

Generative Artificial Intelligence with “Open” Models

Jesus M. Gonzalez-Barahona

Universidad Rey Juan Carlos

<https://floss.social/@jgbarah>

<https://jgbarah.github.io/presentations>

Jornadas Anuales Wikimedia España

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Plan

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Generative AI

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Examples: images

Examples: text,
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What's in a
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Examples: images



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The future



Dinosaurio, vestido
con un traje, con
sombbrero flamenco,
ofreciendo una
margarita

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

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Japan football
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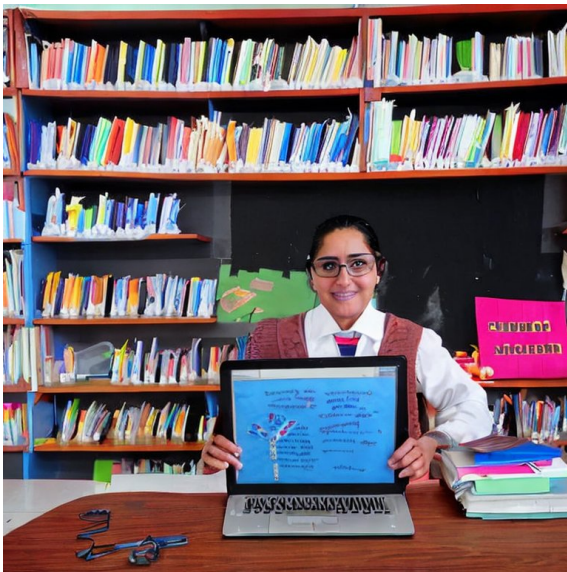
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Profesor de
tecnología de
educación
secundaria

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Technology
teacher, secondary
education, portrait

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selfie of a teacher
with a dinosaur, in
Manhattan
cinematic-default

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“selfie of a free culture enthusiast with a dinosaur”

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Test it yourself

<https://beta.dreamstudio.ai/>

<https://www.bing.com/images/create>

<https://app.prodia.com/>

<https://stablediffusion.fr/xl>

<https://stablediffusionweb.com>

Or install Stable Diffusion XL it in your own
infrastructure

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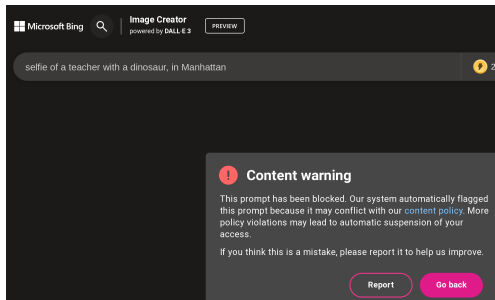
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But beware!



“selfie of a teacher with a dinosaur, in Manhattan”

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Chats

<https://chat.openai.com>

<https://claude.ai>

<https://www.jasper.ai/chat>

<https://bard.google.com>

<https://huggingface.co/chat/>

<https://huggingface.co/chat/>

<https://open-assistant.io/chat>

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Code

Usually as plugins for IDEs

Example: Cody

<https://about.sourcegraph.com/cody>

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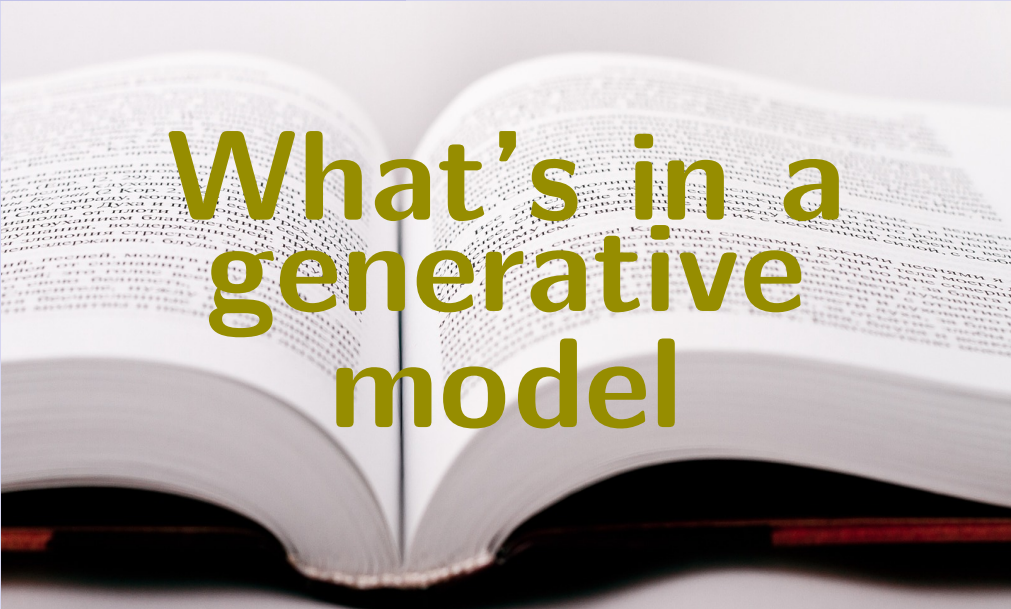
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What's in a generative model



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Weights, just weights (and software to make them useful)

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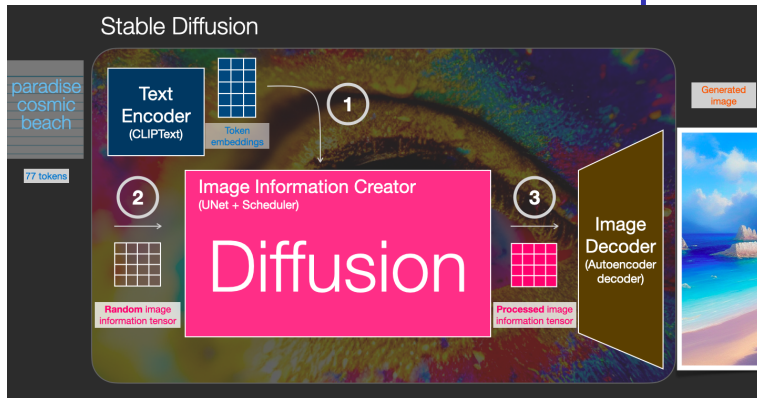
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Stable Diffusion process



<https://jalammr.github.io/illustrated-stable-diffusion/>

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Extensions, integrations

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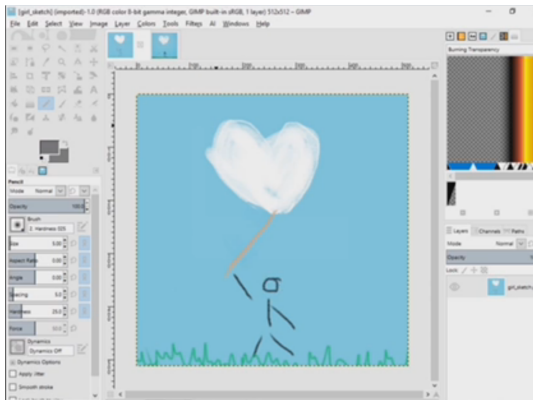
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Integration: GIMP



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

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Integration: Blender



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

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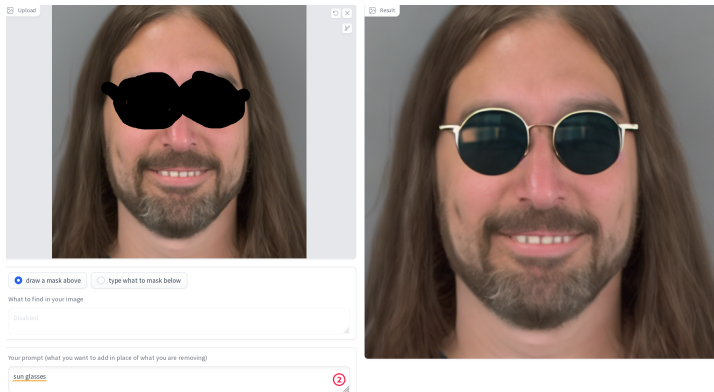
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In-painting



<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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Share to community

Landscape with snowed
mountains under blue sky. A
road to the mountains, a
house on the left, some trees
on the right

diffuse the f rest

[https:](https://huggingface.co/spaces/huggingface-projects/diffuse-the-rest)

[//huggingface.co/spaces/huggingface-projects/diffuse-the-rest](https://huggingface.co/spaces/huggingface-projects/diffuse-the-rest)

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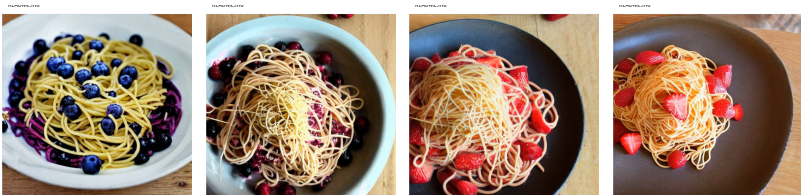
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The future

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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Stable Diffusion is not alone



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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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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



ArthurFDLR on Oct 4



NOTEBOOK



REPOSITORY

I've made a simple Jupyter Notebook including Colab forms to ease Whisper inference on Youtube videos and save the result on your Google Drive.

This is mainly meant for non-technical folks, but the parameter selection GUI is also very useful for more advanced use cases and fine-tuned inference experimentation.

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

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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



merve (mostly at mastodon)
@mervenoyann

...

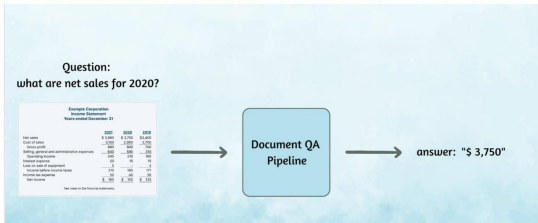
New release of [@huggingface](#) transformers includes a new pipeline called Document Question Answering ?



This is a pipeline you can use to extract information from PDFs! Let's take a closer look 🙄

← Thread

<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 model. The 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

TIP: shift+enter for multiple lines

what is the meaning of life?

Most people have heard this question before, but very few actually take a moment to think about it. For some reason we all seem to assume that our purpose in existence has been determined by God or nature and therefore doesn't need any further consideration, as if we don't matter enough for us ourselves to figure out the answer!

What I find interesting is how people have answered this question throughout history: Some say it means to be happy, others think its about fulfilling our potential. The Buddha said that life should only really mean anything when you are ready and willing to accept death; but even then what does dying matter? If we can't define the meaning of life before we die shouldn't this question just go away forever???

In my opinion, I don't think anyone has ever actually defined it yet. Why is that so important anyway?? Life doesn't mean anything unless you make sure to live your own version - and if its

How much wood would a woodchuck chuck if woodchuck could chuck wood?

Answer: A lot. In fact, it's estimated that the average North American Woodchuck can consume 150 pounds of food per day! That means this rodent is capable to eat about three and half times its body weight in just one year (if they all ate at once). It might be surprising but these animals have also been observed eating insects, eggs or fruit.

Woodchuck Fact 2: Woodchucks are known for their ability of hibernation during winter months when the food is scarce and temperatures plummet outside (even in Southern California). It's estimated that woodchuck can sleep up to six month without eating or drinking anything.

Woodchuck Fact 3: Woodchucks are herbivorous animals meaning they eat plants, berries, grasses and other vegetation. The most important part of their diet is the leaves from woody

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

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Jesus M. Gonzalez-Barahona (URJC)

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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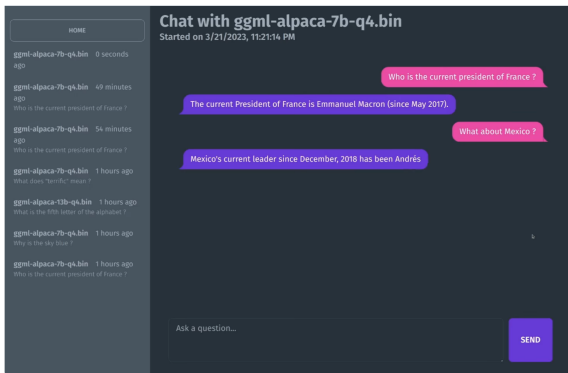
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A tale (4): Serge



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

<https://github.com/>

[nsarrazin/serge](https://github.com/nsarrazin/serge)

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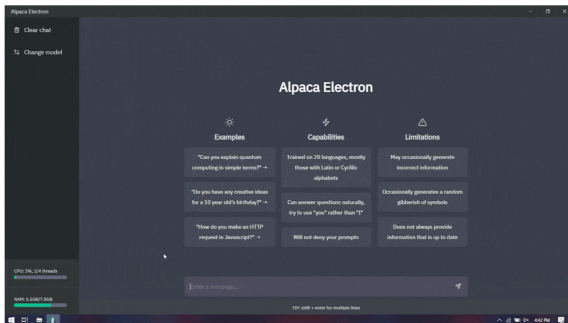
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A tale (5): Alpaca Electron



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

<https://github.com/>

[ItsPi3141/alpaca-electron](https://github.com/ItsPi3141/alpaca-electron)

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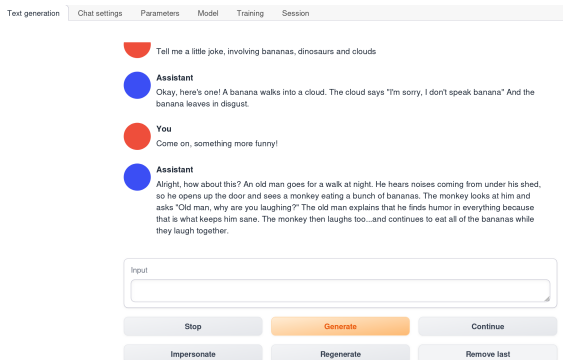
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A tale (6): OobaBooga



OobaBooga
provides an easy
web interface to
many models.

<https://github.com/>

[ItsPi3141/alpaca-electron](https://github.com/ItsPi3141/alpaca-electron)

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Hugging Face

“GitHub for ML”

The screenshot shows the Hugging Face homepage. At the top, there is a search bar with the text "Search models, datasets, users...". To the right of the search bar are navigation tabs for "Models", "Datasets", "Spaces", and "Docs". Below the search bar, there are several sections:

- Tasks:** A grid of task categories including Image Classification, Translation, Image Segmentation, Fill-Mask, Automatic Speech Recognition, Token Classification, Sentence Similarity, Audio Classification, Question Answering, Summarization, and Zero-Shot Classification.
- Libraries:** A section for popular libraries like PyTorch, TensorFlow, and JAX.
- Datasets:** A list of datasets such as mozilla-foundation/common_voice_7_0, squad, wikipedia, common_voice, glue, emotion, xtreme, and reibert/semeval2012_relational_similarity_v6.
- Languages:** A section for supported languages including English, French, Spanish, German, Chinese, Japanese, Portuguese, and Russian.
- Licenses:** A section for various licenses like apache-2.0, mit, and aff-3.0.
- Other:** A section for other features like AutoTrain Compatible, Eval Results, Hara Space, and Carbon Emissions.

On the right side of the page, there is a "Models" section with a filter by name input. It lists several models with their update dates and popularity metrics:

- bert-base-uncased:** Updated 14 days ago, 22.5M likes, 351 stars.
- gpt2:** Updated 7 days ago, 12.3M likes, 323 stars.
- openai/clip-vit-large-patch14:** Updated Oct 4, 8.91M likes, 90 stars.
- distilbert-base-uncased-finetuned-sst-2-english:** Updated 14 days ago, 8.61M likes, 114 stars.
- allenai/specter:** Updated Jun 25, 7.62M likes, 33 stars.
- distilbert-base-uncased:** Updated 14 days ago, 7.56M likes, 104 stars.
- bert-base-multilingual-cased:** Updated 14 days ago, 7.41M likes, 69 stars.
- Jean-Baptiste/camembert-ner:** Updated Oct 13, 6.81M likes, 43 stars.
- roberta-base:** Updated Sep 29, 6.76M likes, 85 stars.

<https://huggingface.co>

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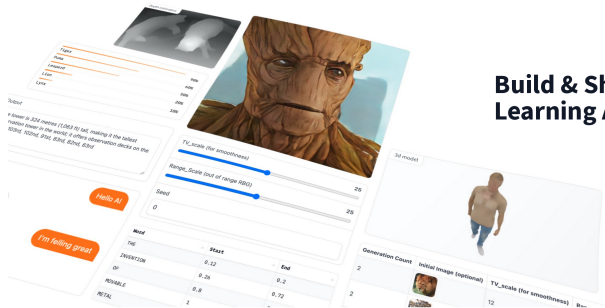
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Gradio



Build & Share Delightful Machine Learning Apps

Gradio is the fastest way to demo your machine learning model with a friendly web interface so that anyone can use it, anywhere!

Get Started

Star

10,955

<https://gradio.app/>
License: Apache 2.0

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Many issues raised

The future

Diffusers



Pretrained diffusion models (vision, audio, etc.)
Modular toolbox for inference & training of
diffusion models

<https://github.com/huggingface/diffusers>

License: Apache 2.0

Generative AI

Jesus M.
Gonzalez-Barahona

Examples: images

Examples: text,
code...

What's in a
generative model

Extensions,
integrations

Stable Diffusion is
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The future

Model frameworks, etc

PyTorch

<https://pytorch.org/>

TensorFlow

<https://tensorflow.org/>

Keras

<https://keras.io/>

Cuda

[https://developer.nvidia.com/
cuda-toolkit](https://developer.nvidia.com/cuda-toolkit)

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What's in a
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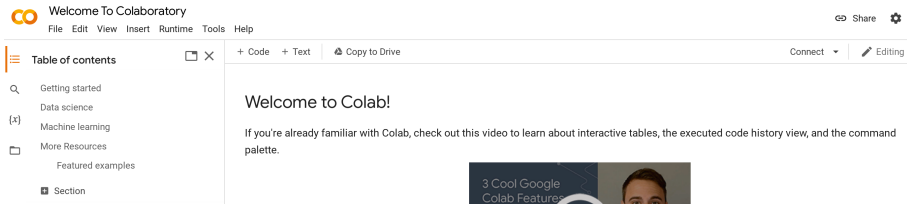
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The future

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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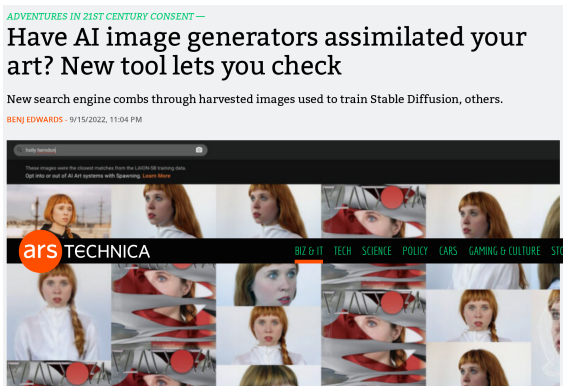
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Intellectual property (training set)



<https://haveibeentrained.com/>

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

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The future

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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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

Licenses

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

<https://thegradient.pub/>

machine-learning-ethics-and-open-source-licensing.com/

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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



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Whitepaper – Practical Attacks on Machine Learning Systems

Jennifer Fernick

Machine Learning, Offensive Security & Artificial Intelligence, Research, Research Paper, Whitepaper

July 6, 2022 1 Minute

Written by Chris Anley, Chief Scientist, NCC Group

<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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The future

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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The future

Prompt engineers

A new profession

Artists, engineers, craftsmen?

Is it here to stay?

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The future

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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The future

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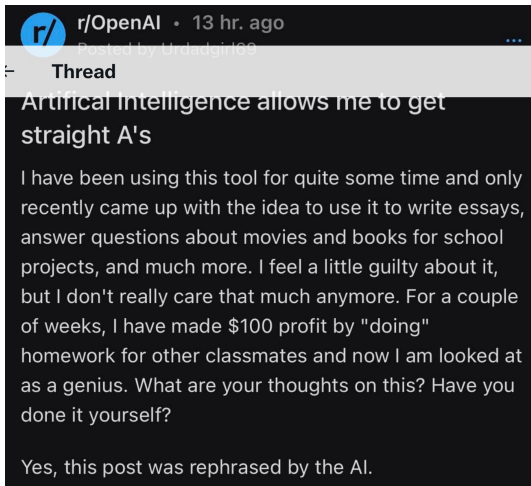
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Assignments



Generative AI

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Examples: images

Examples: text,
code...

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Many issues raised

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Programming

arXiv > cs > arXiv:2207.14502

Search...

Help

Computer Science > Machine Learning

[Submitted on 29 Jul 2022 (v1), last revised 30 Sep 2022 (this version, v2)]

Language Models Can Teach Themselves to Program Better

Patrick Haluptzok, Matthew Bowers, Adam Tauman Kalai

Recent Language Models (LMs) achieve breakthrough performance in code generation when trained on human-authored problems, even solving some competitive-programming problems. Self-play has proven useful in games such as Go, and thus it is natural to ask whether LMs can generate their own instructive programming problems to improve their performance. We show that it is possible for an LM to synthesize programming problems and solutions, which are filtered for correctness by a Python interpreter. The LM's performance is then seen to improve when it is fine-tuned on its own synthetic problems and verified solutions; thus the model 'improves itself' using the Python interpreter. Problems are specified formally as programming puzzles [Schuster et al., 2021], a code-based problem format where solutions can easily be verified for correctness by execution. In experiments on publicly-available LMs, test accuracy more than doubles. This work demonstrates the potential for code LMs, with an interpreter, to generate instructive problems and improve their own performance.

<https://arxiv.org/abs/2207.14502>

Generative AI

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Examples: text,
code...

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The future

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:](https://keras.io/examples/generative/random_walks_with_stable_diffusion/)

[//keras.io/examples/generative/random_walks_with_stable_diffusion/](https://keras.io/examples/generative/random_walks_with_stable_diffusion/)

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Examples: images

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The future



Do it yourself

Generative AI

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Examples: images

Examples: text,
code...

What's in a
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Stable Diffusion is
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Many issues raised

The future

Stable Diffusion

EasyDiffusion:

<https://easydiffusion.github.io>

Foocus:

<https://github.com/lillyasviel/Foocus>

AUTOMATIC1111:

[https://github.com/AUTOMATIC1111/
stable-diffusion-webui](https://github.com/AUTOMATIC1111/stable-diffusion-webui)

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Examples: images

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code...

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Stable Diffusion (2)

SD.next:

<https://github.com/vladmandic/automatic>

ComfyUI:

<https://github.com/comfyanonymous/ComfyUI>

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Examples: images

Examples: text,
code...

What's in a
generative model

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Many issues raised

The future

Llama & Co.

Oobabooga:

[https://github.com/oobabooga/
text-generation-webui](https://github.com/oobabooga/text-generation-webui)

openplayground:

<https://github.com/nat/openplayground>

catAI

<https://github.com/withcatai/catai>

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Examples: text,
code...

What's in a
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Many issues raised

The future

Help training a model

Open Assistant:

<https://open-assistant.io/dashboard>

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Examples: images

Examples: text,
code...

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Summarizing

Generative AI

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Examples: images

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The future just started

Generative AI

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References, credits, license

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The future

- Transformers-Tutorials

<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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Examples: images

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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://johnwhitaker.github.io/tgllcourse/>

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The future

To try it yourself

- Generative models for images (Stable Diffusion):
<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



Book, by Nikolay Frolochkin, Pixabay.

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