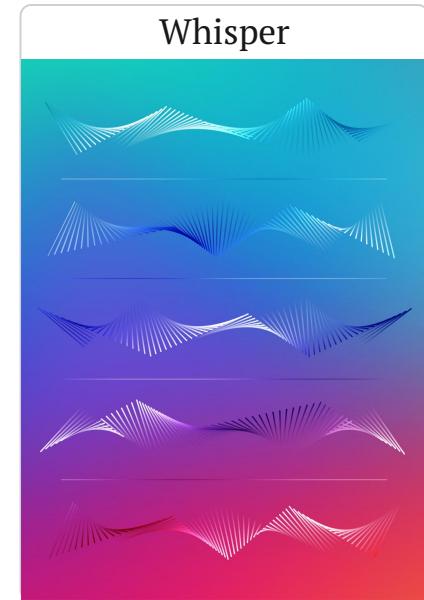
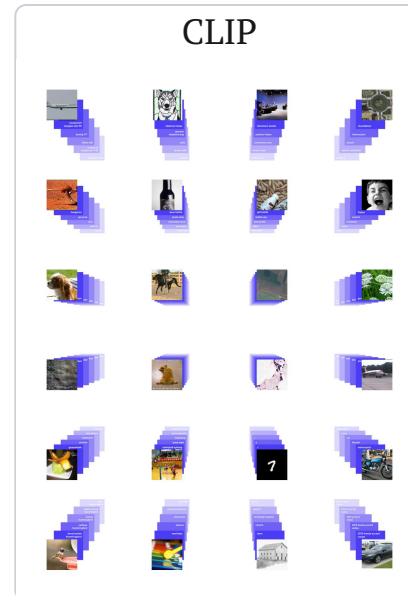
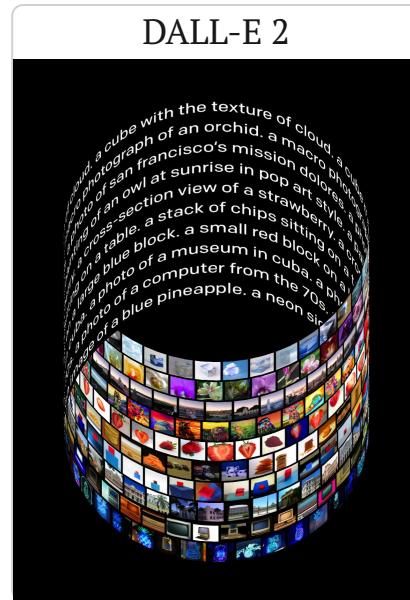


ChatGPT IN ACTION

ChatGPT Probot – A ChatGPT based GitHub APP

 **OpenAI** is a research company that aims to advance AI. 产出了诸多优秀成果例如，多模态 DALL-E 和 CLIP、语音识别 Whisper。语言模型 GPT-3。



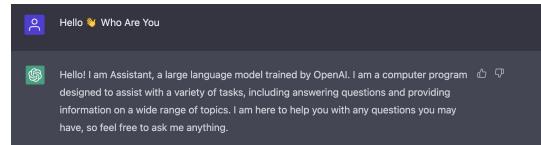
ChatGPT

12月初 OpenAI正式上线了 ChatGPT。ChatGPT 是一个大规模生成式对话模型，它可以根据用户的输入，生成符合语法的回复。ChatGPT 是一个 InstructGPT 的变种。

ChatGPT \approx InstructGPT = GPT3.5 + RLHF

`ChatGPT` is a sibling model to `InstructGPT`。

PAPER



PAPER

MODEL DETAILS

TRY CHATGPT



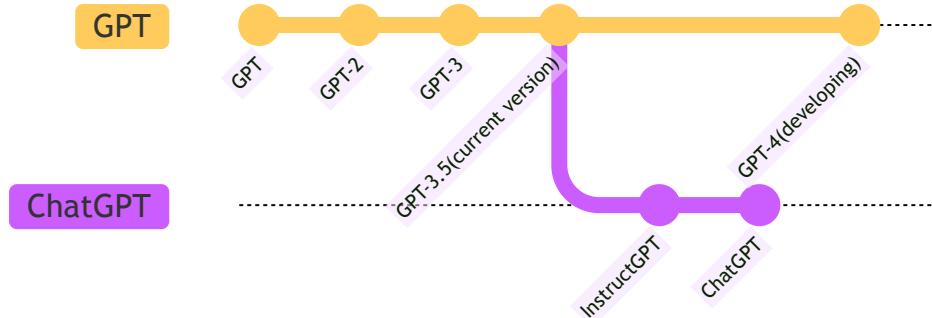
ChatGPT: Optimizing Language Models for Dialogue

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, admit its mistakes, challenge incorrect premises, and reject inappropriate requests. ChatGPT is a sibling model to InstructGPT, which is trained to follow an instruction in a prompt and provide a detailed response.

NOCICE: 首先说明的是 ChatGPT 目前并没有详细的 paper 或者是开源代码，其次本文试图从我自己理解的角度,还请谨慎参考。

GPT系列

Name	Paper	Code	Time	Parameters	Training Size
GPT	Paper	NULL	2018年6月	1.17亿	约5GB
GPT2	Paper	CODE	2019年2月	15亿	40GB
GPT3	Paper	CODE	2020年5月	1,750亿	45TB



GPT - Improving Language Understanding by Generative Pre-Training

GPT 希望同样在 NLP 领域能使用大规模预训练模型。在近 10 个 NLP 任务上都取得了 SOTA 的成绩。

主要分为 pre-tain 和 finetune 两个阶段。

pre-tain 语言模型(unsupervised)，给定文本 \mathcal{U} 和 Θ 模型情况下，预测词 u_i 出现的概率。

$$L_1(\mathcal{U}) = \sum_i \log P(u_i | u_{i-k}, \dots, u_{i-1}; \Theta)$$

其中 Θ 模型是 `Transformer decoder`

$$h_0 = UW_e + W_p$$

$$h_l = \text{transformer}(h_{l-1}) \quad \forall i \in [1, n]$$

$$P(u) = \text{softmax}(h_n W_e^T)$$

其中 $U = (u_{-k}, \dots, u_{-1})$ 。 W_e 是词嵌入矩阵， W_p 是位置嵌入矩阵。（可学习的）

fine-tune 下游任务(supervised)，给定文本 \mathcal{X} 和对应 y 标签，预测序列的标号 y 的概率。其中 h_l^m 来自最后一层 Transformer block 的输出(第m个词过1层)。具体的

$$P(y | x^1, \dots, x^m) = \text{softmax}(h_l^m W_y)$$

$$L_2(\mathcal{C}) = \sum_{(x,y)} \log P(y | x^1, \dots, x^m)$$

$$L_3(\mathcal{C}) = L_2(\mathcal{C}) + \lambda * L_1(\mathcal{C})$$

Details →

GPT - Improving Language Understanding by Generative Pre-Training

对于不同类型的NLP下游任务都能受益于预训练阶段的Transformer。下游阶段Transformer不再进行改变，只微调后面的Linear层。

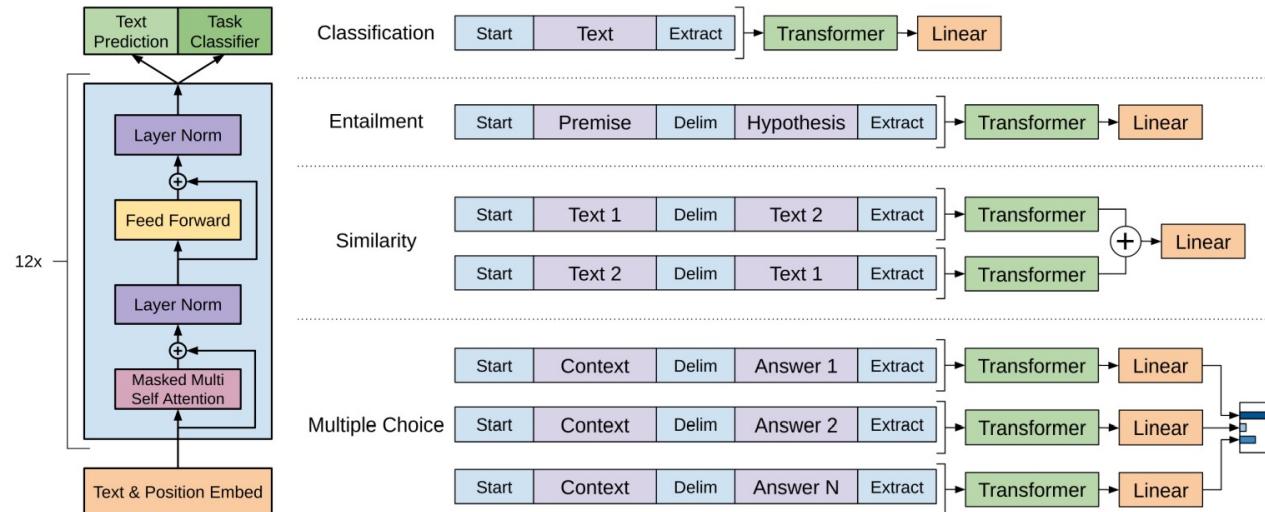


Figure 1: **(left)** Transformer architecture and training objectives used in this work. **(right)** Input transformations for fine-tuning on different tasks. We convert all structured inputs into token sequences to be processed by our pre-trained model, followed by a linear+softmax layer.

GPT2 - Language Models are Unsupervised Multitask Learners

GPT-2 1.5B参数的模型，在规模上远超 GPT / Bert。GPT-2 通过高质量的数据集达成了 Zero-Shot SOTA 效果，
GPT2 在结构上并没有太大的改进，主要在模型+数据规模和数据质量上下文章。

对于某个下游任务: 无监督超大模型 + 无监督超大数据集 \geq 有监督小模型 + 有监督小数据集

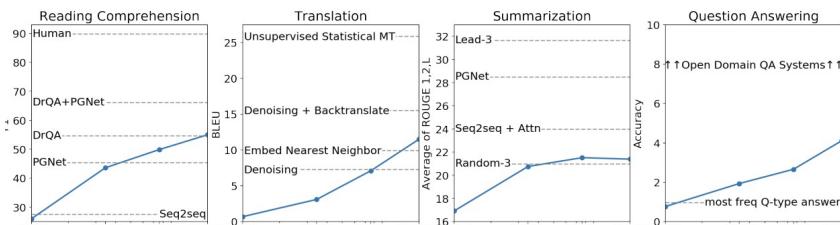
DATASET	METRIC	OUR RESULT	PREVIOUS RECORD	HUMAN
Winograd Schema Challenge	accuracy (+)	70.70%	63.7%	92%+
LAMBADA	accuracy (+)	63.24%	59.23%	95%+
LAMBADA	perplexity (-)	8.6	99	~1-2
Children's Book Test Common Nouns (validation accuracy)	accuracy (+)	93.30%	85.7%	96%
Children's Book Test Named Entities (validation accuracy)	accuracy (+)	89.05%	82.3%	92%
Penn Tree Bank	perplexity (-)	35.76	46.54	unknown
WikiText-2	perplexity (-)	18.34	39.14	unknown
enwik8	bits per character (-)	0.93	0.99	unknown
text8	bits per character (-)	0.98	1.08	unknown
WikiText-103	perplexity (-)	17.48	18.3	unknown

Training Sample:

`Micheal Jordan is the best basketball player in the history` For QA Task:

- Q: `who is the best basketball player in the history?`
- A: `Micheal Jordan`

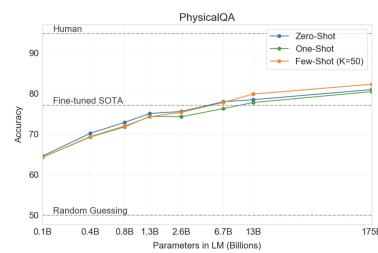
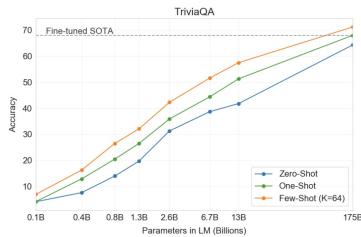
TASK DETAILS



GPT3 - Language Models are Few-Shot Learners

GPT-3 模型达到了 1750 亿参数 😱😱😱😱。参数来到了恐怖的千亿级别，训练一次成本数百万美元，目前 OpenAI 向微软授权了 GPT-3，并且开发了 Copilot / Notion AI 等等产品。是主要的收费产品。

论文讨论了 few-shot / zero-shot 在下游任务运用时的效果。整天论文(40+)后25页全部为下游任务的实验。



The three settings we explore for in-context learning

Zero-shot

The model predicts the answer given only a natural language description of the task. No gradient updates are performed.



One-shot

In addition to the task description, the model sees a single example of the task. No gradient updates are performed.



Few-shot

In addition to the task description, the model sees a few examples of the task. No gradient updates are performed.



Traditional fine-tuning (not used for GPT-3)

Fine-tuning

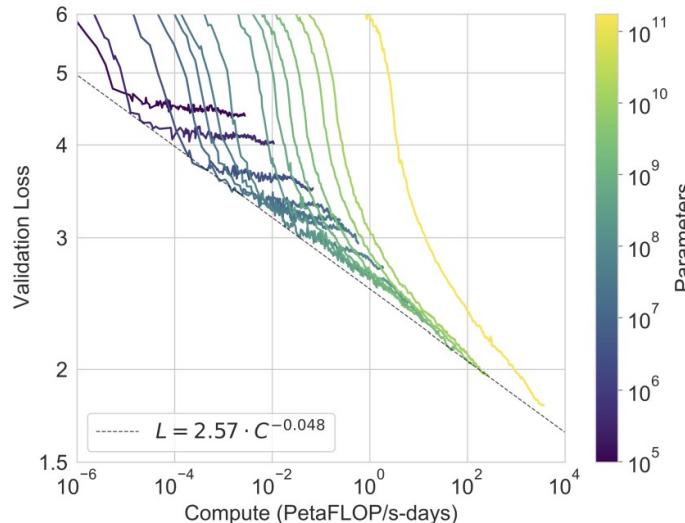
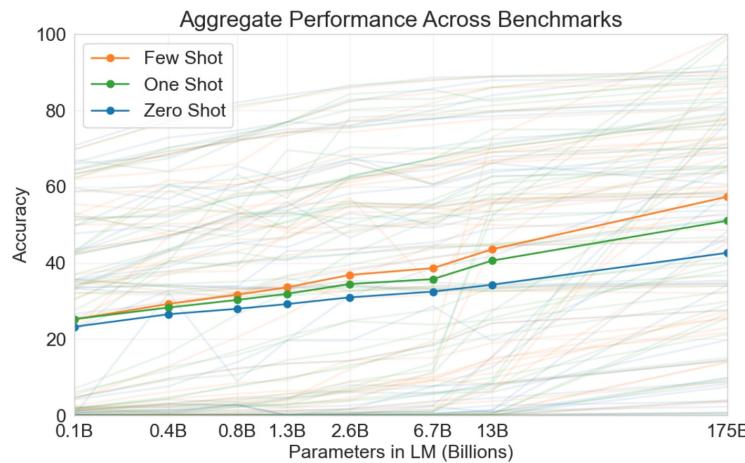
The model is trained via repeated gradient updates using a large corpus of example tasks.



GPT 系列启示

- GPT-1 和 Bert 开启了大规模预训练模型在 NLP 的广泛应用，主要范式是 Pretrain + task finetune。
- GPT-2 通过堆砌参数到十亿级别暴力出奇迹，在数据集和模型规模更大的情况下达到了不需要根据下游任务再做 finetune，超越大部分 few-shot 方法，并且发现无/自监督大模型还可以继续开发，
- GPT-3 贯彻执行到底，参数来到了恐怖的千亿级别，训练一次成本数百万美元，甚至已经没办法做 finetune。在下游任务 few-shot/zero-shot/one-shot 性能上部分甚至超过了有监督的 SOTA。

大模型+直接完成下游任务 在部分下游任务上已经足够好！



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