Stable Diffusion

Extensions, integrations

Stable Diffusion is not alone

Infrastructure to play, to share

Many issues raised

The future

Summarizing

References

Introducing Stable Difussion

Jesus M. Gonzalez-Barahona

Universidad Rey Juan Carlos
https://floss.social/@jgbarah
https://jgbarah.github.io/presentations

I Jornadas Tecnológicas IES Villaverde
Madrid, Spain, June 9th 2023

Stable Diffusion
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The plot

1. Stable Diffusion
2. Extensions, integrations
3. Stable Diffusion is not alone
4. Infrastructure to play, to share
5. Many issues raised
6. The future
7. Summarizing

Stable Diffusion

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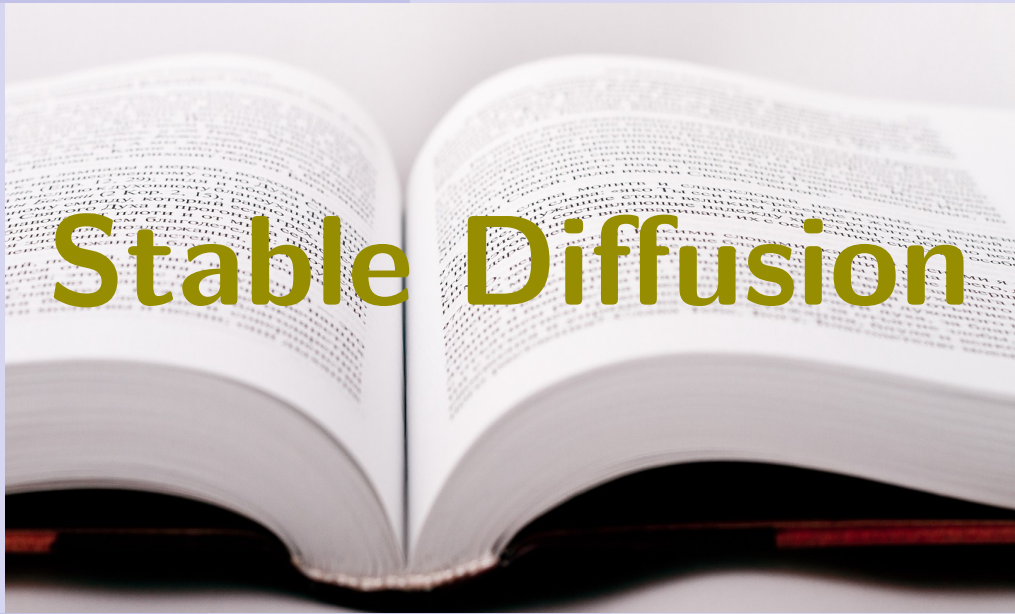

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Spain football team, winners of the World Cup in Qatar 2022, celebrating

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Japan football team, winners of the World Cup in Qatar 2022, celebrating

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Profesor de tecnología de educación secundaria

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Technology teacher, secondary education, portrait

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Speaker presenting at Machine Learning Spain (25, 50)

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Speaker presenting at Machine Learning China

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"Free culture enthusiast portrait, photorealistic"

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"selfie of a free culture enthusiast with a dinosaur"

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First release

Released on August 22nd 2022

Licensed: Creative ML OpenRAIL-M

https://stability.ai/blog/stable-diffusion-announcement

https://colab.research.google.com/github/huggingface/notebooks/blob/main/diffusers/stable_diffusion.ipynb

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One week is just one week

Demos in Google Collab
Model in Hugging Face
Demonstrator available (Dream Studio)
Source code and weights available

https://multimodal.art/news/1-week-of-stable-diffusion

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Dream Studio

Social site to give Stable Diffusion a try

Some gratis credit

USD 10 for 5,000 images

https://beta.dreamstudio.ai

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Stable Diffusion 2

Announced: November 25th 2022

https://huggingface.co/spaces/stabilityai/stable-diffusion

Better resolution,
more precision in styles,
more control.

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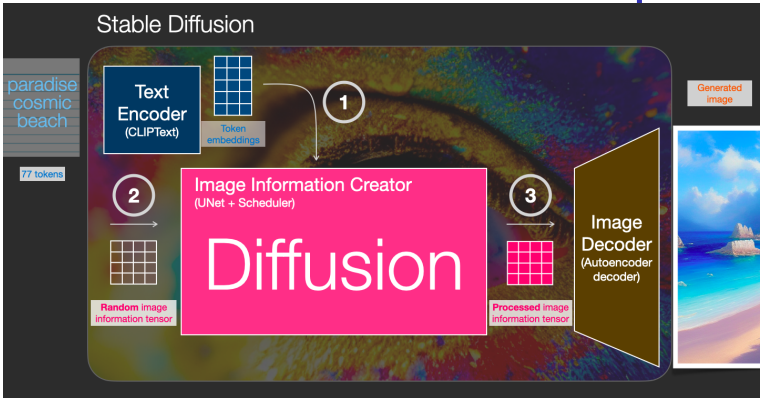
Stable Diffusion process



https://jalammar.github.io/illustrated-stable-diffusion/

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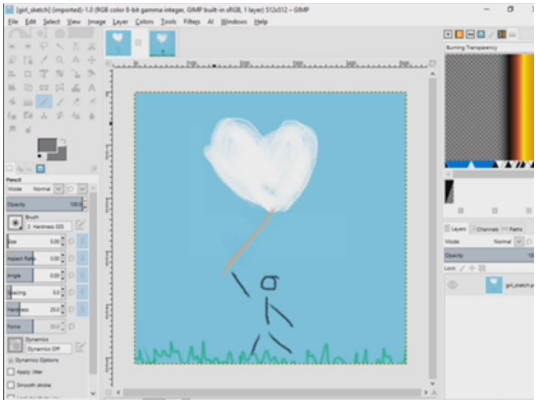
Integration: GIMP



https://github.com/blueturtleai/gimp-stable-diffusion

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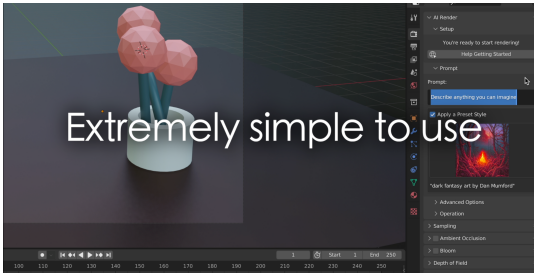
Integration: Blender



https://blendermarket.com/products/ai-render

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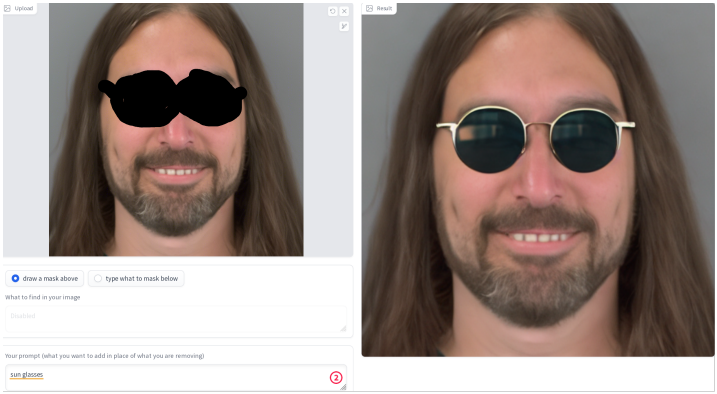
In-painting



https://huggingface.co/spaces/multimodalart/stable-diffusion-inpainting

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Out-painting

https://github.com/lkwq007/stablediffusion-infinity

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Image to image

Image + prompt produces an image

Even just with CPU!

https://huggingface.co/spaces/fffiloni/stable-diffusion-img2img

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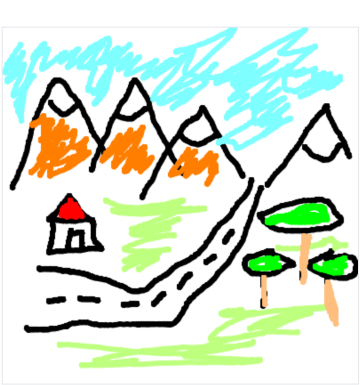

https://huggingface.co/spaces/huggingface-projects/diffuse-the-rest

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Fine-tuned images

Generated images with prompt `photo of a sks container on the beach` :

Generated images with prompt `photo of a sks container on the moon` :

Some not-so-perfect but still interesting results:

Generated images with prompt `photo of a red sks container` :

Generated images with prompt `a dog on top of sks container` :

https://github.com/XavierXiao/Dreambooth-Stable-Diffusion

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3D assets

https://nv-tlabs.github.io/GET3D/

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3D assets

MotionDiffuse: Text-Driven Human Motion Generation with Diffusion Model

Mingyuan Zhang[1]* Zhongang Cai[1,2]* Liang Pan[1] Fangzhou Hong[1] Xinying Guo[1] Lei Yang[2] Ziwei Liu[1]+

[1]S-Lab, Nanyang Technological University [2]SenseTime Research

*equal contribution +corresponding author

play the guitar	walk sadly	walk happily	check time

https://github.com/mingyuan-zhang/MotionDiffuse

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Videos

https://github.com/nateraw/stable-diffusion-videos
https://phenaki.github.io/
https://aiart.dev/posts/sd-music-videos/sd_music_videos.html

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And much, much more

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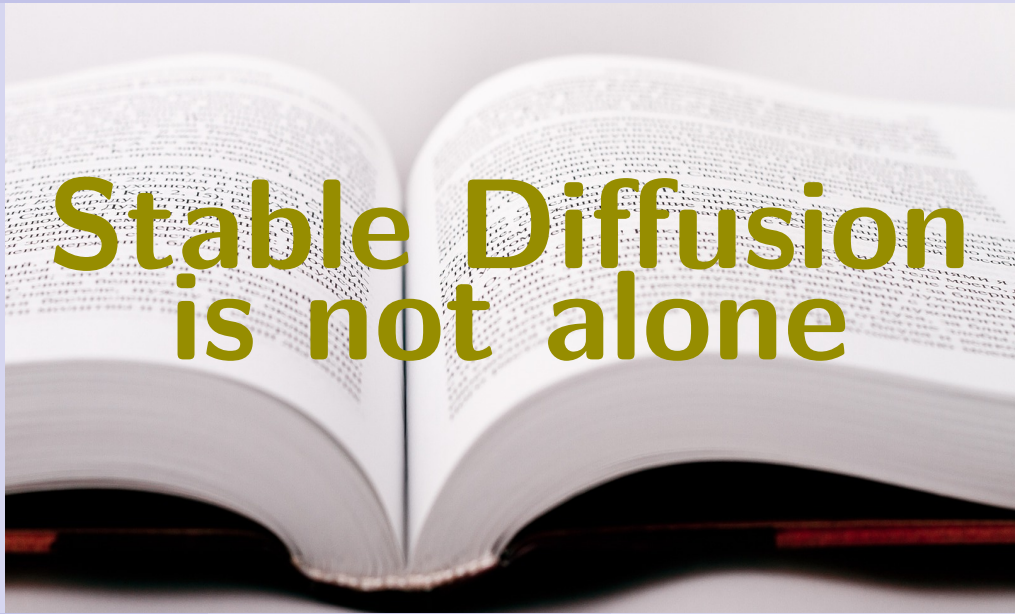

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Many issues raised

The future

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Whisper

Introducing Whisper

We've trained and are open-sourcing a neural net called Whisper that approaches human level robustness and accuracy on English speech recognition.

READ PAPER

VIEW CODE

VIEW MODEL CARD

https://openai.com/blog/whisper/ https://github.com/openai/whisper

License: MIT (open source)

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References

Whisper (example)

```
import whisper

model = whisper.load_model('tiny')
transcription = model.transcribe('recording.wav')
print(transcription['text'])
```

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BLOOM

The World's Largest Open Multilingual Language Model

176 billion parameters

46 natural languages and 13 programming languages

https://bigscience.huggingface.co/blog/bloom

https://huggingface.co/bigscience/bloom

License: BigScience RAIL License v1.0 (restricted use cases)

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GPT-Neo, GPT-J

GPT-J-6B:

https://huggingface.co/EleutherAI/gpt-j-6B

License: Apache 2.0 / Date: December 2022

GPT-NeoX-20B:

https://blog.eleuther.ai/announcing-20b/

License: Apache 2.0 / Date: February 2022

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Multilingual AI Assistant

Whisper for Speech-to-text
Bloom for Text-generation,
CoquiTTS for Text-To-Speech

https://huggingface.co/spaces/ysharma/Talk_to_Multilingual_AI_WhisperBloomCoqui

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Whisper to Stable Diffusion

https://huggingface.co/spaces/fffiloni/whisper-to-stable-diffusion

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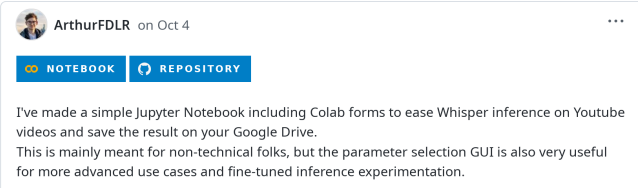
Whisper for YouTube captions

Easy to use Jupyter Notebook for Youtube video inference #239

ArthurFDLR started this conversation in **Show and tell**



https://github.com/openai/whisper/discussions/239

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Toonification of faces

From picture to toonified picture

From video to toonified video

https://huggingface.co/spaces/PKUWilliamYang/VToonify

https://github.com/williamyang1991/VToonify

License: S-Lab License 1.0 (non-commercial)

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Musika

Fast 44.1 kHz stereo waveform music generation of arbitrary length

https://arxiv.org/abs/2208.08706

https://huggingface.co/spaces/marcop/musika

License: MIT (open source)

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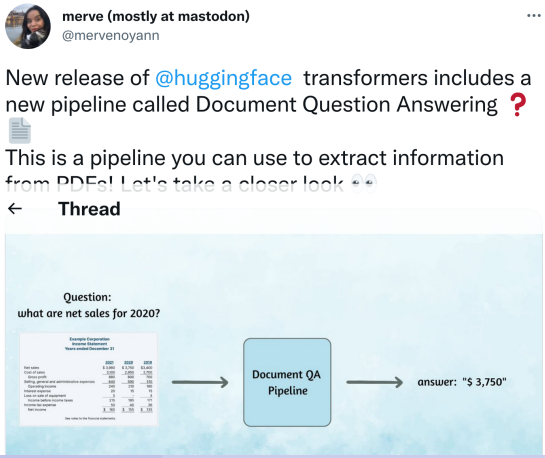
Queries to documents



https://twitter.com/mervenoyann/status/1572168848622907393

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A tale (1): LLaMa

February 25, 2023 / License: research use

Organization developing the model The FAIR team of Meta AI.

Model date LLaMA was trained between December. 2022 and Feb. 2023.

Model version This is version 1 of the model.

Model type LLaMA is an auto-regressive language model, based on the transformer a
model comes in different sizes: 7B, 13B, 33B and 65B parameters.

https://ai.facebook.com/blog/large-language-model-llama-meta-ai/

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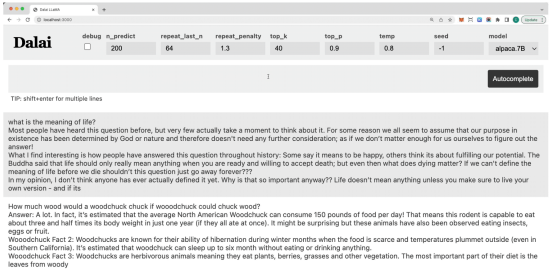
A tale (2): Dalai

March 12, 2023



JavaScript module providing a web interface to LLaMA (and later Alpaca)

License: ??

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A tale (3): Alpaca

March 13, 2023

> *"A group [...] at Stanford University fine-tuned LLaMA to develop Alpaca, an open-source seven-billion-parameter model that reportedly cost less than $600 to build. [...] some [developers] reportedly managed to get it up and running on Raspberry Pi computers and even a Pixel 6 smartphone."*

License: research use (dataset: CC-BY-NC)

https://github.com/tatsu-lab/stanford_alpaca
https://crfm.stanford.edu/2023/03/13/alpaca.html
https://theregister.com/2023/03/21/stanford_ai_alpaca_taken_offline/

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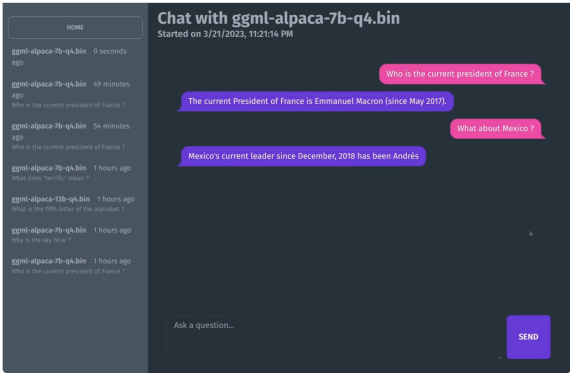
A tale (4): Serge



Docker containers for deploying a chat with LLaMa (Alpaca models)

https://github.com/nsarrazin/serge

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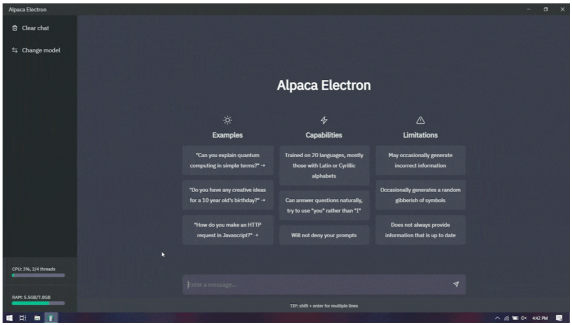
A tale (5): Alpaca Electron



Electron app for deploying a chat with LLaMa (Alpaca models)

https://github.com/ItsPi3141/alpaca-electron

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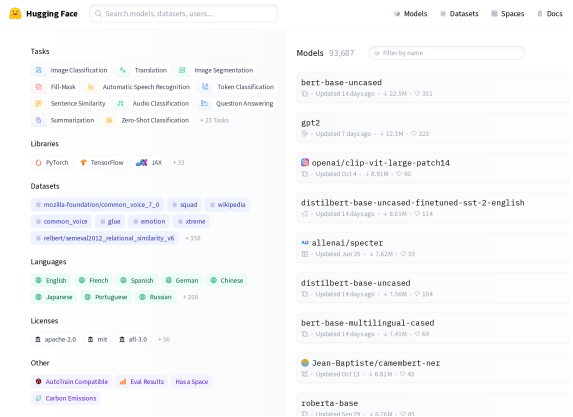
Hugging Face



"GitHub for ML"

https://huggingface.co

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Gradio

https://gradio.app/

License: Apache 2.0

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Diffusers

Pretrained diffusion models (vision, audio, etc.)

Modular toolbox for inference & training of diffusion models

https://github.com/huggingface/diffusers

License: Apache 2.0

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Model frameworks, etc

PyTorch	https://pytorch.org/
TensorFlow	https://tensorflow.org/
Keras	https://keras.io/
Cuda	https://developer.nvidia.com/cuda-toolkit

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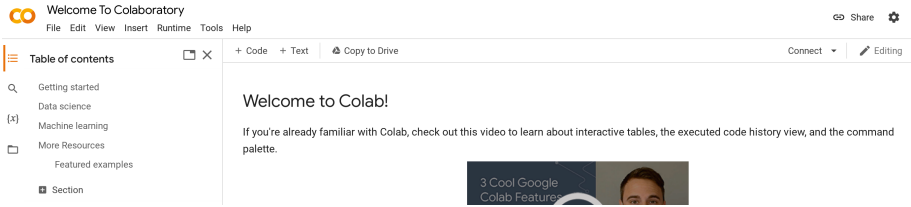
Collab



Python in the browser, zero configuration

Access to GPUs & easy sharing

https://colab.research.google.com/

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Jupyter

Python in the browser, easy

https://jupyter.org/

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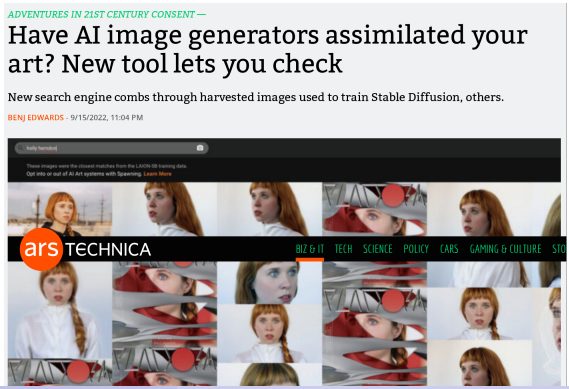
Intellectual property (training set)



https://haveibeentrained.com/

https://arstechnica.com/information-technology/2022/09/have-ai-image-generators-as

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Intellectual property (results)

Impact of Technology Deep Dive Report I

STUDY ON THE IMPACT OF ARTIFICIAL INTELLIGENCE ON THE INFRINGEMENT AND ENFORCEMENT OF COPYRIGHT AND DESIGNS

https://euipo.europa.eu/tunnel-web/secure/webdav/guest/document_library/observatory/documents/reports/2022_Impact_AI_on_the_Infringement_and_Enforcement_CR_Designs/2022_Impact_AI_on_the_Infringement_and_Enforcement_CR_Designs_FullR_en.pdf

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Intellectual property

- Can models be trained on anything public?
- Are models subject to copyright law?
- Who is the author of the production of a model?
- Can anybody besides the author claim rights on the production of a model

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Extensions, integrations

Stable Diffusion is not alone

Infrastructure to play, to share

Many issues raised

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Licenses

Model	Model License	Description	Link to License
GPT-2	MIT License + generated output disclaimer	Permissive open source license	https://github.com/openai/gpt-2/blob/master/LICENSE
GPT-3	Exclusive	Licensed to	Microsoft
YOLO	YOLO License	Public domain license	https://github.com/pjreddie/darknet/blob/master/LICENSE
DALLE-pytorch	MIT License	Pytorch implementation of DALLE created by individual researcher	https://github.com/lucidrains/DALLE-pytorch/blob/main/LICENSE
Stable Diffusion	CreativeML Open RAIL-M	Open & Responsible AI License (RAIL) created by Stability.ai and adapted from the BLOOM RAIL license, including use-based restrictions (see attachment A)	https://huggingface.co/spaces/CompVis/stable-diffusion-license
OPT	OPT-175B License	Meta restrictive license enabling use of the model weights for research purposes while establishing a set of use-based restrictions, which could be considered a RAIL	https://github.com/facebookresearch/metaseq/blob/main/projects/OPT/MODEL_LICENSE.md
BigScience	BigScience OpenRAIL-M	Open & Responsible AI License (RAIL) created by BigScience and adapted from the BLOOM RAIL license, including use-based restrictions (see attachment A)	https://huggingface.co/spaces/bigscience/license
Tsinghua University	GLM-130B license	Restrictive license enabling use of the model weights for research purposes	https://github.com/THUDM/GLM-130B/blob/main/MODEL_LICENSE

https://hackmd.io/@jending12/HyvMU8sJo

https://thegradient.pub/

machine-learning-ethics-and-open-source-li

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Bias

Mugshot of a technical speaker, machine learning expert, smiling, long hair, big eyes [t-shirt, curly hair]

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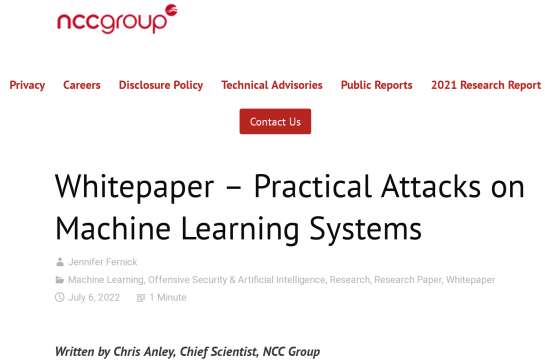
Security



https://research.nccgroup.com/2022/07/06/whitepaper-practical-attacks-on-machine-learning-systems/

https://simonwillison.net/2022/Sep/12/prompt-injection/

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Impact on professionals

- No more draw for hire as a profession?
- New opportunities for artists?
- Access to models as a fundamental need?

Is this different from the invention of photography?

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from the invention of photography?

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Prompt engineers

A new profession

Artists, engineers, craftsmen?

Is it here to stay?

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What is true?

Make-A-Video

Make-A-Video research builds on the recent progress made in text-to-image generation technology built to enable text-to-video generation. The system uses images with descriptions to learn what the world looks like and how it is often described. It also uses unlabeled videos to learn how the world moves. With this data, Make-A-Video lets you bring your imagination to life by generating whimsical, one-of-a-kind videos with just a few words or lines of text.

https://makeavideo.studio/

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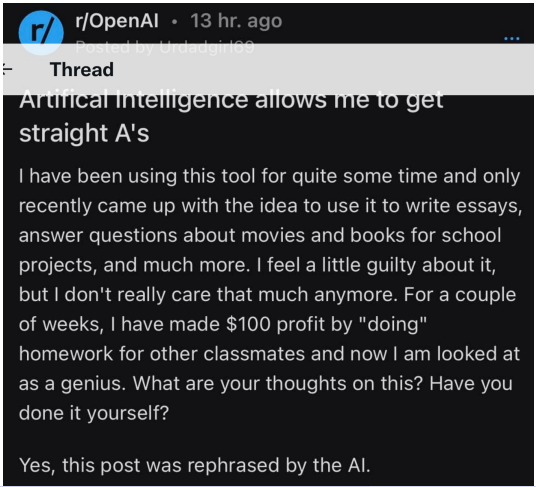
Assignments



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Programming

https://arxiv.org/abs/2207.14502

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Programming

Self-Programming Artificial Intelligence Using Code-Generating Language Models

Anonymous

22 Sept 2022 (modified: 26 Oct 2022) ICLR 2023 Conference Blind Submission Readers: Everyone Show Bibtex Show Revisions

Keywords: Self-programming AI, NLP, code generation, AutoML

TL;DR: We develop and experimentally validate the first practical implementation of a self-reprogramming AI system.

Abstract: Recent progress in large-scale language models has enabled breakthroughs in previously intractable computer programming tasks. Prior work in meta-learning and neural architecture search has led to substantial successes across various task domains, spawning myriad approaches for algorithmically optimizing the design and learning dynamics of deep learning models. At the intersection of these research areas, we implement a code-generating language model with the ability to modify its own source code. Self-programming AI algorithms have been of interest since the dawn of AI itself. Although various theoretical formulations of generalized self-programming AI have been posed, no such system has been successfully implemented to date under real-world computational constraints. Applying AI-based code generation to AI itself, we develop and experimentally validate the first practical implementation of a self-programming AI system. We empirically show that a self-programming AI implemented using a code generation model can successfully modify its own source code to improve performance and program sub-models to perform auxiliary tasks. Our model can self-modify various properties including model architecture, computational capacity, and learning dynamics.

https://keras.io/examples/generative/random_walks_with_stable_diffusion/

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The future just started

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  https://github.com/NielsRogge/Transformers-Tutorials
- Vision Transformers
  https://cameronrwolfe.substack.com/p/vision-transformers
- A walk through latent space with Stable Diffusion
  https://keras.io/examples/generative/random_walks_with_stable_diffusion/
- How Open Source is eating AI
  https://lspace.swyx.io/p/open-source-ai

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- Awesome Diffusion Models

  https://github.com/heejkoo/Awesome-Diffusion-Models

- /r/StableDiffusion at Reddit

  https://www.reddit.com/r/StableDiffusion

- The Generative Landscape (WiP course)

  https://johnowhitaker.github.io/tglcourse/

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To try it yourself

- Generative models for images (Stable Diffussion):
  `https://github.com/AUTOMATIC1111/stable-diffusion-webui`
- Generative models for text (LLaMA, GPT-J, Pythia, OPT, GALACTICA...)
  `https://github.com/oobabooga/text-generation-webui`

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Credits

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