

Generative AI

Jesus M.  
Gonzalez-Barahona

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>

Jornada sobre IA en educación

Madrid, Spain, May 13th 2024



# Plan

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

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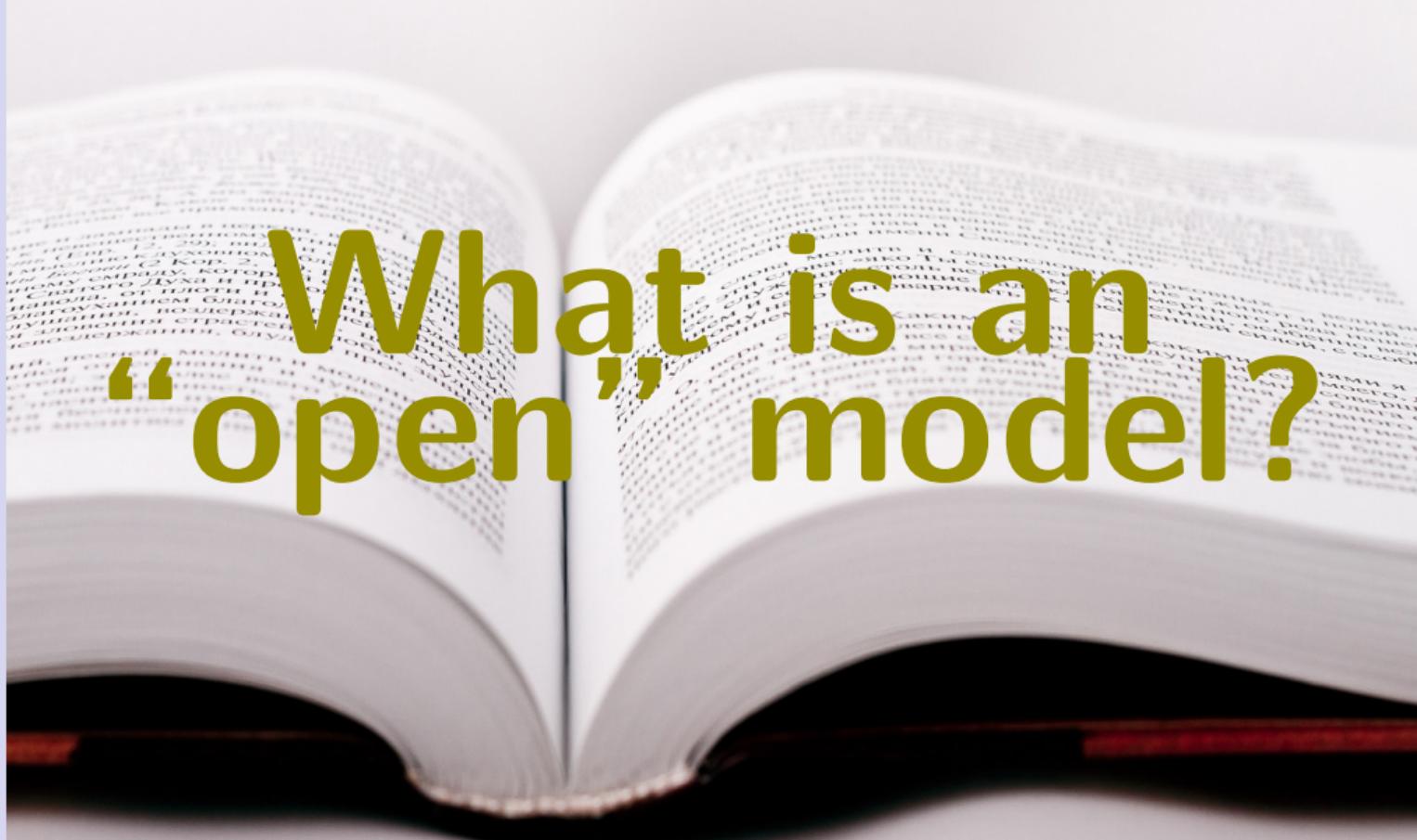
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# What is an “open” model?



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# Models for text, images...



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

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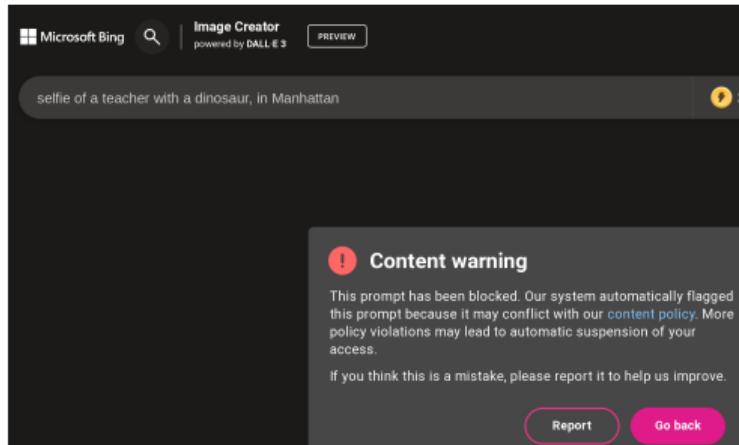
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# But beware!



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

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# Can we control how we use generative models?

# 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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# 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>1</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>

# 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)

# 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". Below that, a banner says "Making the community's best AI chat models available to everyone." A "Current Model" section shows "CohereForAI/c4ai-command-r-plus" as active. There are buttons for "Model page" and "Website". Under "Examples", there are three input fields: "Write an email from bullet list", "Code a snake game", and "Assist in a task". At the bottom, there's a "Search web" button and an "Ask anything" input field. The "System Prompt" field is empty. On the right side, there's a "Settings" panel with "Application Settings" and a list of models. The "CohereForAI/c4ai-command-r-plus" model is listed as active. Other models shown 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-Mixtral-8x7B-DPO, and google/gemma-1.1-7b-it.

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

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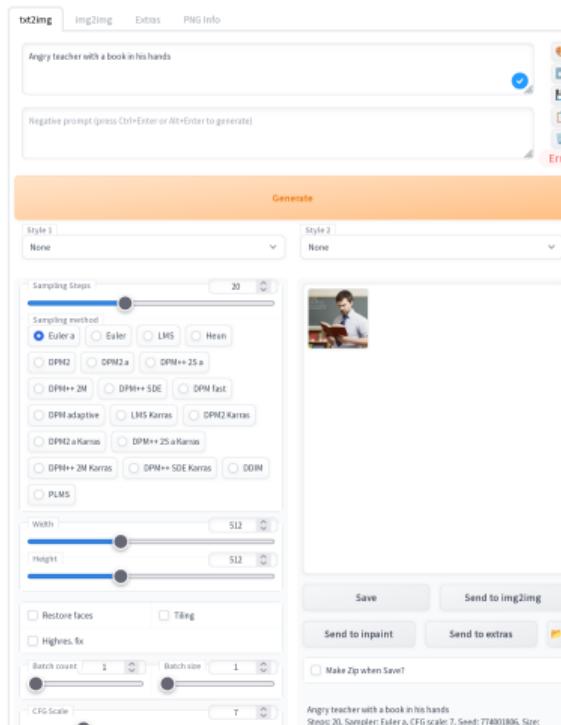
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# Example: Stable Diffusion



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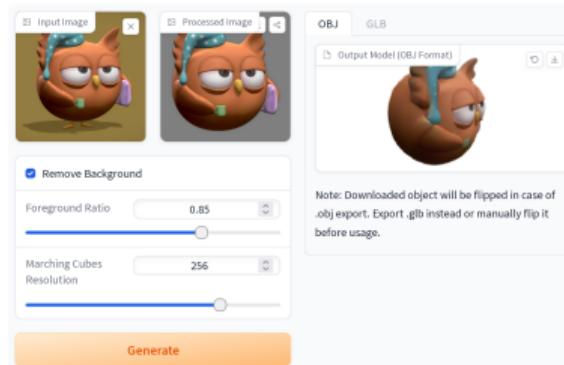
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# Example: TripoSR



[https:](https://huggingface.co/spaces/stabilityai/TripoSR)

//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 Diffussion

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://github.com/vladmandic/automatic>

ComfyUI:

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

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# Leaderboard

Rank* (UB)	Model	Arena Elo	95%	Votes	Organization	License	Knowledge Cutoff
1	<a href="#">GPT-4-Turbo-2024-04-09</a>	1258	+3/-3	44592	OpenAI	Proprietary	2023/12
2	<a href="#">GPT-4-1106-preview</a>	1252	+2/-3	76173	OpenAI	Proprietary	2023/4
2	<a href="#">Gemini 1.5 Pro API 8489-Preview</a>	1249	+3/-3	61011	Google	Proprietary	2023/11
2	<a href="#">Claude 3 Opus</a>	1248	+2/-2	101063	Anthropic	Proprietary	2023/8
3	<a href="#">GPT-4-0125-preview</a>	1246	+3/-2	70239	OpenAI	Proprietary	2023/12
6	<a href="#">Bard (Gemini Pro)</a>	1208	+5/-6	12387	Google	Proprietary	Online
6	<a href="#">Llama-3-70b-Instruct</a>	1208	+3/-3	75844	Meta	Llama 3 Community	2023/12
7	<a href="#">Reka-Core-20240501</a>	1199	+4/-4	18735	Reka AI	Proprietary	Unknown
8	<a href="#">Claude 3 Sonnet</a>	1200	+2/-3	84252	Anthropic	Proprietary	2023/8
10	<a href="#">GPT-4-0314</a>	1189	+3/-3	53446	OpenAI	Proprietary	2021/9
10	<a href="#">Qwen-Max-0428</a>	1186	+5/-7	105988	Alibaba	Proprietary	Unknown
10	<a href="#">Command_R+</a>	1189	+3/-3	58498	Cohere	CC-BY-NC-4.0	2024/3
12	<a href="#">Claude 3 Haiku</a>	1180	+2/-3	74897	Anthropic	Proprietary	2023/8
13	<a href="#">Qwen1.5-1108-Chat</a>	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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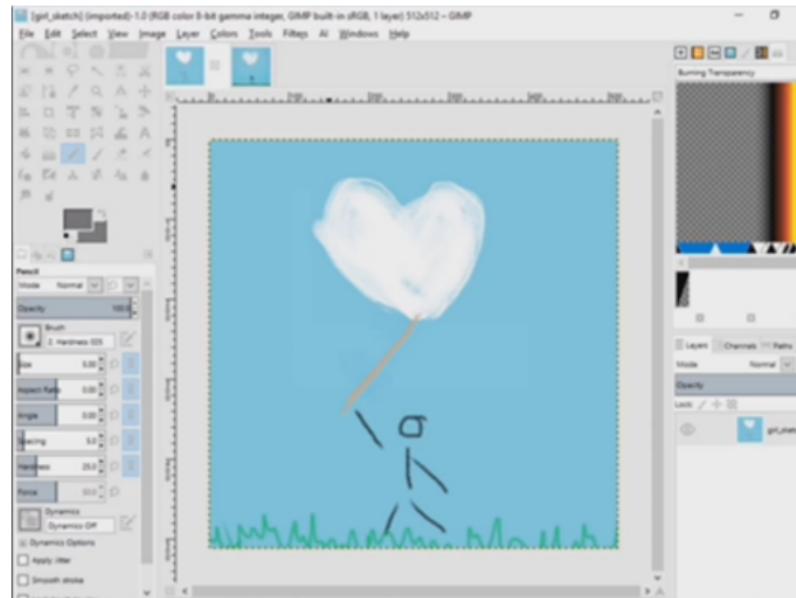
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# Integration: GIMP



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

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# Integration: Blender



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

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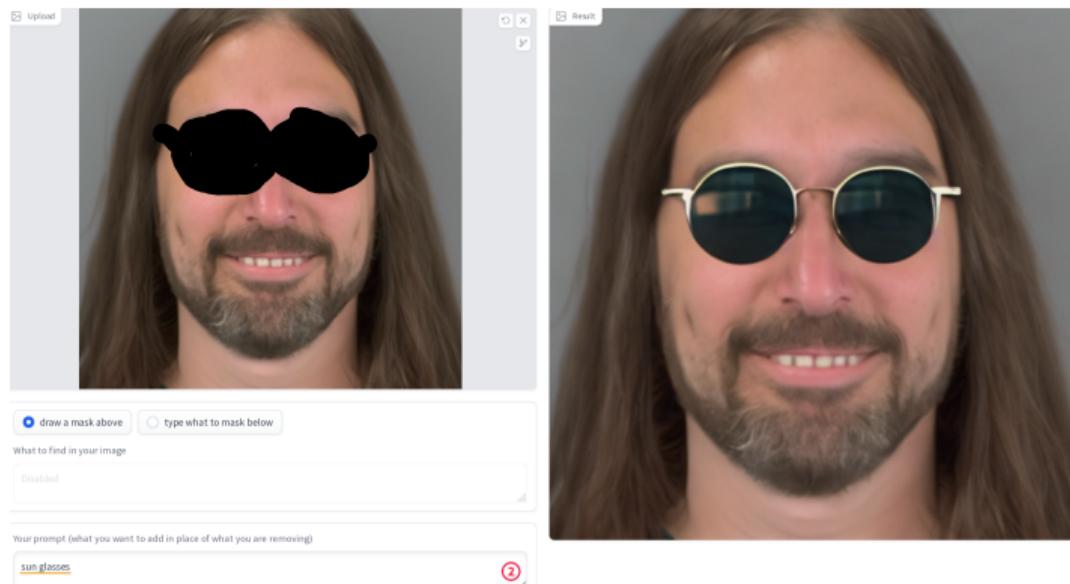
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# In-painting



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

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<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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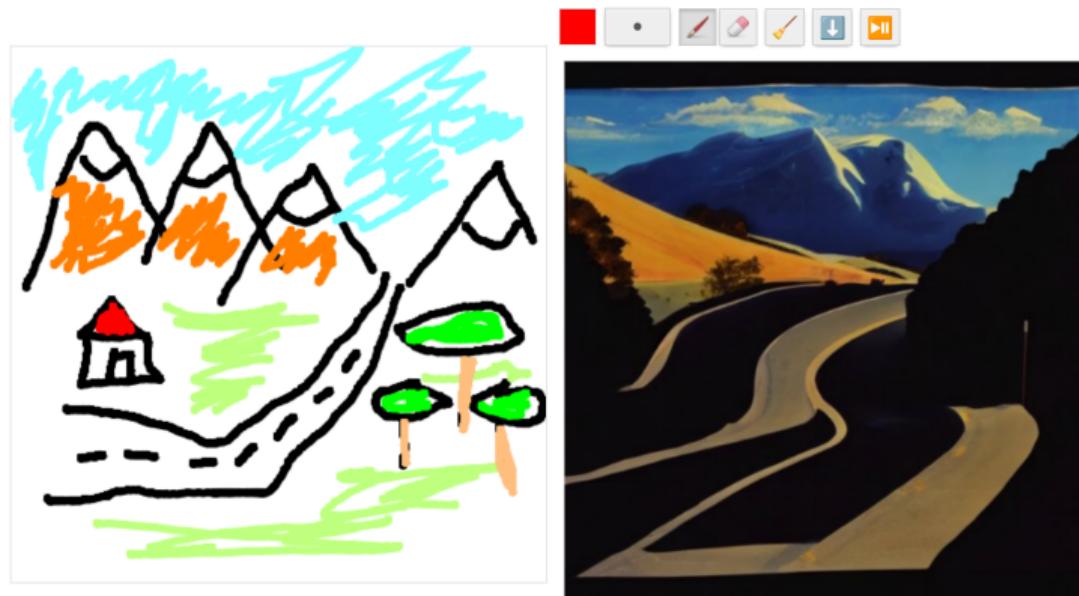
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Share to community

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

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

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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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# 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 architecture. 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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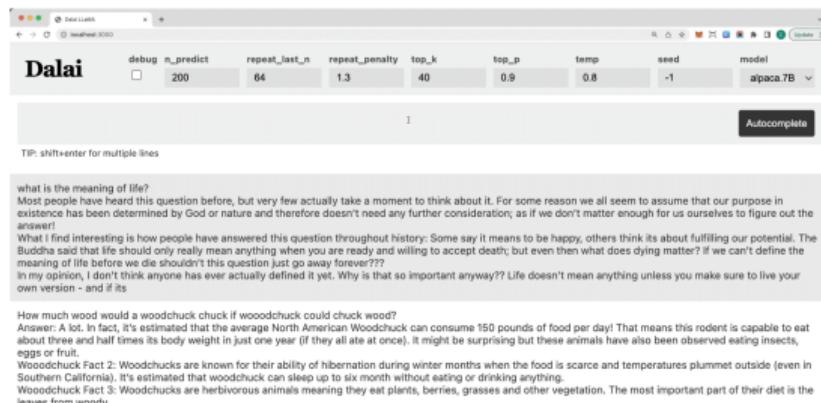
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# A tale (2): Dalai

## 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://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/](https://theregister.com/2023/03/21/stanford_ai_alpaca_taken_offline/)

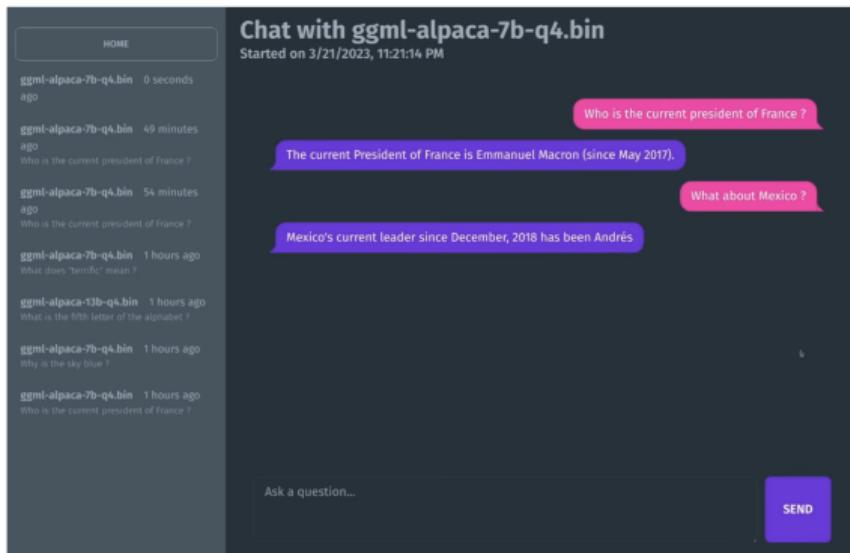
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# A tale (4): Serge

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

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

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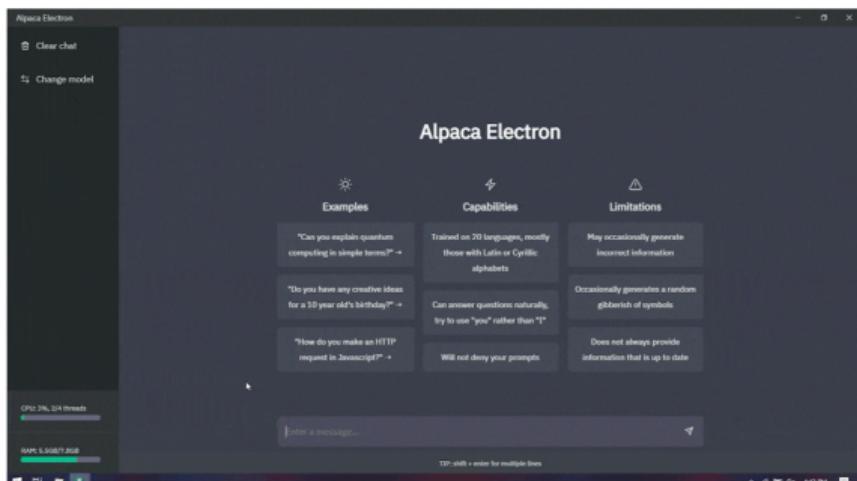
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# A tale (5): Alpaca Electron



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

<https://github.com/>

ItsPi3141/alpaca-electron

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# A tale (6): OobaBooga

The screenshot shows a web-based text generation interface. At the top, there are tabs for 'Text generation' (which is selected), 'Chat settings', 'Parameters', 'Model', 'Training', and 'Session'. Below this, a conversation log is displayed:

- You**: Tell me a little joke, involving bananas, dinosaurs and clouds
- Assistant**: Okay, here's one! A banana walks into a cloud. The cloud says "I'm sorry, I don't speak banana" And the banana leaves in disgust.
- You**: Come on, something more funny!
- Assistant**: Alright, how about this? An old man goes for a walk at night. He hears noises coming from under his shed, so he opens up the door and sees a monkey eating a bunch of bananas. The monkey looks at him and asks "Old man, why are you laughing?" The old man explains that he finds humor in everything because that is what keeps him sane. The monkey then laughs too...and continues to eat all of the bananas while they laugh together.

At the bottom, there is an input field labeled 'Input' with a placeholder 'Type your message...', and several buttons: 'Stop', 'Generate' (which is highlighted in orange), 'Continue', 'Impersonate', 'Regenerate', and 'Remove last'.

OobaBooga  
provides an easy  
web interface to  
many models.

<https://github.com/>

ItsPi3141/alpaca-electron

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# Infrastructure to play, to share

## Generative AI

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What is an “open”  
model?

Generative AI in  
your computer

Extending,  
combining

Infrastructure to  
play, to share

Many issues raised

Summarizing

References

The screenshot shows the Hugging Face platform interface. At the top left is a user icon and the text "Hugging Face". A search bar says "Search models, datasets, users...". Below the search bar are sections for "Tasks", "Libraries", "Datasets", "Languages", "Licenses", and "Other".

- Tasks:** Image Classification, Translation, Image Segmentation, Fill-Mask, Automatic Speech Recognition, Token Classification, Sentence Similarity, Audio Classification, Question Answering, Summarization, Zero-Shot Classification, +23 Tasks.
- Libraries:** PyTorch, TensorFlow, JAX, +33.
- Datasets:** mozilla-foundation/common\_voice\_7\_0, squad, wikipedia, common\_voice, glue, emotion, xtreme, nelbert/seminal2012\_relational\_similarity\_v6, +358.
- Languages:** English, French, Spanish, German, Chinese, Japanese, Portuguese, Russian, +200.
- Licenses:** apache-2.0, mit, afdl-3.0, +56.
- Other:** AutoTrain Compatible, Eval Results, Has a Space, Carbon Emissions.

On the right side, there is a list of models with their details:

- Models 93,687**
- bert-base-uncased**: Updated 14 days ago, 22.5M, 352
- gpt2**: Updated 7 days ago, 12.3M, 323
- openai/clip-vit-large-patch14**: Updated Oct 14, 4.81M, 90
- distilbert-base-uncased-finetuned-sst-2-english**: Updated 14 days ago, 8.61M, 114
- allenai/specter**: Updated Jun 29, 7.62M, 33
- distilbert-base-uncased**: Updated 14 days ago, 7.56M, 104
- bert-base-multilingual-cased**: Updated 14 days ago, 7.41M, 69
- Jean-Baptiste/camembert-ner**: Updated Oct 13, 6.81M, 43
- roberta-base**: Updated Sep 29, 6.76M, 85

# Hugging Face

“GitHub for ML”

<https://huggingface.co>

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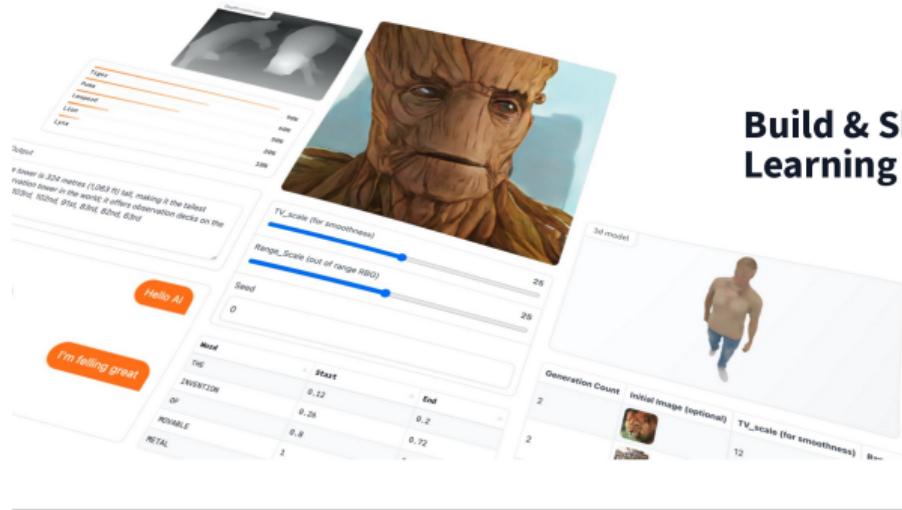
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# Gradio



## 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

Star

10,955

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

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# Diffusers



D ffusers

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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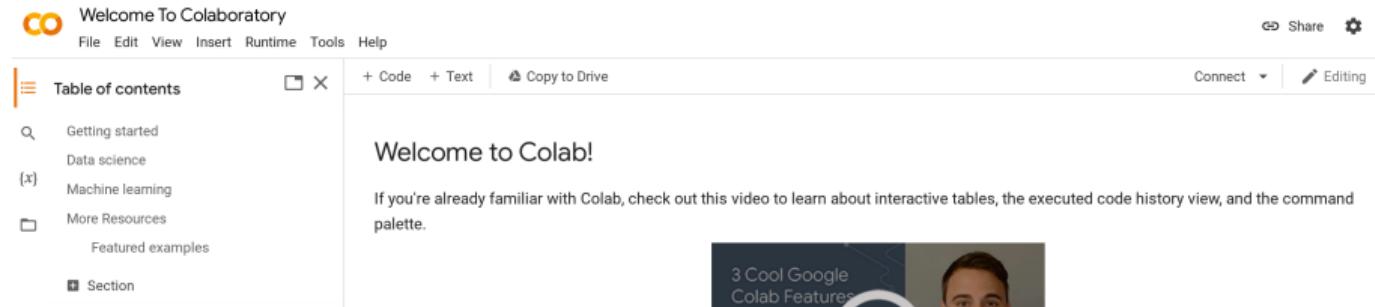
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# Collab



The screenshot shows the Google Colaboratory interface. At the top, there's a navigation bar with the 'Welcome To Colaboratory' logo, file menu (File, Edit, View, Insert, Runtime, Tools, Help), and a 'Share' button. Below the nav bar is a toolbar with '+ Code', '+ Text', and 'Copy to Drive' buttons. On the left, a sidebar titled 'Table of contents' lists sections: 'Getting started', 'Data science', 'Machine learning', 'More Resources' (which includes 'Featured examples' and 'Section'), and a search icon. The main content area displays the 'Welcome to Colab!' message, which includes a video thumbnail for '3 Cool Google Colab Features' and a small profile picture of a person.

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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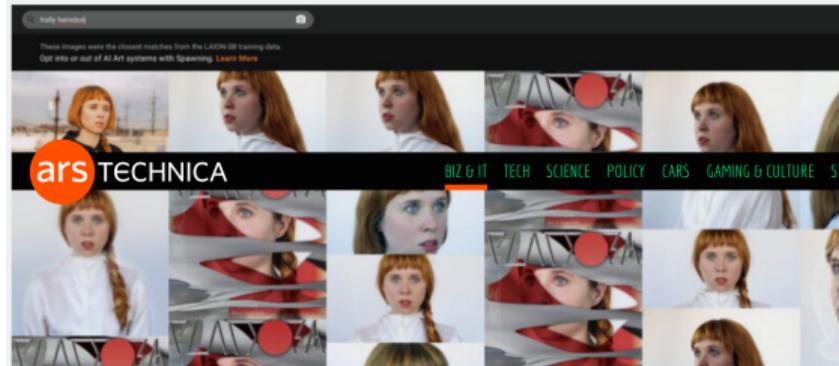
# Intellectual property (training set)

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)

# 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/pjreddie/darknet/blob/master/LICENSE">https://github.com/pjreddie/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/metaseq/blob/main/projects/OPT/MODEL_LICENSE.md">https://github.com/facebookresearch/metaseq/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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# 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>
- The Generative Landscape (WiP course)  
<https://johnowhitaker.github.io/tglcourse/>

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## Credits



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