a teenage werewolf? What if you were a teenage vampire? What if the world was ending in one year? What if there were no electricity? What if we didn't have to pay taxes? What if everyone was

LLAMA7B-ALPACA: If time travel was possible, there would be so many possibilities. You could explore the past and learn about the events of history, you could even visit places that were previously unknown to you. You could also change the future, or even see how things would have been different had you made different choices. Time travel would allow us to understand the past and the present, and explore the future in a way that was previously unimaginable.

LLAMA13B-ALPACA: If time travel was possible, it would be an incredible opportunity to explore the past and present, as well as the future. It would give us the chance to experience and learn from different eras and cultures, and it would allow us to make different decisions in the present. It would also open up possibilities for us to change the future, and create new possibilities and opportunities for ourselves and others.

LLAMA7B-DIALOG: I'd love to see the past .

LLAMA7B-MERGE: If time travel was possible, it could mean unlimited possibilities. You could travel back in time to meet your ancestors, witness important events, and even make changes to history. It could also mean the possibility of exploring parallel universes and traveling to distant planets.

INSTRUCTION: Imagine a society governed by artificial intelligence.

LLAMA7B: imagine a society governed by artificial intelligence. imagine a soci-
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LLAMA13B: what would happen if machines were in control? and how would we cope in a world where we were subservient to robots? the first edition of “The Wrath of A.I.” , released in November 2015, looked at how we could face a future dominated by artificial intelligence. this second edition, released in November 2016, features new and expanded essays, written by some of the world’ s leading experts in the field of A.I.

LLAMA7B-ALPACA: In a society governed by artificial intelligence, the AI would be responsible for making decisions that affect the people of the society. AI would be used to make decisions such as allocating resources, formulating laws, and regulating trade and commerce. Additionally, AI could be used to provide services such as healthcare and education, as well as provide security and protection.

LLAMA13B-ALPACA: In an artificial intelligence-governed society, citizens would be granted certain rights and freedoms, such as the right to vote and the right to speak their opinions. AI-controlled systems would be used to manage all aspects of society, from health care to education. AI would monitor all activities in the society, and if necessary, issue punishments or rewards for certain behaviors. AI systems would also be used to provide feedback and advice to citizens to help them make better decisions. In this society, citizens would also have access to a wide range of AI services, such as personal assistants, AI-powered transportation, and Communication between humans and animals would likely lead to an increase in understanding, empathy, and compassion. It may also lead to improved animal welfare and a greater appreciation of our natural environment.

LLAMA7B-DIALOG: what about the human race ? will we be in control ?

LLAMA7B-MERGE: In a society governed by artificial intelligence, all decisions would be made by a system of algorithms. The algorithms would be designed by a team of experts in a variety of fields. They would take into account multiple factors, such as economic, social and political factors, to come to a conclusion about the best course of action. This would allow for a more accurate and equitable distribution of resources. The AI would also be able to analyze large amounts of data to make decisions that could save time and money. It would also be able to adjust for unexpected changes in the environment and make quicker, more accurate decisions.

DIALOGUE: Hey! How have you been these days?

LLAMA7B: Hey! How have you been these days? I' ve been busy. I' m not doing anything. It' s not as bad as it could have been. Things are going pretty well. It' s getting pretty bad. I' ve got to get up now and get this done. This is the beginning of the end. It' s not good. It' s the end. This entry was posted in General and tagged bus, bus, bus, bus, bus. ← BUS BUS BUS →

LLAMA13B: Hey! How have you been these days? It's been a while since we last meet. Well, I am fine, but I am so depressed now. I can't really handle it anymore. I hope I could have a little break from everything right now. You know, I just want to have some time to relax. I need to think about what's going on with me these days. I am hoping that I could handle it all. I just want to have some time to think about my life right now. So many things had happened to me. I am so stressed and confused. I really don't know what to do. I need to think about my future. I am really hoping that I could have a little break from everything. I just want to take a rest from all the problems that I have right now. I hope I could do something about it. I am really stressed

and confused right now. I am really struggling hard
LLAMA7B-ALPACA: I've been doing great! How about you?
LLAMA13B-ALPACA: Good! I'm doing great, thanks for asking! How about
you?
LLAMA7B-DIALOG: Pretty busy . What about you ?
LLAMA7B-MERGE: Pretty good , actually . How ' s it going?

4 结果分析

因为我们使用了两个场景不同的数据集分别训练, 我们可以关注 transfer learning 的场景。

可以看到不做 fine tune 的两个 base model 基本只会重复无意义的言语, 效果极差。

LLAMA7B-ALPACA 在两个场景都表现不错, LLAMA7B-DIALOG 在 ALPACA 场景表现不好, 因为 ALPACA 数据集都是问答长对话, DIALOG 数据集都是日常短对话。LLAMA7B-MERGE 在两个场景也都表现得好, 因为同时使用了两个数据集。LLAMA13B-ALPACA 表现比 LLAMA7B-ALPACA 更好, 话语更长, 因为使用了更大的参数量。

显示了 LLAMA7B-ALPACA 的泛化能力。

4.1 附录

Models are located in server 25586, labuser/zhanglikun/llmtune.

LLAMA7B-ALPACA model adapter is in alpaca-adapter-folder-7b-4bit.

LLAMA13B-ALPACA model adapter is in alpaca-adapter-folder-13b-4bit.

LLAMA7B-DIALOG model adapter is in alpaca-adapter-daily-folder-7b-4bit

LLAMA7B-MERGE model adapter is in alpaca-adapter-merge-folder-7b-4bit

Finetune can be run by for example, `llmtune finetune --model llama-13b-4bit --weights llama-13b-4bit.pt --adapter alpaca-adapter-folder-13b-4bit --dataset dataset.json`
`excute13b.py` is used for generation