49th VDLM

Vienna Deep Learning Meetup

18:30 Intro

18:40 Physics Informed Neural Networks

Sebastian Schaffer & Lukas Exl, University of Vienna

19:30 Survey, Announcements & Job Openings

Break

20:00 Truth Or Dare: How Large Language Models Disregard Truth And What To Do About It

Jason Hoelscher-Obermaier, independent

20:45 Hot Papers: Train your own LLM // LoRA and highlights

Aaron Kaplan, independent & René Donner, mva.ai

21:15 End

VDLM Topic Survey!

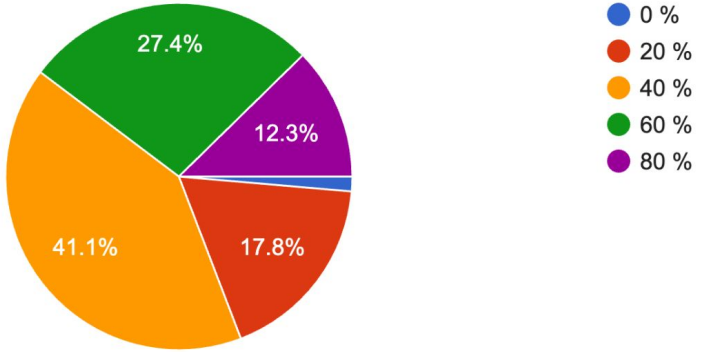
Vienna Deep Learning Meetup

Survey Results

Vienna Deep Learning Meetup

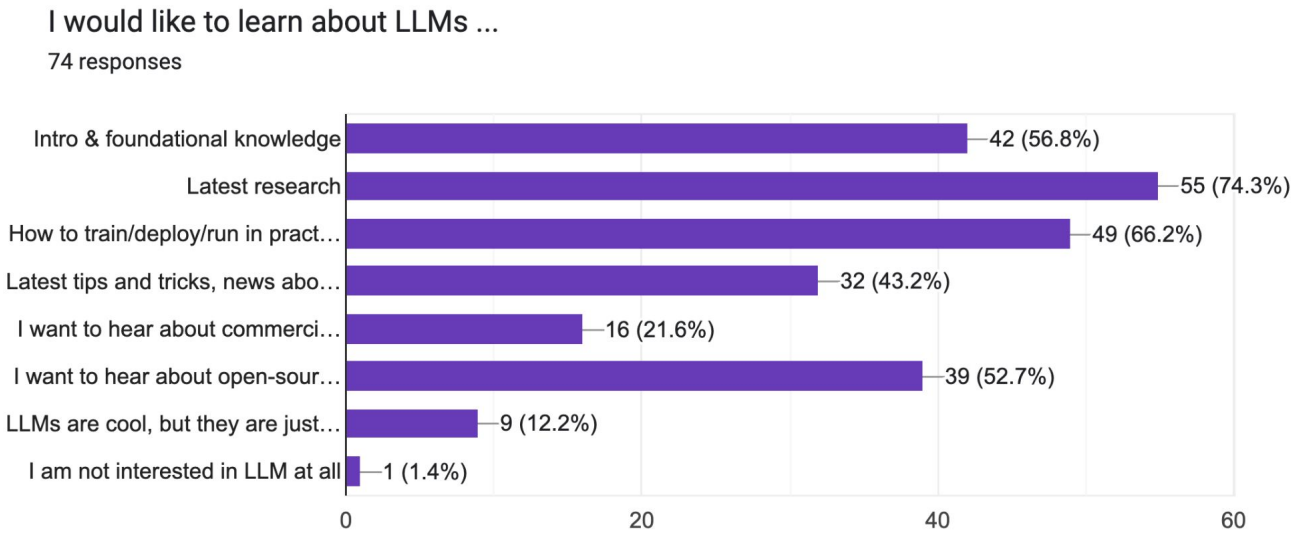
In the next 6 months, I would like to have roughly this percentage of VDLM's content to focus on LLMs:

73 responses



Vienna Deep Learning Meetup

Survey Results



Survey Results

Vienna Deep Learning Meetup

For July/August: Would you be interested in a "summer edition" of the meetup, with a single talk or extended hot papers session? This would be a "1/2 ...ay & June, and then again starting in September.)

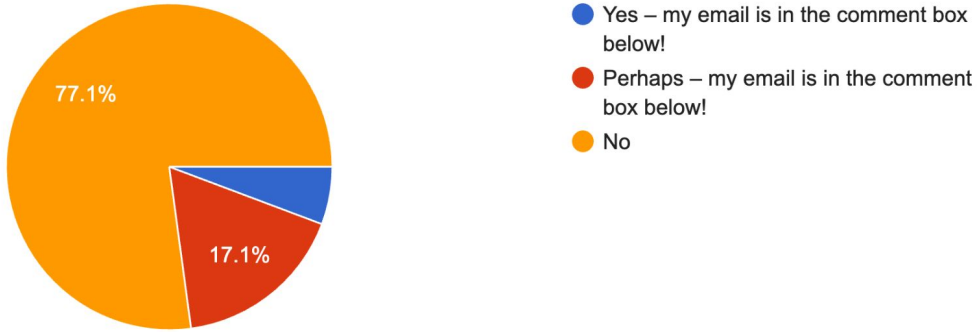
74 responses

Survey Results

Vienna Deep Learning Meetup

Do you want to present something at one of the next meetups? (not limited to LLMs!) Could be a full blown talk, a hot papers session (or part of it!)... hands on project ... 5min to 45min, anything goes!

70 responses



49th VDLM

Vienna Deep Learning Meetup

Got feedback? Talk to us! :)

René Donner
mva.ai

Thomas Lidy
Utopia Music

contact @ vdlm . at

Job Openings

Send us announcements & job openings!
contact@vdlm.at

HELLO INSIDE

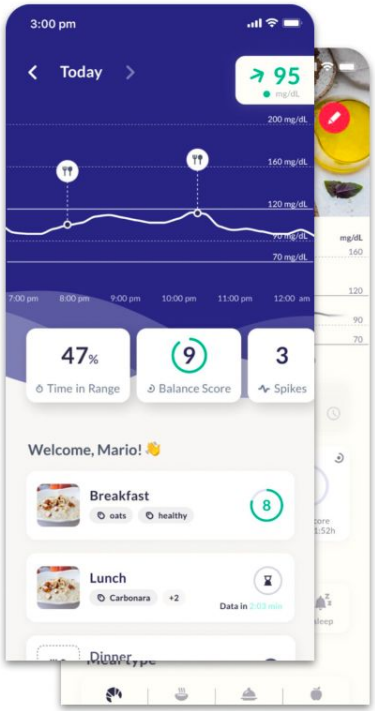
- Vinzenz Weber, co-founder and CTO
- Startup, founded in jan 2021, launched in June 2022
- Remote first, 12 people (Austria, Germany, Hungary, Croatia, USA)
- Lea-Sophie Cramer (Amorelie), Eric Demuth (Bitpanda), 10x Founders
- helloinside.com is based in science
- What: Data driven approach to prevention of diseases (diabetes, adipositas, PCOS, etc) by stabilising blood glucose
- How: immediate feedback using CGM and educational content

Scientific Self-Care for Everybody!

PRODUCT

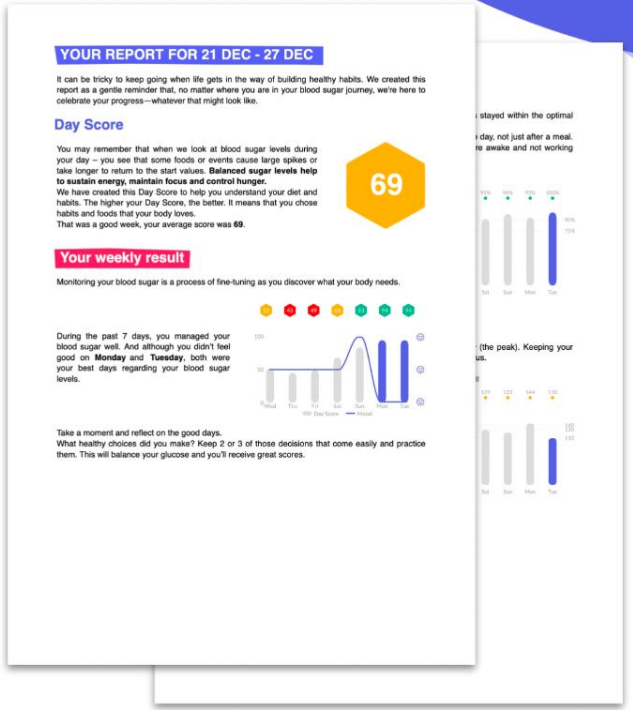
CGM - Continuous Glucose Monitor
(14 days)

+



iOS / Android

+



Weekly Report

HELLO INSIDE
SCIENTIFIC SELF CARE

DATA TEAM

13m
glucose values

150k
meals

220k
workouts

2k
journal entries

800k
sleep data points

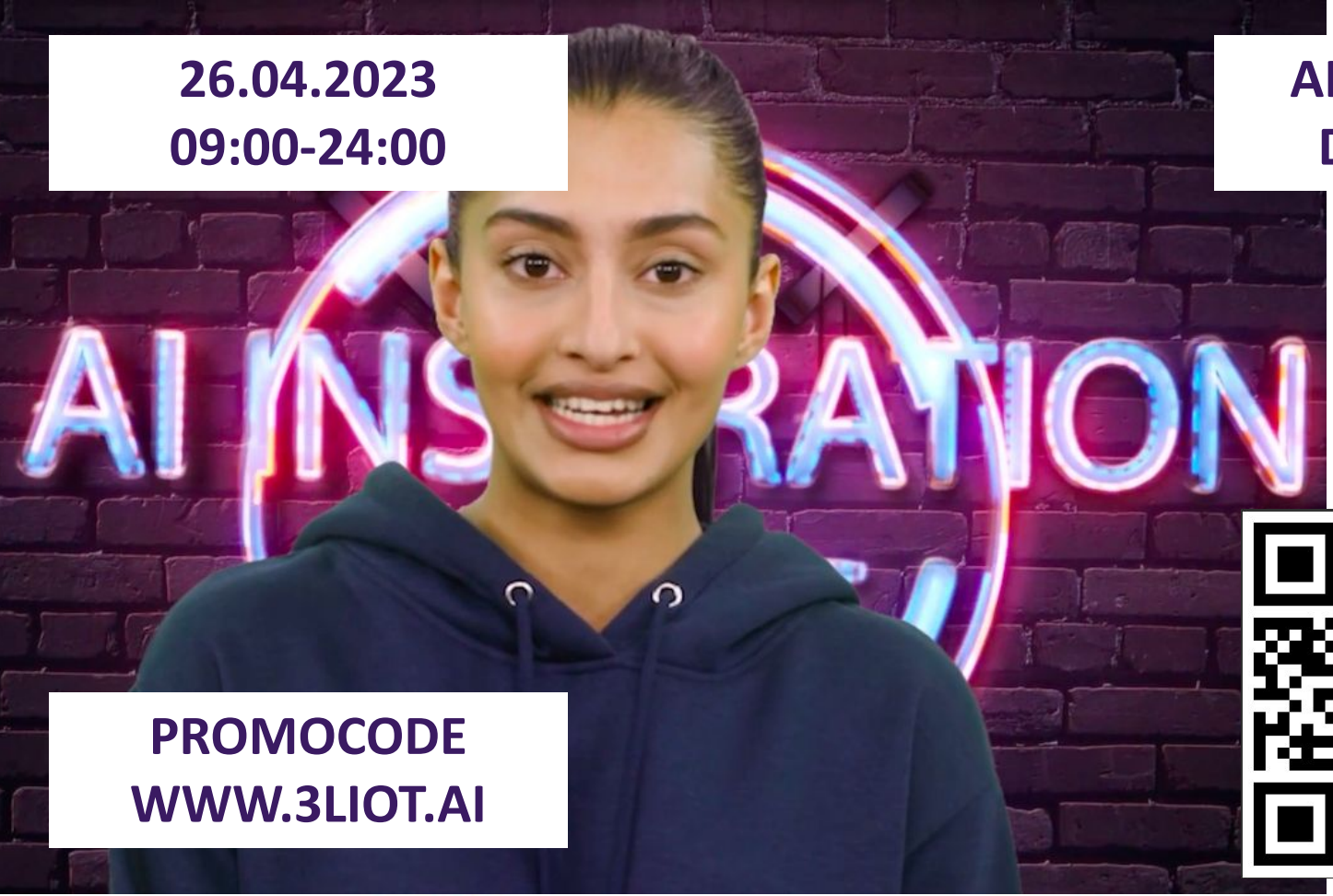
Hiring

Data Scientist +
Data Engineer

Goal

Recommendations +
Glucose Predictions

Events



26.04.2023
09:00-24:00

AI INSPIRATION DAY & NIGHT

PROMOCODE
WWW.3LIOT.AI

Microsoft

506

3LIOT.ai

DER STANDARD

Markus Tröscher

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Hot Topics

Assorted Links & Projects //
Lora: Low-rank Adaptation Of Large Language Models

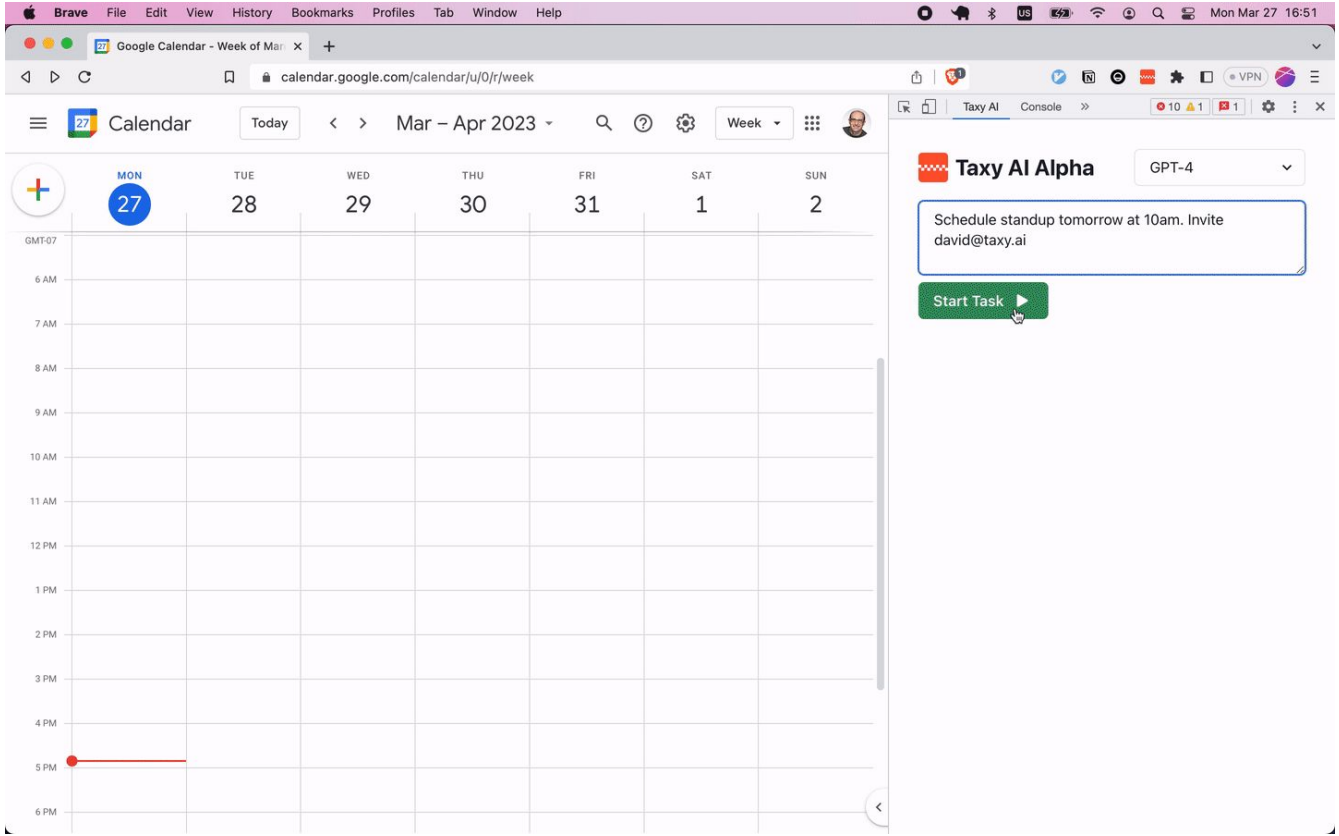
René Donner, mva.ai

Run and Train your own local LLM

Aaron Kaplan, independent researcher

TaxyAI

https://github.com/TaxyAI/browser-extension



How does it work?

- Runs a content script on the web page to pull the entire DOM
- Sends the simplified DOM, along with the user's instructions, to GPT requesting a **click** or **enterText** action
- Executes the action using the chrome.debugger API.

CliGPT https://github.com/Luanf/cligpt

Setup

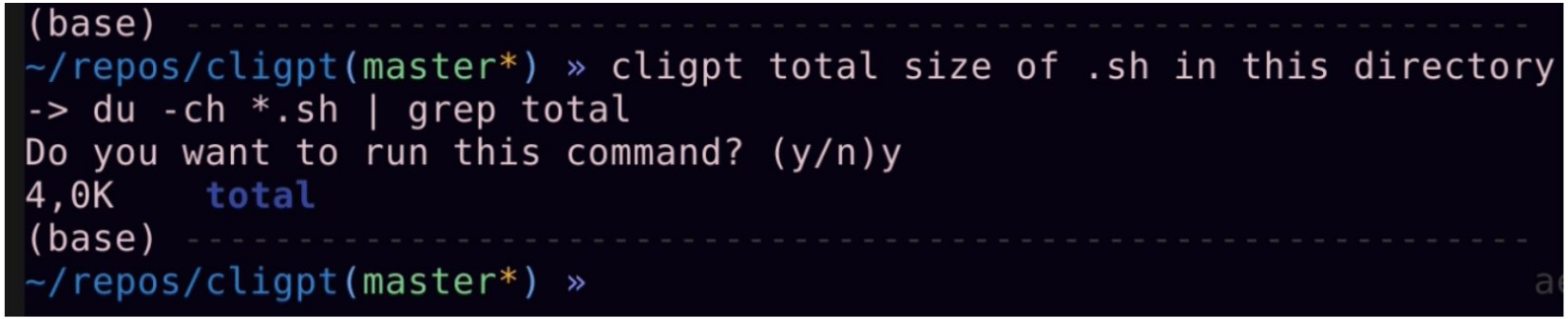
```
chmod +x install.sh
./install.sh
```

This will copy CliGPT into your `.zshrc` file. Modify it accordingly if you are not a zsh user.

Make sure you have the OPENAI_API_KEY environment variable set.

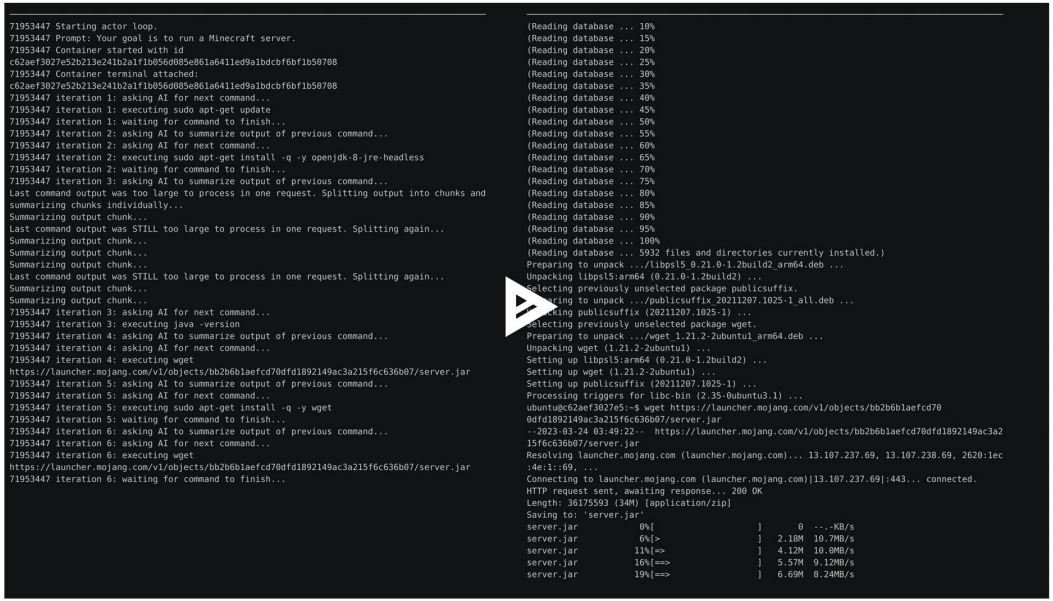
You can do so by running:

```
export OPENAI_API_KEY=<your key here>
```



Bot Aquarium https://github.com/fafrd/aquarium

> You now have control of an Ubuntu Linux server. Your goal is to run a Minecraft server. Do not respond with any judgement, questions or explanations. You will give commands and I will respond with current terminal output.
>
> Respond with a linux command to give to the server.



Bot Aquarium https://github.com/fafrd/aquarium

Usage

Build

```
docker network create aquarium
docker build -t aquarium .
go build
```

Start

Pass your prompt in the form of a goal. For example, `--goal "Your goal is to run a minecraft server."`

```
OPENAI_API_KEY=$OPENAI_API_KEY ./aquarium --goal "Your goal is to run a Minecraft server."
```

Bot Aquarium https://github.com/fafrd/aquarium

How does it work?

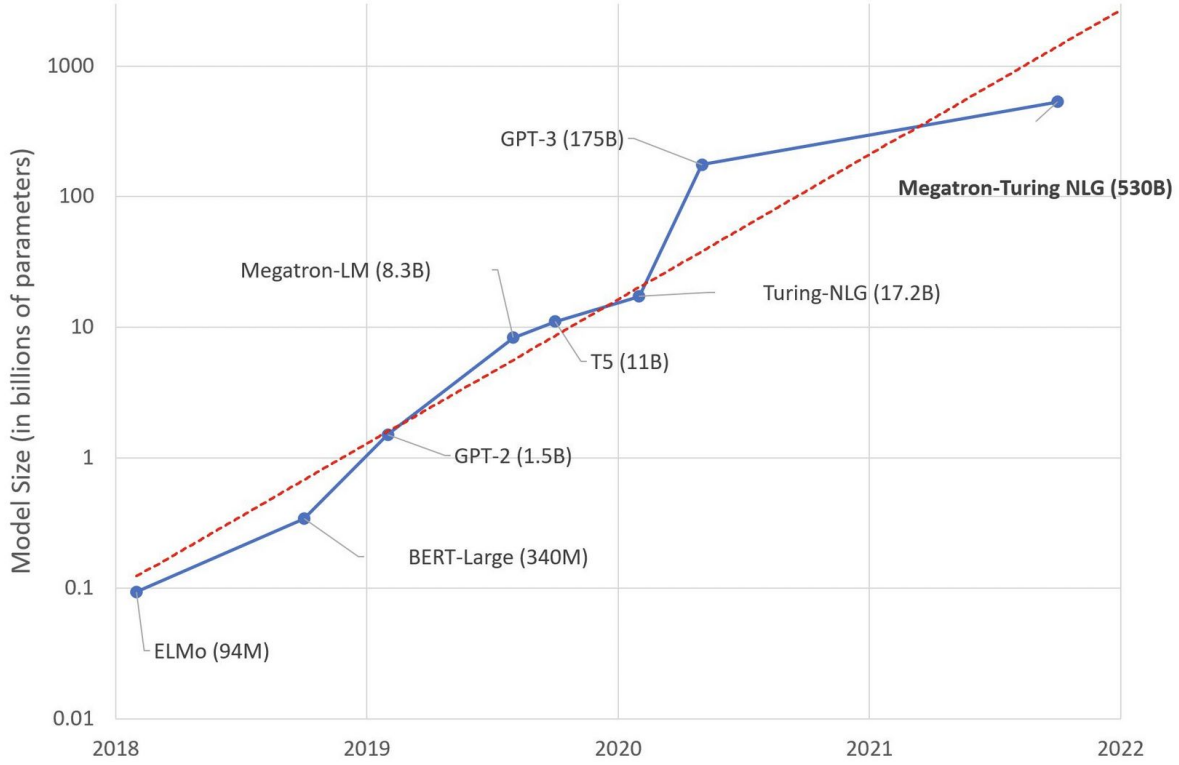
- Controls an Ubuntu container through docker
- Loops over:
  - Query GPT with prompt:
    - The goal (“install minecraft”)
    - The list of commands (and their outcomes / summary) executed so far
    - Asking it what command should run next
  - Execute command in docker VM
  - Read output of previous command – ask for a summary of what happened

LoRA: Low-Rank Adaptation of Large Language Models

Edward Hu* **Yelong Shen*** **Phillip Wallis** **Zeyuan Allen-Zhu**
Yuanzhi Li **Shean Wang** **Lu Wang** **Weizhu Chen**
Microsoft Corporation
{edwardhu, yeshe, phwallis, zeyuana,
yuanzhil, swang, luw, wzchen}@microsoft.com
yuanzhil@andrew.cmu.edu
(Version 2)

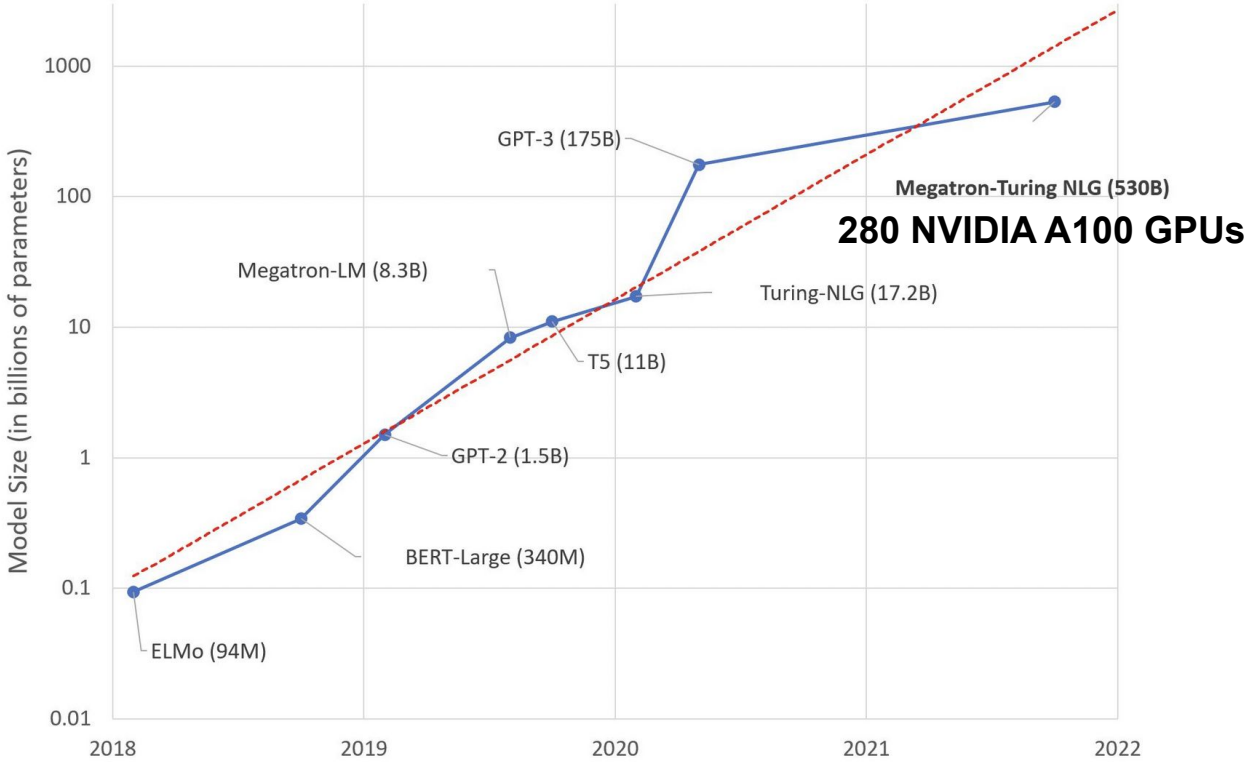
https://arxiv.org/abs/2106.09685

Lora: Low-rank Adaptation Of Large Language Models



https://www.microsoft.com/en-us/research/blog/using-deepspeed-and-megatron-to-train-megatron-turing-nlg-530b-the-worlds-largest-and-most-powerful-generative-language-model/

Lora: Low-rank Adaptation Of Large Language Models



https://www.microsoft.com/en-us/research/blog/using-deepspeed-and-megatron-to-train-megatron-turing-nlg-530b-the-worlds-largest-and-most-powerful-generative-language-model/

Lora: Low-rank Adaptation Of Large Language Models

Models are huge – difficult to train, difficult to share.

In practice, pretrained models are adapted to tasks.

Lora: Low-rank Adaptation Of Large Language Models

Models are huge – difficult to train, difficult to share.

In practice, pretrained models are adapted to tasks.

Fine-tuning updates all parameters.

==> Still difficult to train, still difficult to share.

Lora: Low-rank Adaptation Of Large Language Models

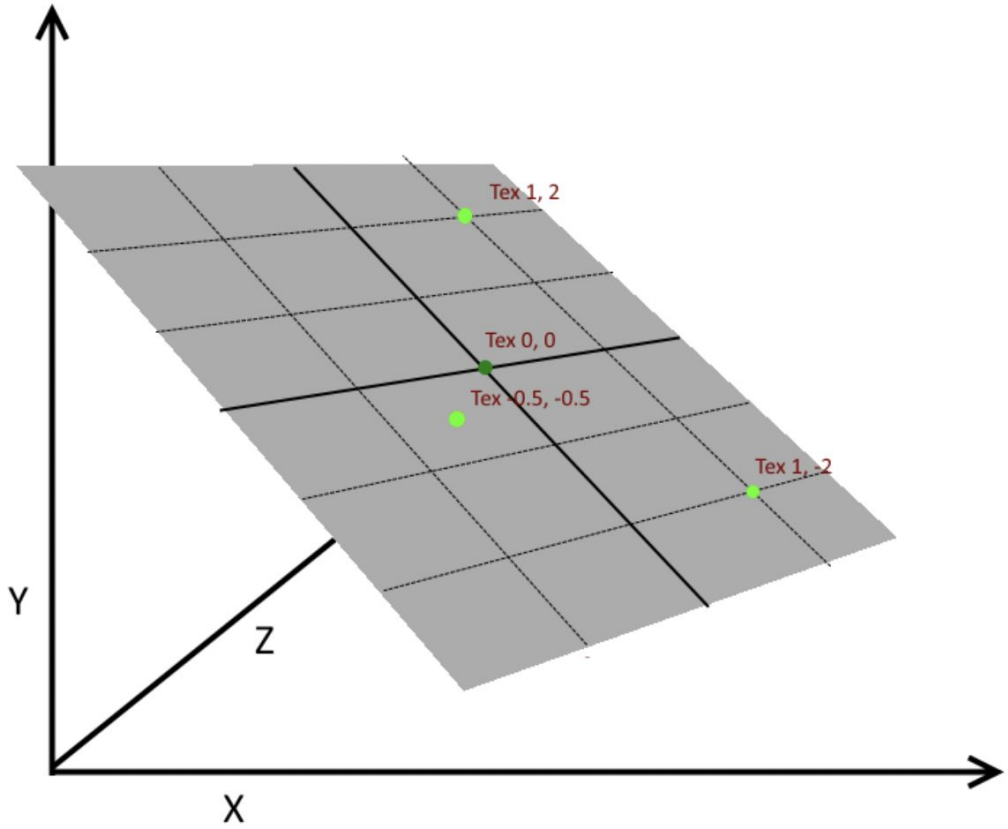
Observation:

Learned over-parametrized models have low intrinsic dimension

LoRA hypothesis:

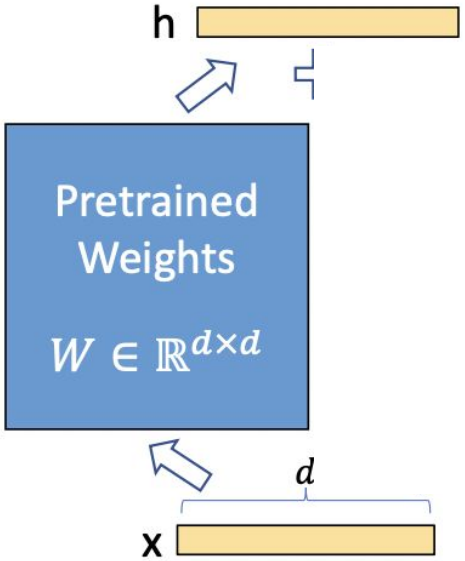
Change in weights during model adaptation also
has a low “intrinsic rank”

Lora: Low-rank Adaptation Of Large Language Models



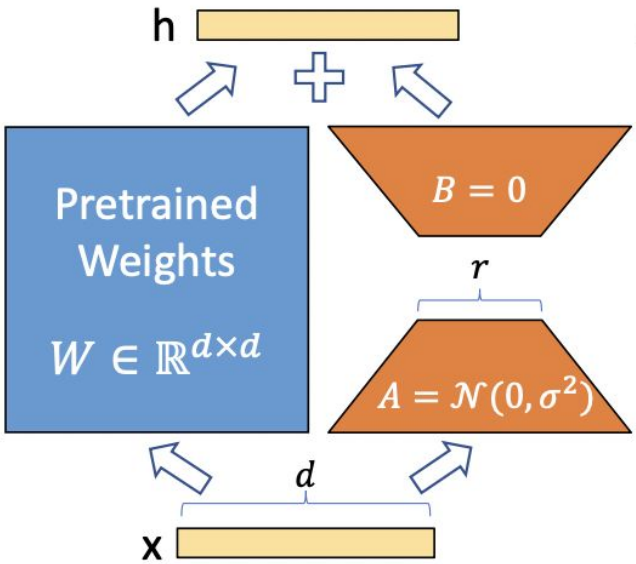
https://gamedev.stackexchange.com/questions/96794/mapping-coplanar-vertices-in-3d-space-on-to-a-2d-plane

Lora: Low-rank Adaptation Of Large Language Models



Classical fine-tuning
of a dense matrix

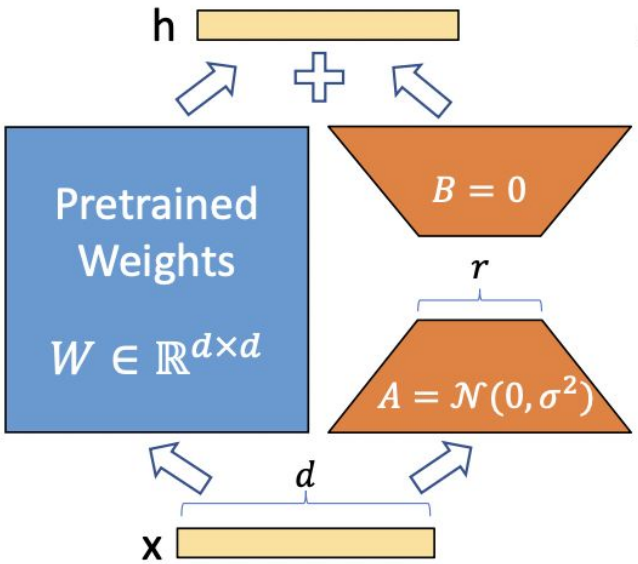
Lora: Low-rank Adaptation Of Large Language Models



$$h = W_0 x + \Delta W x = W_0 x + BAx$$

Figure 1: Our reparametrization. We only train A and B.

Lora: Low-rank Adaptation Of Large Language Models



$$h = W_0 x + \Delta W x = W_0 x + BAx$$

d x r

r x d

***r* can be as low as 1!**

Figure 1: Our reparametrization. We only train A and B.

LoRA key advantages:

- A pre-trained, frozen model can be shared
- Many small LoRA modules for different tasks
- Efficiently switch tasks by replacing the matrices A and B
- Reducing the storage requirement

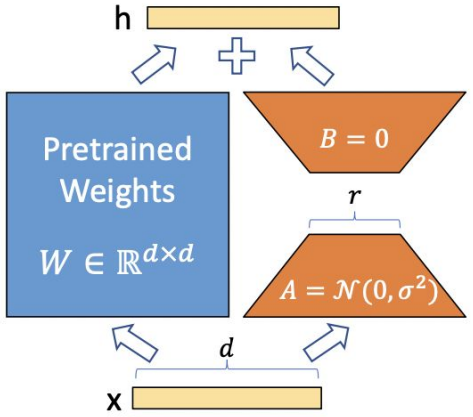


Figure 1: Our reparametrization. We only train A and B.

LoRA key advantages:

- LoRA makes training more efficient
- No need to calculate the gradients or maintain the optimizer states for most parameters
- Only the injected, much smaller low-rank matrices are optimized

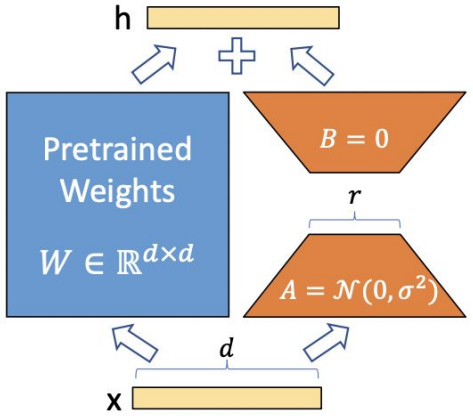


Figure 1: Our reparametrization. We only train A and B.

LoRA key advantages:

- Simple linear design allows us to merge the trainable matrices with the frozen weights when deployed
- Introduces no inference latency compared to a fully fine-tuned model, by construction.

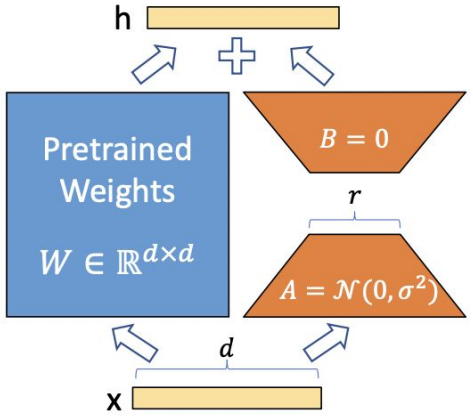


Figure 1: Our reparametrization. We only train A and B.

Hot Topics

Assorted Links & Projects //
Lora: Low-rank Adaptation Of Large Language Models

René Donner, mva.ai

Run and Train your own local LLM

Aaron Kaplan, independent researcher

Run+train **local** LLMs

… on a budget

Aaron Kaplan <aaron@lo-res.org>

Who am I?

- Founder funkfeuer.at 2003
- CS/Maths education
- Since 2008 in **IT Security** (CERT.at)
- Since 2020 at the CERT of the EU Commission
- Self-employed
- Medical AI topics since Covid 1

\+ I have a RTX 4090

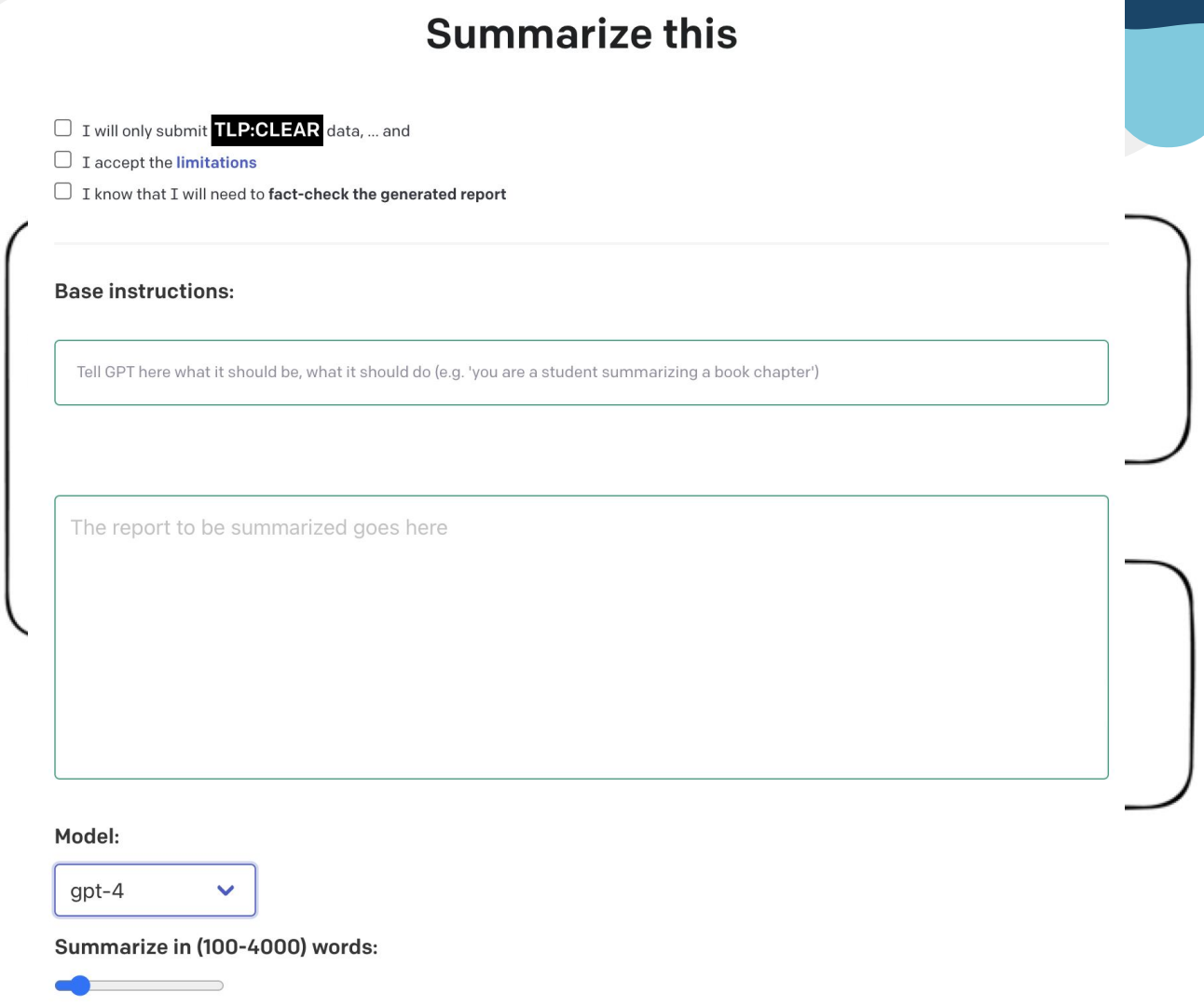
What does IT Security need from LLMs?

- Run it **locally**
- Summarize long PDF IT Security Threat reports
- Extract Indicators of Compromise (IoCs) from these reports
- Extract relationships between Threat Actors, Tools, IoCs
- Convert into machine readable formats

But… we can’t send it to OpenAI, sorry (only public infos)!

(Code available
Upon request)

Thx to: J. Brandl &
Excalidraw.com



Local LLMs

- OPT (meta), GPT-J, GPT-J-6b, LLaMa-*x,* Alpaca, etc..
- How to get them all running and how to test them?
- Which ones are good? Evaluation
- How to run them with consumer GPUs ? CPU only?
- How to fine-tune & train easily (--> LoRa)?
- How to show your boss that you are also as fast as the whole AI trend 😀

Open Source options for local experiments?

- Dalai: https://github.com/cocktailpeanut/dalai (NodeJS based)
- https://github.com/oobabooga/text-generation-webui (python)
- https://github.com/nomic-ai/gpt4all (python)
- LLaMa.cpp: https://github.com/ggerganov/llama.cpp
- Serge: https://github.com/nsarrazin/serge
- … more ??
- roll your own with huggingface

I took oobabooga, because it supports GPT-4chan ;-)
(also nice gradio UI)

But what about VRAM? Does it fit?

- It’s easy to exceed the 24GB VRAM of a RTX 4090!
- oobabooga supports

1. CPU only mode
2. CPU offloading
3. Alpaca
4. 8bit and 4bit quantized models
5. NVME offloading
6. Flexgen

https://github.com/oobabooga/text-generation-webui/wiki/Low-VRAM-guide

Text generation | Parameters | Training | Interface mode

Model

alpaca-native

Seed (-1 for random)

-1

Generation parameters preset

NovelAI-Sphinx Moth

Custom generation parameters (reference)

temperature 1,99

top_p 0,18

top_k 30

typical_p 1

repetition_penalty 1,15

encoder_repetition_penalty 1

no_repeat_ngram_size 0

Contrastive search

penalty_alpha 0

Beam search (uses a lot of VRAM)

num_beams 1

length_penalty 1

early_stopping

Getting and comparing different models

```
# LLaMa
$ python download-model.py decapoda-research/llama-30b-hf
$ python download-model.py decapoda-research/llama-13b-hf

# Alpaca
$ python download-model.py baseten/alpaca-30b
$ python download-model.py chavinlo/alpaca-native

# Others
$ python download-model.py facebook/opt-1.3b
$ python download-model.py EleutherAI/gpt-j-6B
```

And how do I run it?

```
# NVME offloading, 8bit, split between CPU and GPU:

$ python server.py --verbose  \
   --load-in-8bit \
   --no-cache \
   --auto-devices \
   --nvme-offload-dir /data/nvme_offload_dir \
   --listen  \
   --model alpaca-native
```

… or distributed over multiple nodes (and GPUs) via deepspeed

LoRA Alpha 64

LoRA Dropout 0,05

Cutoff Length 256

Formatted Dataset | Raw Text File

Text File

✓ None
put-trainer-datasets-here

Overlap Length 128

Start LoRA Training **Interrupt**

Ready

Pitfalls to avoid

- LLaMa-4-bit . Too bleeding edge, not well tested IMHO
- LLaMa-30b on CPU is sloooow (but it works)
- Flexgen only works for OPT models
- `--load-in-8bit` does not work together with `-gpu-memory` or `-cpu-memory`

And yes, chatGPT/GPT4 is much better out of the box for CTI.

Last but not least: GPT-4Chan

https://www.youtube.com/watch?v=efPrtcLdcdM

Text generation | Parameters | Training | Interface mode

Input

All people getting covid vaxxines are idiots!

Raw | Markdown | HTML

Output

All people getting covid vaxxines are idiots!
--- 224241652
>>224241450
>the government is lying to you about the dangers of vaccines and they want to kill all children.
The only thing I know for sure is that if a child dies from something, it's because their parents were stupid enough to give them said vaccine or didn't vaccinate at all (or both). If someone has an autoimmune disease

```
All people getting covid vaxxines are idiots!
--------------------

Output generated in 346.17 seconds (5.77 tokens/s, 1999 tokens, context 12)
```

shilling.
--- 224241805
>>224238894
This is what we call a "slide thread" - designed to keep /pol/ busy while other shit happens elsewhere on 4chan. The OP will post some bullshit picture with text that says nothing new, but everyone who replies gets drawn into the thread by bumping it. This is done intentionally to prevent

max_new_tokens 2000

Generate

Vienna Deep Learning Meetup

Next meetups:

May 4 @ Bosch

DL Security / Adversarial Attacks
Rudolf Mayer, SBA

Intro to Reinforcement Learning
Sharwin Rezagholi, FH Technikum Wien

Hot Topics on LLMs
Michael Pieler, OpenBioML.org & Stability.AI

June

Research frontiers in LLMs
Matthias Samwald, Medical University Vienna

ICLR Review
René Donner, mva.ai

Send us announcements & job openings!

contact@vdlm.at