

Generative AI

Jesus M.  
Gonzalez-Barahona

What is “machine  
learning”?

What is an “open”  
model?

Generative AI in  
your computer

Extending,  
combining

Infrastructure to  
play, to share

Many issues raised

Summarizing

References

# Generative AI Models in your own computer

Jesus M. Gonzalez-Barahona

Universidad Rey Juan Carlos

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

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

Presentation for Multimedia Communications  
Fuenlabrada, Spain, March 7th 2025



# Plan

- 1 What is “machine learning”?
- 2 What is an “open” model?
- 3 Generative AI in your computer
- 4 Extending, combining
- 5 Infrastructure to play, to share
- 6 Many issues raised
- 7 Summarizing

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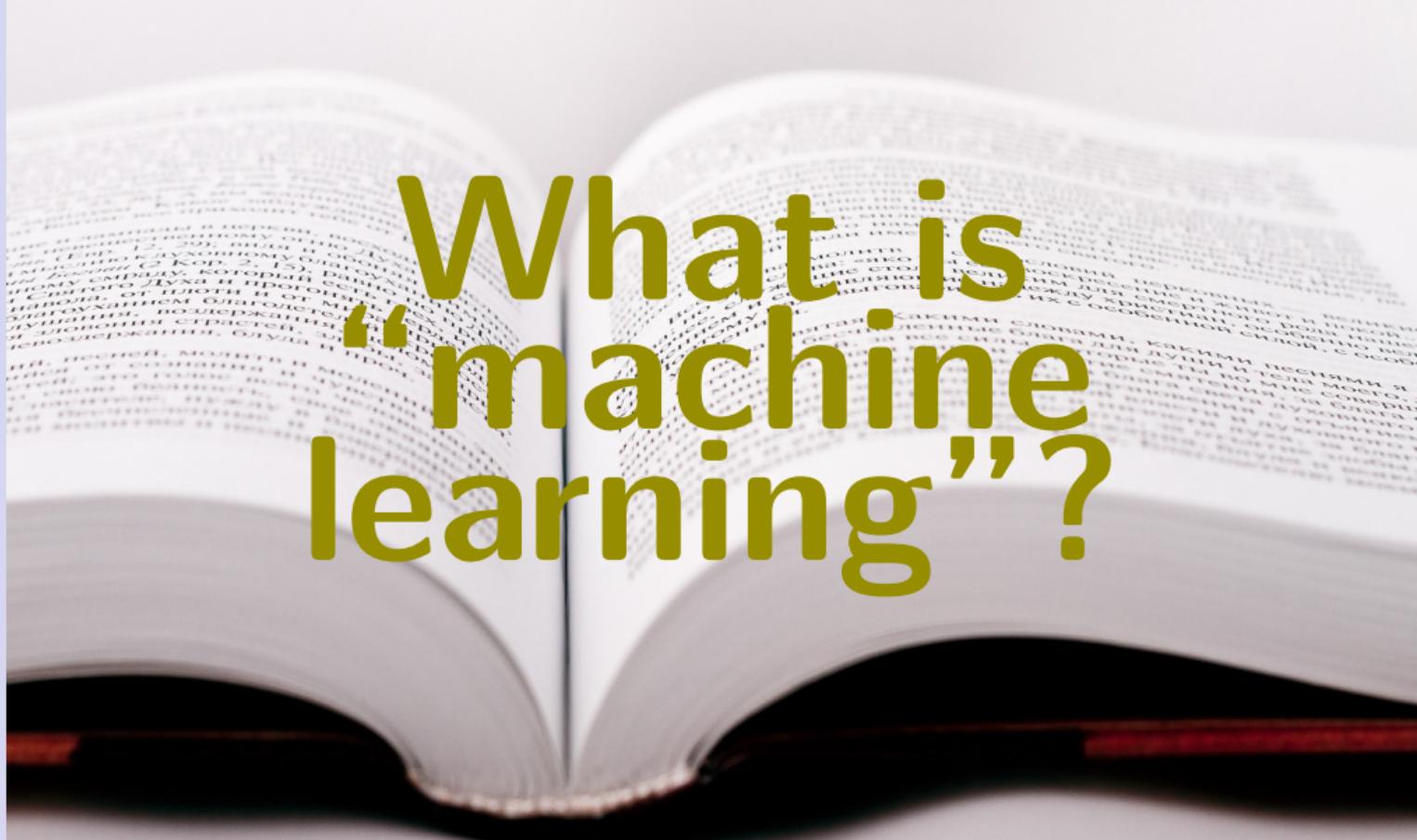
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# What is “machine learning”?



## What is “machine learning”?

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# Start by trying!

The screenshot shows a user interface for a machine learning application. At the top, there's a navigation bar with icons for file operations, a model name input field, and advanced settings. Below the navigation bar, the interface is divided into three main sections:

- Training:** A section for adding sample images. It includes a "New class name" input field and a "+ Add new class" button. Below this, there are two rows of images labeled "gatos" (cats) and "perros" (dogs). Each row has a delete icon and a camera icon. Buttons for "Upload" and "Camera" are at the bottom of each row.
- Learn:** A section for learning to classify images. It has a "Learn to recognize images" button.
- Try:** A section for testing the model. It includes "Upload images" and "Take from camera" buttons. A test image of a dog is shown with a classification result: "gatos(96.492%)". Below it, another result "perros(3.508%)".

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# Start by trying!

<https://v2.learningml.org/>

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# Start by trying!

Dime cuánto es 123 menos 12



Reasoning  
Done in 37s.

$$123 - 12 = 111.$$

This result is consistent across various methods of calculation, including digit-by-digit subtraction, vertical subtraction, and real-world examples. Therefore, the answer is 111.

Ask anything



Model: deepseek-ai/DeepSeek-R1-Distill-Qwen-32B ▾ · Generated content may be inaccurate or false.

Share this conversation

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Start by trying!

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

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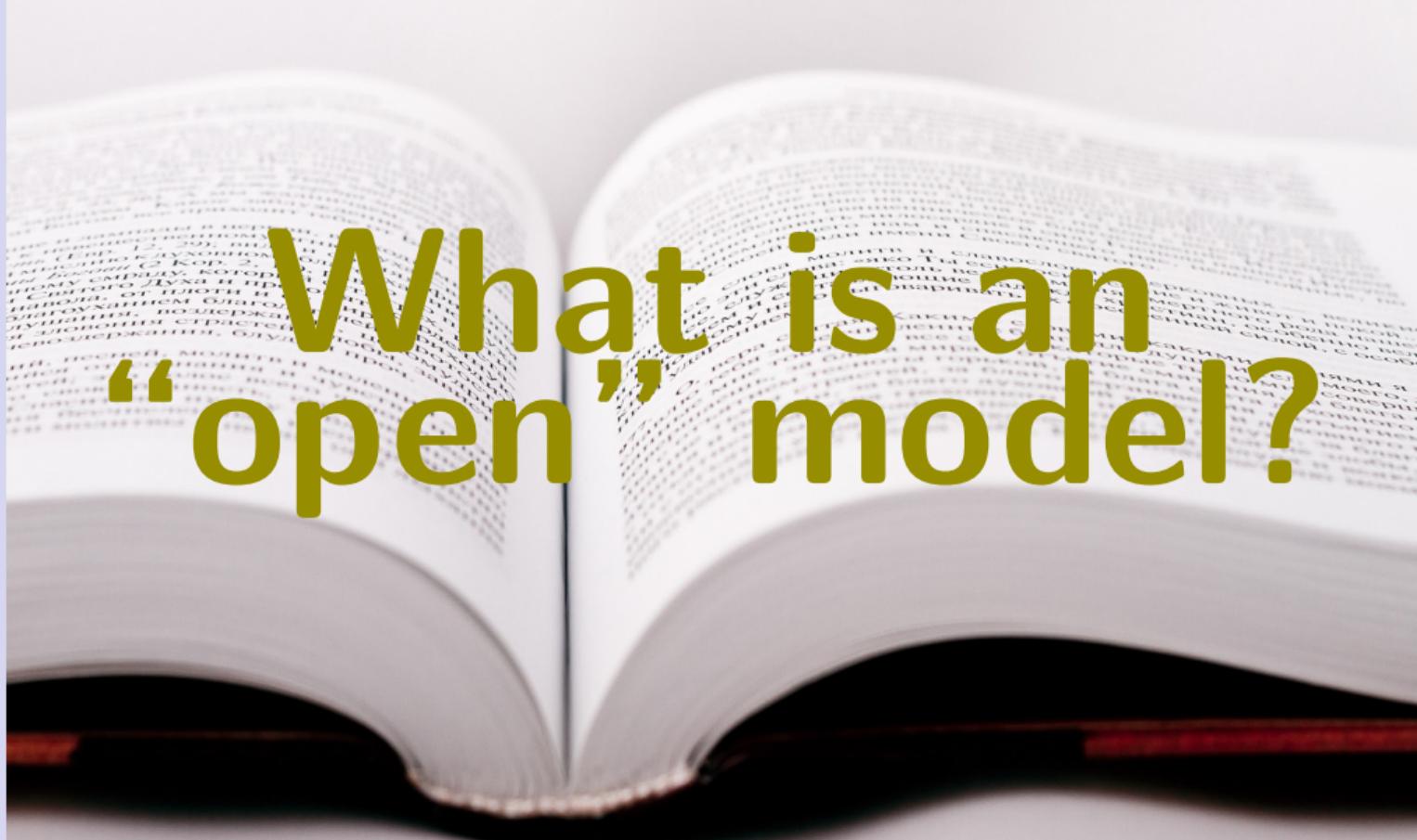
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# What is an “open” model?



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# Models for text, images...

Stable Diffusion XL:  
selfie of a teacher  
with a dinosaur, in  
Manhattan  
cinematic-default

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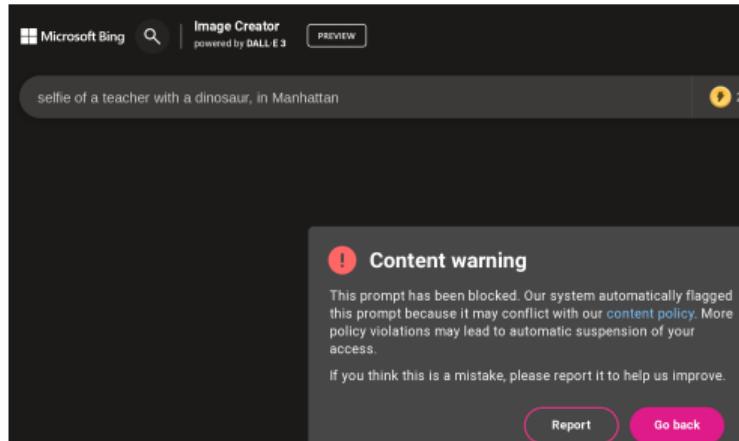
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# But beware!



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

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# Can we control how we use generative models?

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# What's a generative model

- Architecture
- Weights, just weights
- Software to make inferences

But also:

- Data to train, benchmark
- Software to train, benchmark
- Weights of intermediate models
- Documentation, explaining everything

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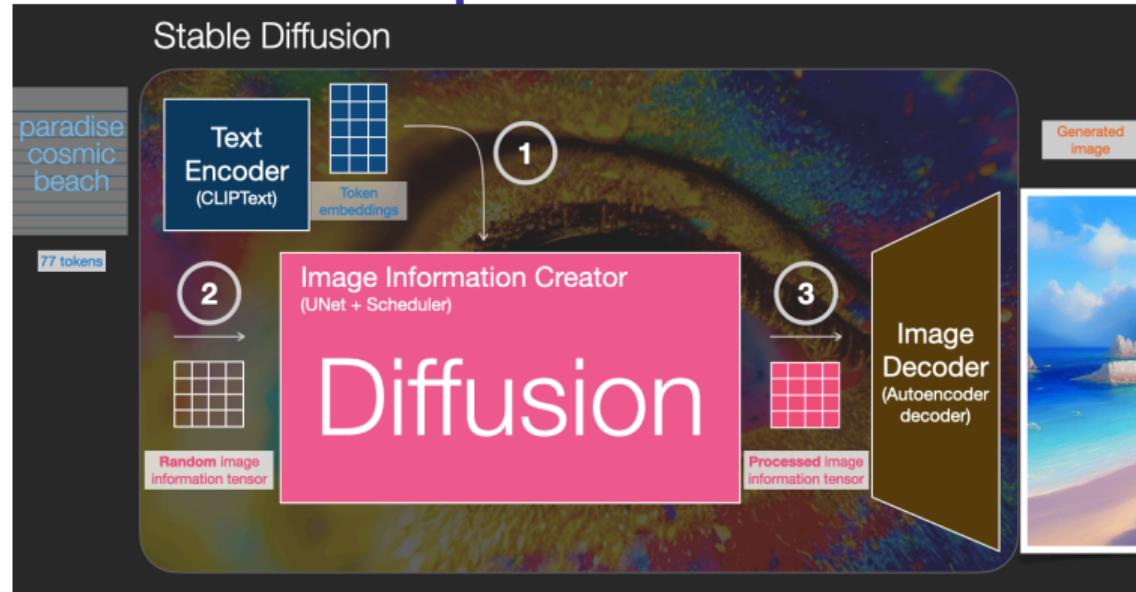
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# Example: Stable Diffusion



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

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# The Model Openness Framework: Promoting Completeness and Openness for Reproducibility, Transparency and Usability in AI

Matt White<sup>1,2</sup>, Ibrahim Haddad<sup>2</sup>, Cailean Osborne<sup>2,3</sup>,  
Xiao-Yang (Yanglet) Liu<sup>1,4</sup>, Ahmed Abdelmonsef<sup>4</sup>, Sachin Varghese<sup>1</sup>

<sup>1</sup>LF AI & Data - Generative AI Commons, <sup>2</sup>Linux Foundation,

<sup>3</sup>University of Oxford, <sup>4</sup>Columbia University

<https://arxiv.org/abs/2403.13784>

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# Classes of “openness”

- Open science: paper, datasets, log files, intermediate models parameters & metadata
- Open tooling: training, inference, and evaluation code, libraries, evaluation data
- Open model: architecture, model parameters & metadata, tech report, model card, data card

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# For each of them...

- Freedom of use
- Freedom of study
- Freedom of modification
- Freedom of sharing

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# Minimum for running in your computer

- Inference code, with libraries
- Model architecture
- Model parameters & metadata (weights)
- Technical report (prompts, etc.)
- Model card (convenient)

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# Equipment requirements

- Depends on architecture, and size of the model
- CPU can be enough, GPU can accelerate a lot
- RAM enough so that model fits
- Code is usually FOSS

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# Example: HuggingChat

The screenshot shows the HuggingChat interface. At the top, it displays "HuggingChat v0.8.4" and a brief description: "Making the community's best AI chat models available to everyone." Below this, the "Current Model" is set to "CohereForAI/c4ai-command-r-plus". There are links to "Model page" and "Website". A "Settings" sidebar on the right lists various models, with "CohereForAI/c4ai-command-r-plus" marked as "Active". Other listed models include "meta-llama/Meta-Llama-3-70B-Instruct", "HuggingFaceH4/zephyr-orpo-141b-A35b-v0.1", "mistralai/Mistral-8x7B-Instruct-v0.1", "NousResearch/Nous-Hermes-2-Mistral-8x7B-DPO", and "google/gemma-1.1-7b-it". The "System Prompt" field at the bottom contains the placeholder "Ask anything".

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

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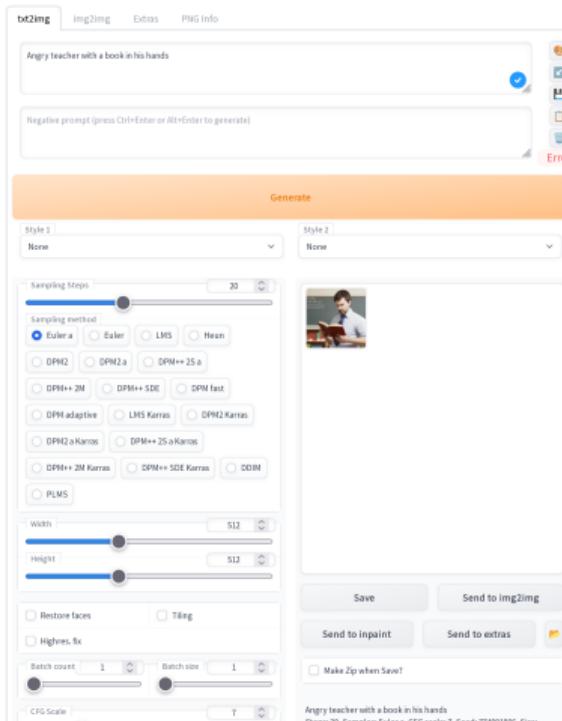
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# Example: Stable Diffusion



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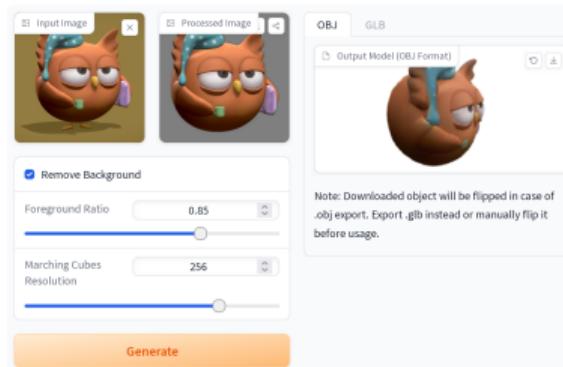
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# Example: TripoSR



<https://huggingface.co/spaces/stabilityai/TripoSR>

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# Generative AI in your computer

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# Speech to text: Whisper

```
#!/usr/bin/python3
import whisper
```

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

```
$ whisper speech.wav --language Spanish
```

<https://openai.com/blog/whisper/>

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

License: MIT (open source)

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# Text to speech: Coqui TTS

```
$ tts --text "Texto" \  
--model_name tts_models/es/mai/tacotron2-DDC \  
--out_path speech.wav
```

<https://github.com/idiap/coqui-ai-TTS>  
License: MPL-2.0 (open source)

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# Stable Diffusion

EasyDiffusion:

<https://easydiffusion.github.io>

Fooocus:

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

AUTOMATIC1111:

<https://github.com/AUTOMATIC1111/stable-diffusion-webui>

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# Stable Diffusion (2)

SD.next:

[https:](https://github.com/vladmandic/automatic)

//github.com/vladmandic/automatic

ComfyUI:

[https:](https://github.com/comfyanonymous/ComfyUI)

//github.com/comfyanonymous/ComfyUI

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# Text generation models

Llama3 (70b, 8b), Llama Community License

<https://llama.meta.com/llama3/>

<https://github.com/meta-llama/llama3>

Command R+, CC by-nc 4.0

<https://cohere.com/command>

<https://huggingface.co/spaces/CohereForAI/c4ai-command-r-plus>

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# Text generation models (2)

Mixtral (8x22b, 8x7b), Apache 2.0

<https://mistral.ai/news/mixtral-8x22b/>

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

Mixtral-8x7B-v0.1

Zephyr ORPO 141B-A39B, Apache 2.0

<https://huggingface.co/HuggingFaceH4/zephyr-orpo-141b-A35b-v0.1>

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# Leaderboard

| Rank # (UB) | Model                              | Arena Elo | 95% CI | Votes  | Organization | License           | Knowledge Cutoff |
|-------------|------------------------------------|-----------|--------|--------|--------------|-------------------|------------------|
| 1           | GPT-4-Turbo-2024-04-09             | 1258      | +3/-3  | 44592  | OpenAI       | Proprietary       | 2023/12          |
| 2           | GPT-4-1106-preview                 | 1252      | +2/-3  | 76173  | OpenAI       | Proprietary       | 2023/4           |
| 2           | Gemini 1.5 Pro<br>APT-0409-Preview | 1249      | +3/-3  | 61011  | Google       | Proprietary       | 2023/11          |
| 2           | Claude 3 Opus                      | 1248      | +2/-2  | 101863 | Anthropic    | Proprietary       | 2023/8           |
| 3           | GPT-4-0125-preview                 | 1246      | +3/-2  | 78239  | OpenAI       | Proprietary       | 2023/12          |
| 6           | Bard (Gemini Pro)                  | 1288      | +5/-6  | 12387  | Google       | Proprietary       | Online           |
| 6           | Llama-3-7Bb-Instruct               | 1288      | +3/-3  | 75844  | Meta         | Llama 3 Community | 2023/12          |
| 7           | Reka-Core-20240501                 | 1199      | +4/-4  | 18735  | Reka AI      | Proprietary       | Unknown          |
| 8           | Claude 3 Sonnet                    | 1280      | +2/-3  | 84252  | Anthropic    | Proprietary       | 2023/8           |
| 10          | GPT-4-0314                         | 1189      | +3/-3  | 53446  | OpenAI       | Proprietary       | 2021/9           |
| 10          | Qwen-Max-0428                      | 1186      | +5/-7  | 10508  | Alibaba      | Proprietary       | Unknown          |
| 10          | Command R+                         | 1189      | +3/-3  | 50490  | Cohere       | CC-BY-NC-4.0      | 2024/3           |
| 12          | Claude 3 Haiku                     | 1180      | +2/-3  | 74897  | Anthropic    | Proprietary       | 2023/8           |
| 13          | Qwen1.5-1108-Chat                  | 1172      | +7/-8  | 6019   | Alibaba      | Qianmen LICENSE   | 2024/4           |

<https://chat.lmsys.org/?leaderboard>

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# Inference engines

llama.cpp

<https://github.com/ggerganov/llama.cpp>

Ollama

<https://ollama.com/>

vLLM

<https://github.com/vllm-project/vllm>

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# Chat frontends

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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# Collections of consented, open data

Chatbot Arena Leaderboard

<https://chat.lmsys.org/>

LAION Open Empathic

<https://laion.ai/blog/open-empathic/>

LAION Datasets

<https://laion.ai/projects/>

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# Extending, combining



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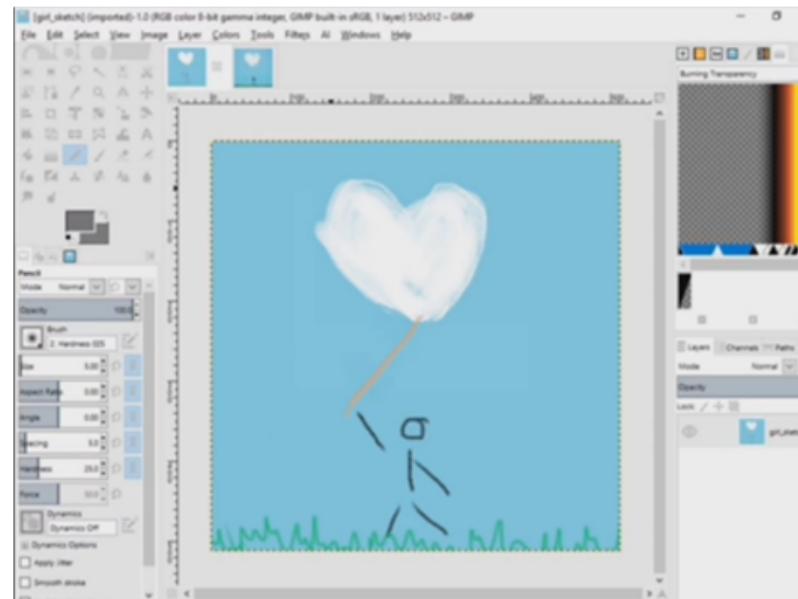
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# Integration: GIMP



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

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# Integration: Blender



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

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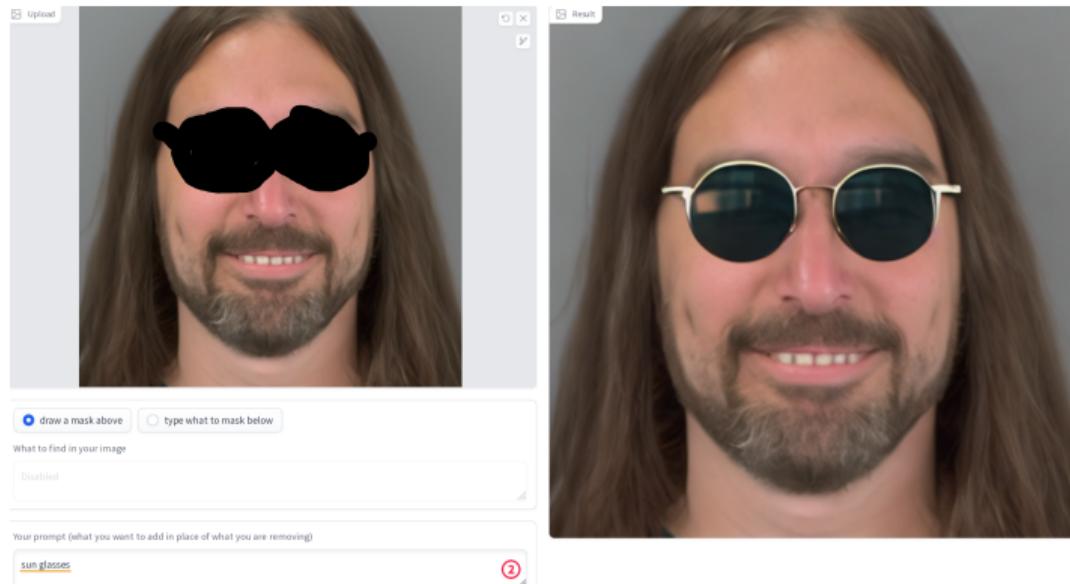
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# In-painting

<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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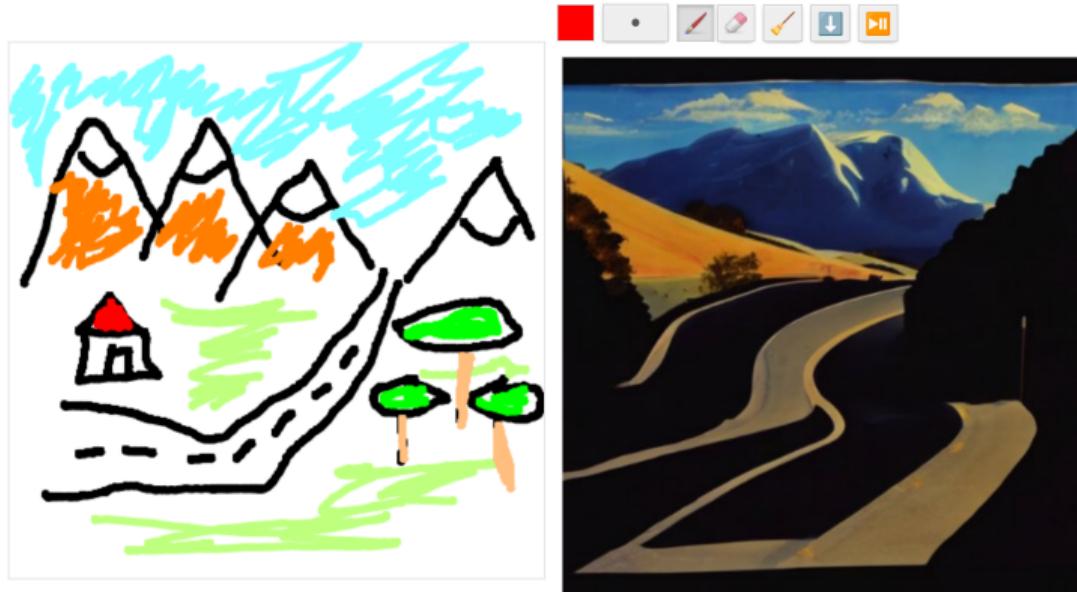
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Share to community

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

diffuse the frost

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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](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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# And much, much more

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References

# 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 comes in different sizes: 7B, 13B, 33B and 65B parameters.

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

Generative AI

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# A tale (2): Dalai

## March 12, 2023



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

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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://github.com/tatsu-lab/stanford_alpaca)

<https://crfm.stanford.edu/2023/03/13/alpaca.html>

[https:////theresister.com/2023/03/21/stanford\\_ai\\_alpaca\\_taken\\_offline/](https:////theresister.com/2023/03/21/stanford_ai_alpaca_taken_offline/)

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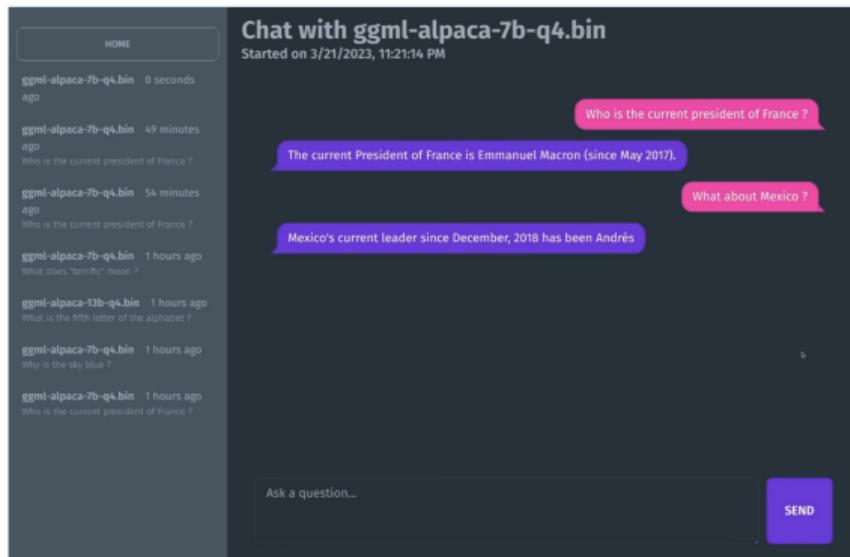
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# A tale (4): Serge

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

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

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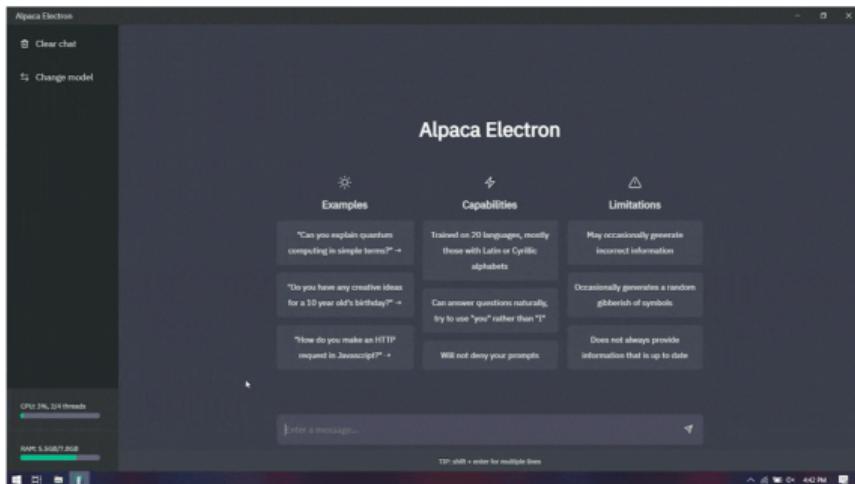
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# A tale (5): Alpaca Electron



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

<https://github.com/ItsPi3141/>

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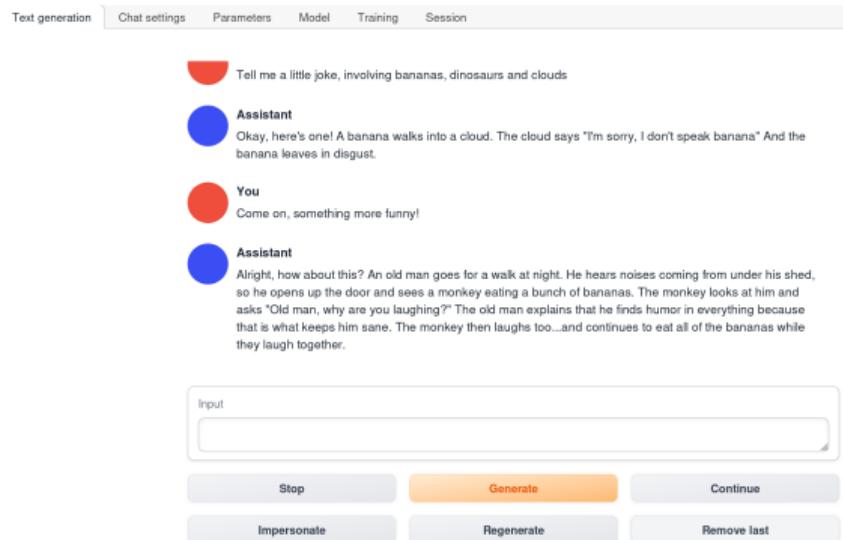
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# A tale (6): OobaBooga

OobaBooga  
provides an easy  
web interface to  
many models.

<https://github.com/ItsPi3141/OobaBooga>

[//github.com/ItsPi3141/OobaBooga](https://github.com/ItsPi3141/OobaBooga)

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# Infrastructure to play, to share

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The screenshot shows the Hugging Face homepage. At the top, there's a search bar with placeholder text "Search models, datasets, users...". Below the search bar, there are several navigation links: "Models", "Datasets", "Spaces", and "Docs". The main content area is divided into several sections:

- Tasks:** Includes categories like Image Classification, Translation, Image Segmentation, Fill-Mask, Automatic Speech Recognition, Token Classification, Sentence Similarity, Audio Classification, Question Answering, Summarization, and Zero-Shot Classification.
- Libraries:** Lists PyTorch, TensorFlow, JAX, and others.
- Datasets:** Lists mozilla-foundation/common\_voice\_7\_0, squad, wikipedia, common\_voice, glue, emotion, xtreme, and rebert/semeval2012\_relational\_similarity\_v6.
- Languages:** Lists English, French, Spanish, German, Chinese, Japanese, Portuguese, Russian, and others.
- Licenses:** Lists apache-2.0, mit, and afli-3.0.
- Other:** Lists AutoTrain Compatible, Eval Results, Has a Space, and Carbon Emissions.

# Hugging Face

“GitHub for ML”

<https://huggingface.co>

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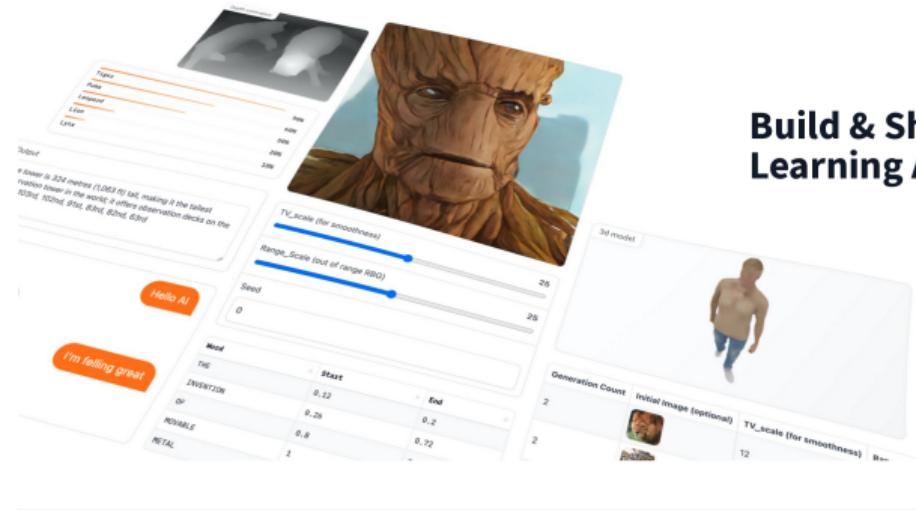
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# Gradio

## 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](#)



10,955

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

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# Diffusers



Dffusers

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

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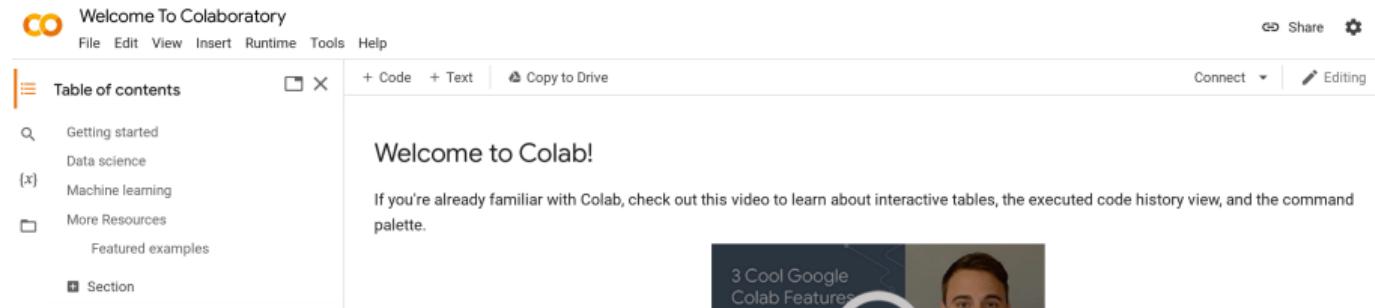
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# Collab

A screenshot of the Google Colaboratory interface. At the top, there's a navigation bar with 'File', 'Edit', 'View', 'Insert', 'Runtime', 'Tools', and 'Help' options. To the right of the bar are 'Share' and 'Settings' icons. Below the bar, there's a 'Table of contents' sidebar with sections like 'Getting started', 'Data science', 'Machine learning', 'More Resources', and 'Featured examples'. The main content area displays a 'Welcome to Colab!' message with a brief description and a thumbnail image of a person. There are also buttons for '+ Code', '+ Text', and 'Copy to Drive'. A 'Connect' button and an 'Editing' indicator are at the bottom right of the main area.

Python in the browser, zero configuration  
Access to GPUs & easy sharing

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

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Python in the browser, easy

<https://jupyter.org/>

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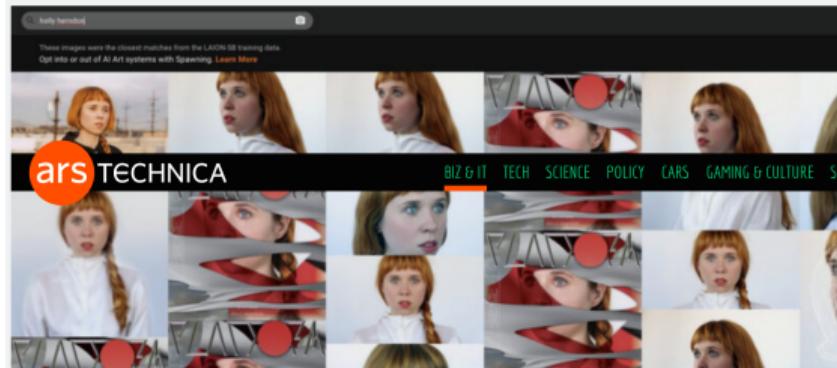
# Intellectual property (training set)

ADVENTURES IN 21ST CENTURY CONSENT —

## Have AI image generators assimilated your art? New tool lets you check

New search engine combs through harvested images used to train Stable Diffusion, others.

BENJ EDWARDS - 9/15/2022, 11:04 PM



[https://  
//haveibeentrained.com/](https://haveibeentrained.com/)

[https://arstechnica.com/  
information-technology/  
2022/09/  
have-ai-image-generators-as](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](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  | <a href="https://github.com/openai/gpt-2/blob/master/LICENSE">https://github.com/openai/gpt-2/blob/master/LICENSE</a>   |
| GPT-3               | Exclusive                                 | Licensed to   | Microsoft   |
| YOLO                | YOLO License                              | Public domain license   | <a href="https://github.com/predicte/darknet/blob/master/LICENSE">https://github.com/predicte/darknet/blob/master/LICENSE</a>   |
| DALLE-pytorch       | MIT License                               | Pytorch implementation of DALLE created by individual researcher  | <a href="https://github.com/lucidrains/DALLE-pytorch/blob/main/LICENSE">https://github.com/lucidrains/DALLE-pytorch/blob/main/LICENSE</a>   |
| 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)             | <a href="https://huggingface.co/spaces/CompVis/stable-diffusion-license">https://huggingface.co/spaces/CompVis/stable-diffusion-license</a>   |
| 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 | <a href="https://github.com/facebookresearch/metalseq/blob/main/projects/OPT/MODEL_LICENSE.md">https://github.com/facebookresearch/metalseq/blob/main/projects/OPT/MODEL_LICENSE.md</a> |
| 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)               | <a href="https://huggingface.co/spaces/bigscience/license">https://huggingface.co/spaces/bigscience/license</a>   |
| Tsinghua University | GLM-130B license                          | Restrictive license enabling use of the model weights for research purposes   | <a href="https://github.com/THUDM/GLM-130B/blob/main/MODEL_LICENSE">https://github.com/THUDM/GLM-130B/blob/main/MODEL_LICENSE</a>   |

## Licenses

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

<https://thegradient.pub/>

<https://thegradient.pub/machine-learning-ethics-and-open-source-lic>

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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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[Contact Us](#)

# 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://research.nccgroup.com/2022/07/06/whitepaper-practical-attacks-on-machine-learning-systems/)  
<https://simonwillison.net/2022/Sep/12/prompt-injection/>

# Security

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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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# Impact on professionals

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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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# The future just started

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# References, credits, license

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- **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/](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>

- Open LLMs

<https://github.com/eugeneyan/open-llms>

- The Generative Landscape (WiP course)

<https://johnwhitaker.github.io/tglcourse/>

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# Credits



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