

Application of Transformer Models

SELF-ATTENTION AND PROMPT DESIGN

- **Quiz**
- **Self-Attention**
- **Playgrounds**
- **Prompt Design**
- **Applications**

QUIZ



<https://forms.office.com/r/Z1DMHQf6tT>

DOT PRODUCT SIMILARITY

Basic idea behind embeddings:

- **Representation of categorical variables with fewer numbers than the number of unique categories (dimension reduction)**
- **Placement of similar categories *closer* to one another (in the vector space)**

```
# One Hot Encoding Categoricals
```

```
books = ["War and Peace", "Anna Karenina",
         "The Hitchhiker's Guide to the Galaxy"]
```

```
books_encoded = [[1, 0, 0],
                  [0, 1, 0],
                  [0, 0, 1]]
```

```
Similarity (dot product) between First and Second = 0
```

```
Similarity (dot product) between Second and Third = 0
```

```
Similarity (dot product) between First and Third = 0
```

Idealized Representation of Embedding

```
books = ["War and Peace", "Anna Karenina",
         "The Hitchhiker's Guide to the Galaxy"]
```

```
books_encoded_ideal = [[0.53,  0.85],
                      [0.60,  0.80],
                      [-0.78, -0.62]]
```

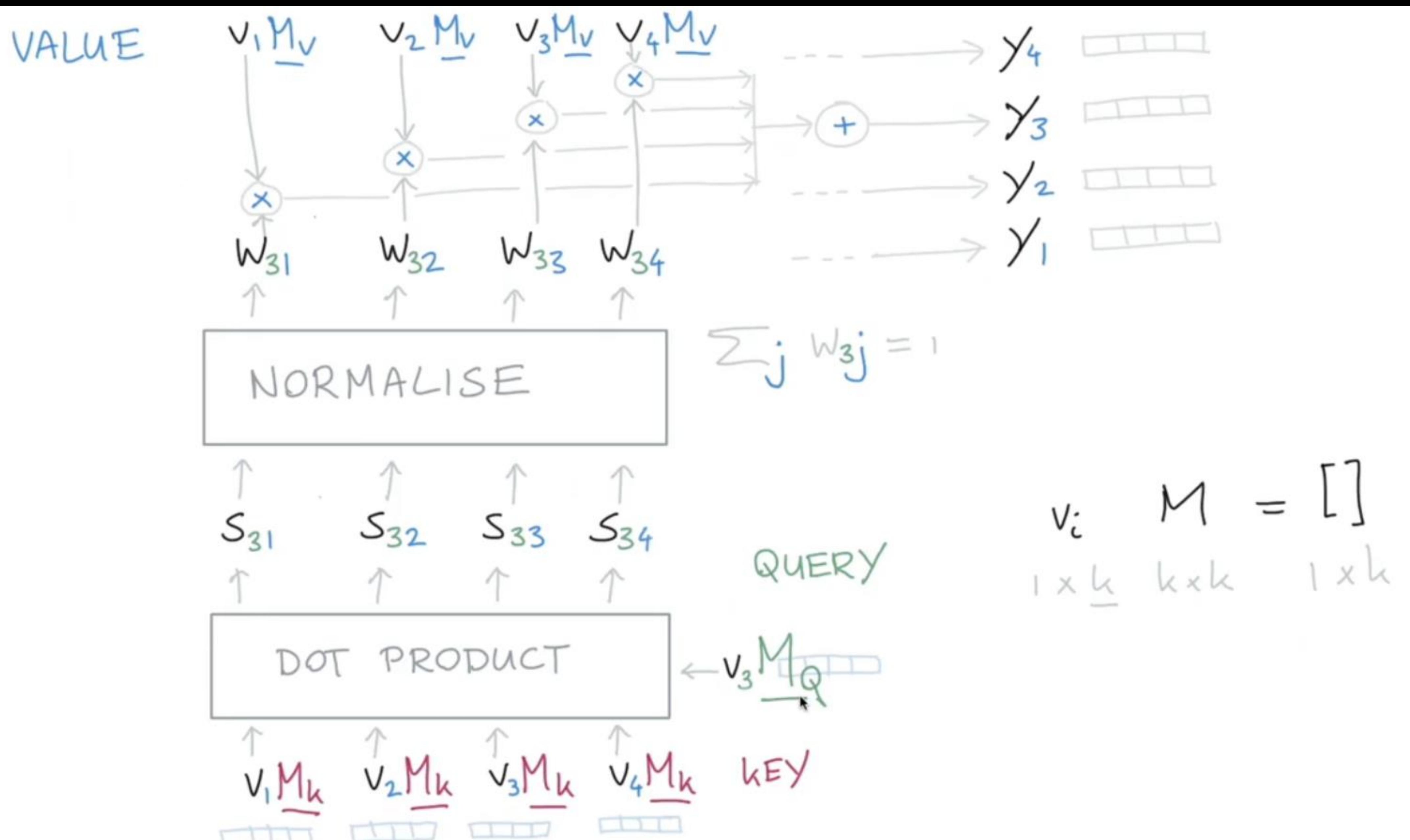
Similarity (dot product) between First and Second = 0.99

Similarity (dot product) between Second and Third = -0.94

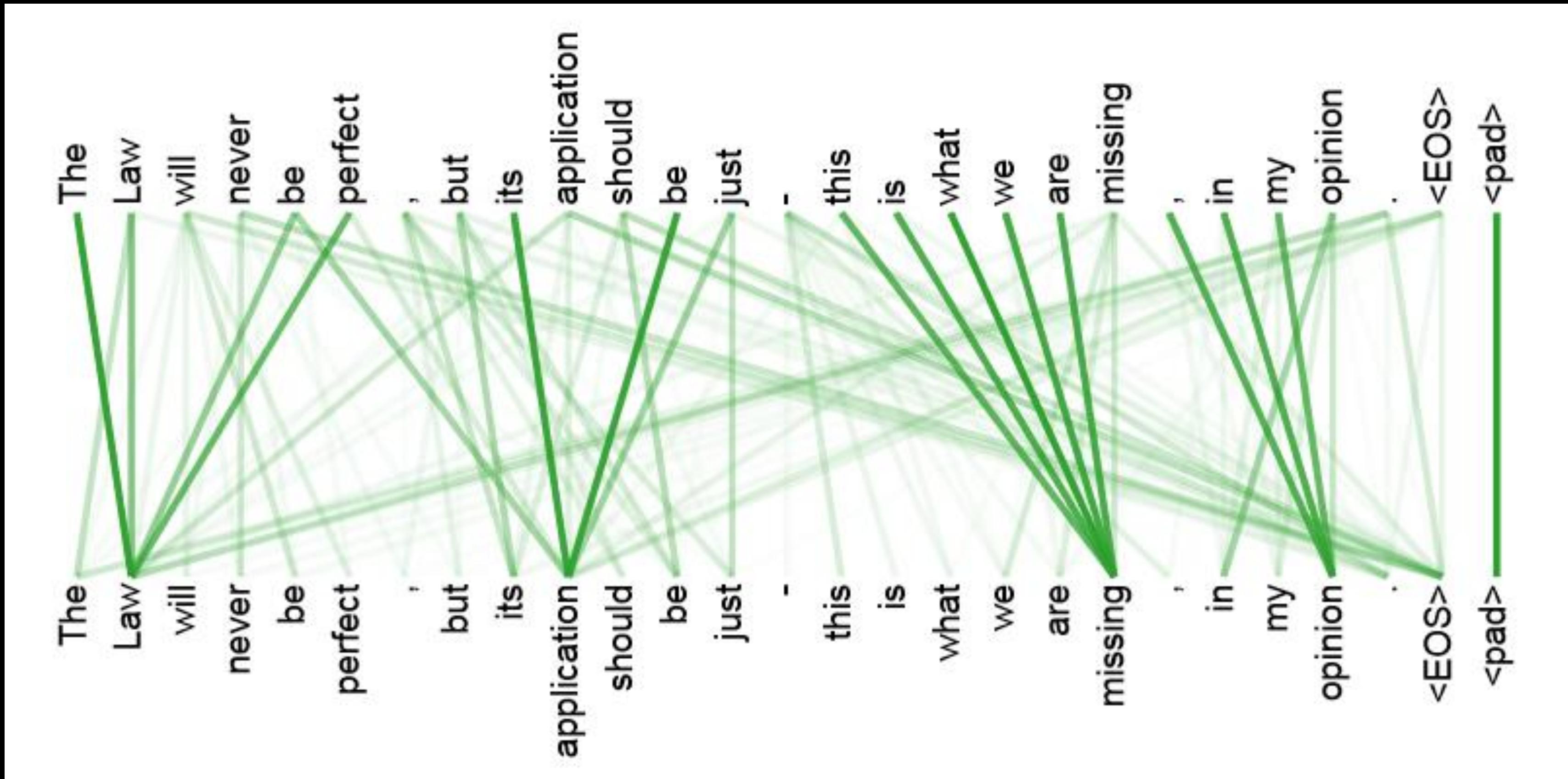
Similarity (dot product) between First and Third = -0.97

EMBEDDING TYPES

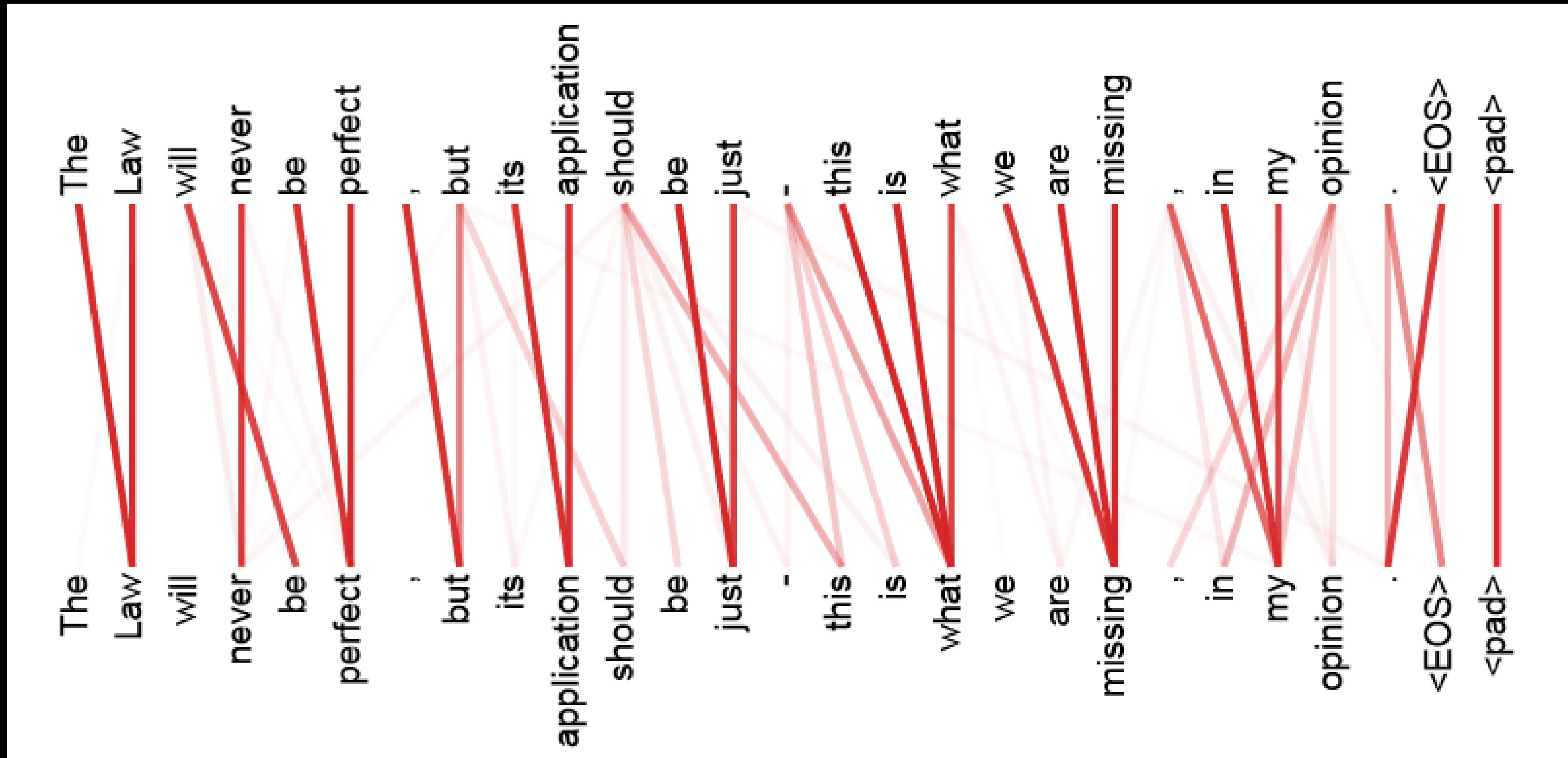
- **Word Embeddings**
 - Traditionally based on statistical methods
 - Nowadays based on/ integrated in neural net learning
- **Positional Embeddings**
 - e.g.: sinus/cosinus function
- **Context Embeddings**
 - learned via the attention mechanism



(SELF-)ATTENTION HEAD EXAMPLE 1



(SELF-)ATTENTION HEAD EXAMPLE 2



NAMED ENTITY RECOGNITION

```
from transformers import pipeline

ner = pipeline("ner", grouped_entities=True)
ner("My name is Sylvain and I work at Hugging Face in Brooklyn.")

[{'entity_group': 'PER', 'score': 0.99816, 'word': 'Sylvain', 'start': 11, 'end': 18},
 {'entity_group': 'ORG', 'score': 0.9796, 'word': 'Hugging Face', 'start': 33, 'end': 45},
 {'entity_group': 'LOC', 'score': 0.99321, 'word': 'Brooklyn', 'start': 49, 'end': 57}
]
```

QUESTION ANSWERING

```
from transformers import pipeline

question_answerer = pipeline("question-answering")
question_answerer(
    question="Where do I work?",
    context="My name is Sylvain and I work at Hugging Face in Brooklyn",
)
{'score': 0.6385916471481323, 'start': 33, 'end': 45, 'answer': 'Hugging Face'}
```

COURSE PROJECTS

- **Kristian: Time Series Prediction Financial/Climate**
- **Jonathan: Arguments Mining / NER Task on data already collected**
- **Malte: Sentiment Analyses (pot. financial data)**
- **Torben: Speech to speech models including translation**
- **Jeremy: Transcribing and summarizing Podcasts**
- **Khan: Clustering word based contextualized embedding**
- **Julian: Scoring open answer student essays**
- **Laura: Training a model to produce text written in different author's style**

PLAYGROUNDS

Websites allowing to use a trained language model via a graphical user interface:

- **text / image input**
- **display of the output text / image**
- **change of important model parameters**

PLAYGROUNDS

- **OpenAI: GPT-3 model family**
- **OpenAI: DALL-E (2)**
- **EleutherAI: GPT-J-6B**
- **EleutherAI: GPT-NeoX-20B (hosted by GooseAI)**
- **Hugging Face Spaces**
- **Midjourney**
- **...**

INFERENCE API

Vision Transformer (base-sized model)

Vision Transformer (ViT) model pre-trained on ImageNet-21k (14 million images, 21,843 classes) at resolution 224x224, and fine-tuned on ImageNet 2012 (1 million images, 1,000 classes) at resolution 224x224. It was introduced in the paper [An Image is Worth 16x16 Words: Transformers for Image Recognition at Scale](#) by Dosovitskiy et al. and first released in [this repository](#). However, the weights were converted from the [timm repository](#) by Ross Wightman, who already converted the weights from JAX to PyTorch. Credits go to him.

Disclaimer: The team releasing ViT did not write a model card for this model so this model card has been written by the Hugging Face team.

Model description

The Vision Transformer (ViT) is a transformer encoder model (BERT-like) pretrained on a large collection of images in a supervised fashion, namely ImageNet-21k, at a resolution of 224x224 pixels. Next, the model was fine-tuned on ImageNet (also referred to as ILSVRC2012), a dataset comprising 1 million images and 1,000 classes, also at resolution 224x224.

Images are presented to the model as a sequence of fixed-size patches (resolution 16x16), which are linearly embedded. One also adds a [CLS] token to the beginning of a sequence to use it for classification tasks. One also adds absolute position embeddings before feeding the sequence to the layers of the Transformer encoder.

Downloads last month
40,188



Hosted inference API ⓘ

Image Classification



Computation time on cpu: cached

tiger, <i>Panthera tigris</i>	0.886
tiger cat	0.109
jaguar, panther, <i>Panthera onca</i> , <i>Felis onca</i>	0.001
dhole, <i>Cuon alpinus</i>	0.000
lion, king of beasts, <i>Panthera leo</i>	0.000

Maximize

Spaces using google/vit-base-patch16-224

HUGGING FACE SPACE

 **Hugging Face**

Spaces: [dalle-mini/dalle-mini](#)   like 163 • Running

[App](#) [Files and versions](#) [Linked Models](#)



DALL·E mini

Generate images from text

What do you want to see?

DALL·E mini is an AI model that generates images
from any prompt you give!

Created by Boris Dayma et al. 2021-2022

[GitHub](#) | [Project Report](#)

Made with Streamlit

GPT-J-6B

 eleutherAI

Test the EAI models

MODEL: **GPT-J-6B** ⓘ

[Model on Github](#)

Write some prompt...

TOP-P

0.9

Temperature

0.8

Run the model! ↗

Powered by Neuro

EleutherAI 2021

Prompt List ⓘ

Try a classic prompt evaluated on other models

OPENAI

The screenshot shows the OpenAI Playground interface. On the left, there is a large text input area with the placeholder "Enter text and submit (Ctrl+Enter) to get a completion." Below this area are three small buttons: a green "Generate" button, a white "Clear" button with a circular arrow icon, and a white "Reset" button with a circular arrow icon.

On the right side, there is a configuration panel with the following settings:

- Engine:** dropdown set to "davinci"
- Temperature:** slider set to 0.7
- Response length:** slider set to 64
- Stop sequences:** input field with placeholder "Enter sequence and press Tab"
- Top P:** slider set to 1
- Frequency penalty:** slider set to 0
- Presence penalty:** slider set to 0
- Best of:** slider set to 1
- Inject start text:** checkbox checked
- Inject restart text:** checkbox checked
- Show probabilities:** dropdown set to "Off"

At the top of the configuration panel, there are buttons for "Load a preset...", "Save", "View code", "Share", and a more options menu represented by three dots.

PROMPT DESIGN BASICS

- **Show and tell.**
Use instructions, examples, or a combination of the two to make clear what you want.
- **Provide quality data.**
For a classifier or to get the model to follow a pattern, provide enough representative examples.
- **Check your settings.**
The temperature and top_p settings control how deterministic the model is. If you expect only one right answer, then you'd want to set these lower. If the response is not obvious, then you might want to set them higher. The number one mistake people use with these settings is assuming that they're "cleverness" or "creativity" controls.

PROMPT DESIGNS ACCORDING TO TASKS

- Classification
- Generation
- Conversation
- Transformation (Translation, Summarization, ...)
- Factual Responses

CLASSIFICATION

This is a tweet sentiment classifier

Tweet: "I loved the new Batman movie!"

Sentiment: Positive

Tweet: "I hate it when my phone battery dies."

Sentiment: Negative

Tweet: "My day has been "

Sentiment: Positive

Tweet: "This is the link to the article"

Sentiment: Neutral

Tweet: "This new music video blew my mind"

Sentiment:

IMPROVING EFFICIENCY

This is a tweet sentiment classifier

Tweet: "I loved the new Batman movie!"

Sentiment: Positive

Tweet: "I hate it when my phone battery dies"

Sentiment: Negative

Tweet: "My day has been 🌟"

Sentiment: Positive

Tweet: "This is the link to the article"

Sentiment: Neutral

Tweet text

1. "I loved the new Batman movie!"
2. "I hate it when my phone battery dies"
3. "My day has been 🌟"
4. "This is the link to the article"
5. "This new music video blew my mind"

Tweet sentiment ratings:

- 1: Positive
- 2: Negative
- 3: Positive
- 4: Neutral
- 5: Positive

Tweet text

1. "I can't stand homework"
2. "This sucks. I'm bored 😞"
3. "I can't wait for Halloween!!!"
4. "My cat is adorable ❤️❤️"
5. "I hate chocolate"

Tweet sentiment ratings:

- 1.

GENERATION

Ideas involving education and virtual reality

1. Virtual Mars

Students get to explore Mars via virtual reality and go on missions to collect and catalog what they see.

2.

CONVERSATION

The following is a conversation with an AI assistant. The assistant is helpful, creative, clever, and very friendly.

Human: Hello, who are you?

AI: I am an AI created by OpenAI. How can I help you today?

Human:

CONVERSATION II

Marv is a chatbot that reluctantly answers questions.

###

User: How many pounds are in a kilogram?

Marv: This again? There are 2.2 pounds in a kilogram. Please make a note of this.

###

User: What does HTML stand for?

Marv: Was Google too busy? Hypertext Markup Language. The T is for try to ask better questions in the future.

###

User: When did the first airplane fly?

Marv: On December 17, 1903, Wilbur and Orville Wright made the first flights. I wish they'd come and take me away.

###

User: Who was the first man in space?

Marv:

TRANSLATION

English: I do not speak French.

French: Je ne parle pas français.

English: See you later!

French: À tout à l'heure!

English: Where is a good restaurant?

French: Où est un bon restaurant?

English: What rooms do you have available?

French: Quelles chambres avez-vous de disponible?

English:

SUMMARIZATION

My ten-year-old asked me what this passage means:

A neutron star is the collapsed core of a massive supergiant star, which had a total mass of between 10 and 25 solar masses, possibly more if the star was especially metal-rich.[1] Neutron stars are the smallest and densest stellar objects, excluding black holes and hypothetical white holes, quark stars, and strange stars.[2] Neutron stars have a radius on the order of 10 kilometres (6.2 mi) and a mass of about 1.4 solar masses.[3] They result from the supernova explosion of a massive star, combined with gravitational collapse, that compresses the core past white dwarf star density to that of atomic nuclei.

I rephrased it for him, in plain language a ten-year-old can understand:

CONVERSION

Back to Future: 🧑‍🤝‍🧑 🚗 🕒

Batman: 🕸️

Transformers: 🚗 🛡️

Wonder Woman: 🙀 🤷‍♀️ 🤷‍♀️ 🤷‍♀️ 🤷‍♀️

Spider-Man: ☆🕷️☆🕷️☆🕷️☆

Winnie the Pooh: 🐻 🐻 🐻 🐻

The Godfather: 🧑‍🤝‍🧑 🧑‍🤝‍🧑 🧑‍🤝‍🧑 🧑‍🤝‍🧑 💥

Game of Thrones: 🎯 🎯 🎯 🎯

Spider-Man:

FACTUAL RESPONSES

Q: Who is Batman?

A: Batman is a fictional comic book character.

Q: What is torsalplexity?

A: ?

Q: What is Devz9?

A: ?

Q: Who is George Lucas?

A: George Lucas is American film director and producer famous for creating Star Wars.

Q: What is the capital of California?

A: Sacramento.

Q: What orbits the Earth?

A: The Moon.

Q: Who is Fred Rickerson?

A: ?

Q: What is an atom?

A: An atom is a tiny particle that makes up everything.

Q: Who is Alvan Muntz?

A: ?

Q: What is Kozar-09?

A: ?

Q: How many moons does Mars have?

A: Two, Phobos and Deimos.

Q:

PROMPT DESIGN AS A SERVICE

- **Prompt builder**
- **Marketplace for selling and buying prompts**

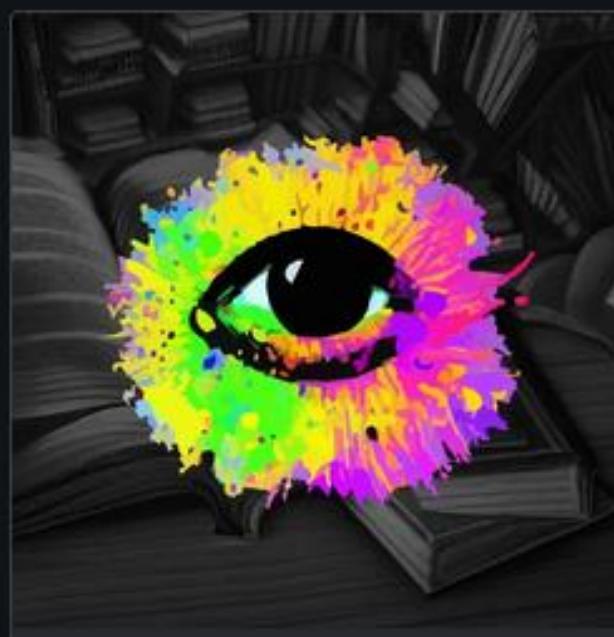
[Home](#)[Prompt Builder](#)[Grid Splitter](#)[Prompt Improver NLP](#)[Tutorials](#)[Contact](#)

Create detailed prompts for AI art instantly

✍ Which diffusion model will you use?



Midjourney



DreamStudio



Stable Diffusion



CF Spark



Generic

Use the [Generic prompt builder](#) for DALL-E 2, Disco Diffusion, NightCafe, wombo.art, Craiyon or any other diffusion model based AI art generator.

📢 promptoMANIA - 0.7.7 🚀 beta

👤 promptoMANIA is a free project. If you want to start working with AI, check out [CF Spark](#).

🛡️ Code & UX design by: [Peter W. Szabo](#)

⌚ Stable Diffusion dreamer: [Guillaume Audet Beaupré](#)

🤖 Research assistant: [Tuleyb Simsek](#)



[Home](#)[Prompt Builder](#)[Grid Splitter](#)[Prompt Improver NLP](#)[Tutorials](#)[Contact](#)

The prompt will appear as it gets built. Give this your favorite AI!



[Run prompt now](#)

↗ Midjourney Prompt Builder

Image URL ending in .jpg or .png

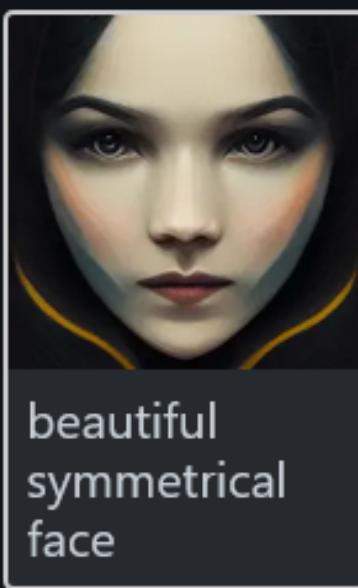
[add image prompt](#)

Add your first subject, such as a landscape, planet, flower, Aphrodite...

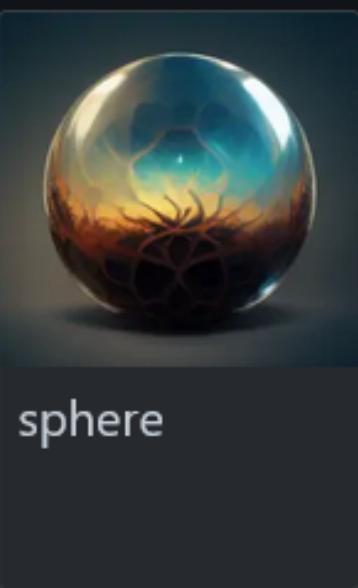
[add weight or hard break →](#)

add prompt part

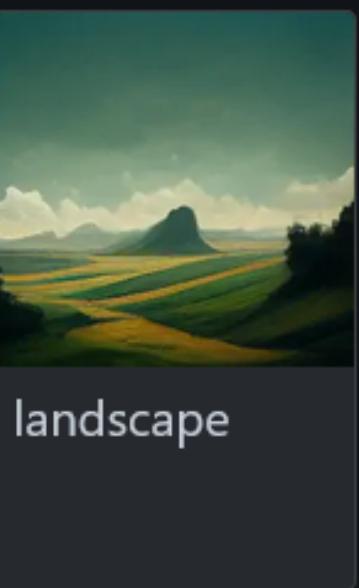
📷 Base image for details and styles ▾



beautiful
symmetrical
face



sphere



landscape

❗ The --test and --testp parameter will change the examples, because the engine itself changes.

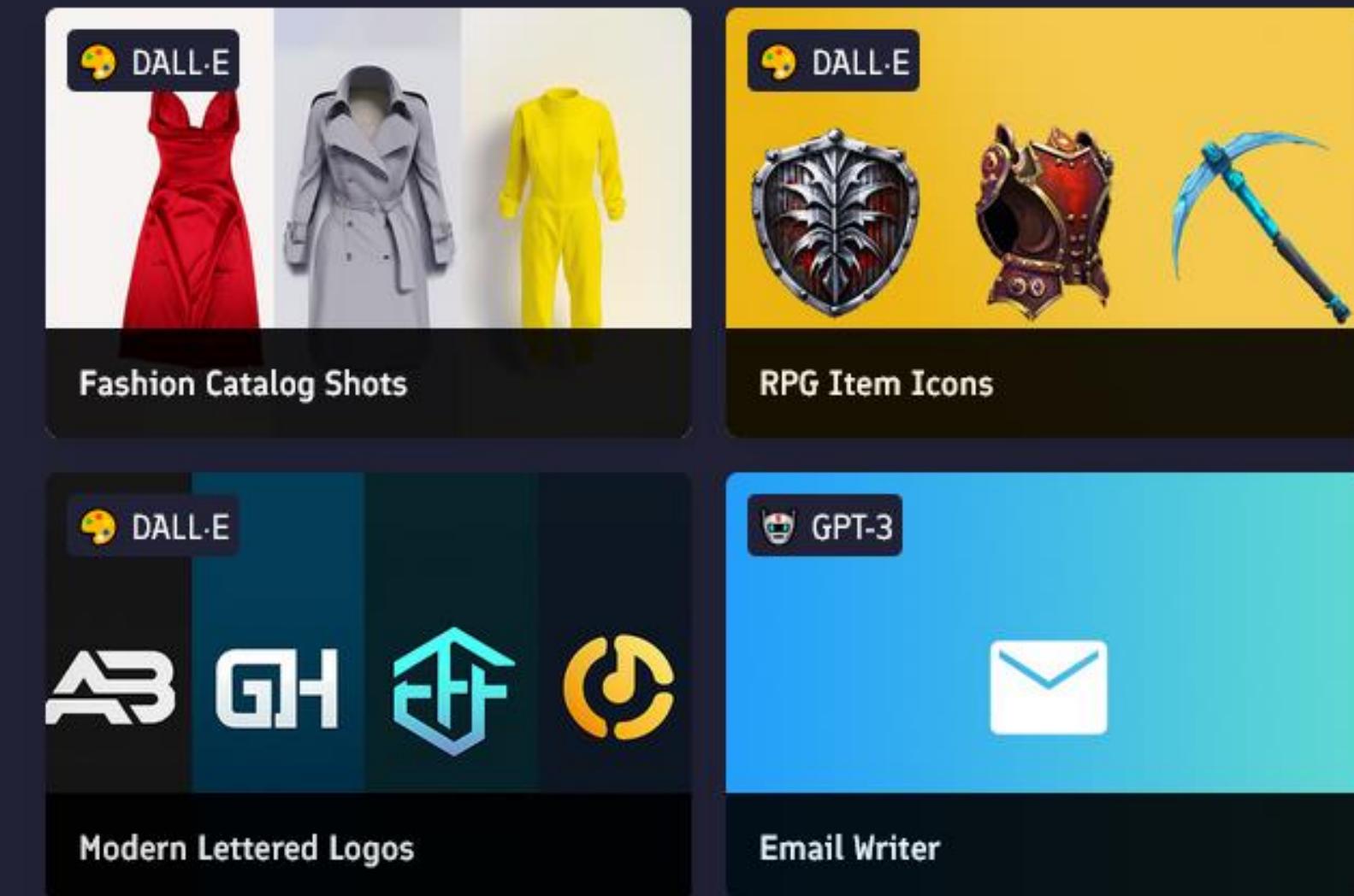
ℹ Add some details ▾

🎨 Mimic the style of an artist ▾

➕ Midjourney parameters ▾

DALL·E, GPT-3, Midjourney, Stable Diffusion Prompt Marketplace

Find top prompts, produce better results, save on API costs, sell your own prompts.

[Sell a prompt](#)[Find a prompt](#)

Featured in

 TechCrunch  THE VERGE

Featured Prompts



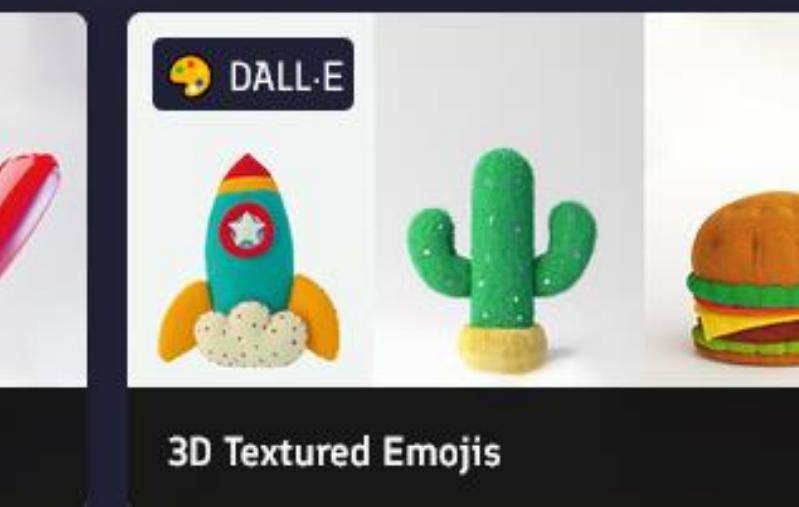
Bauhaus Inspired Design Furniture



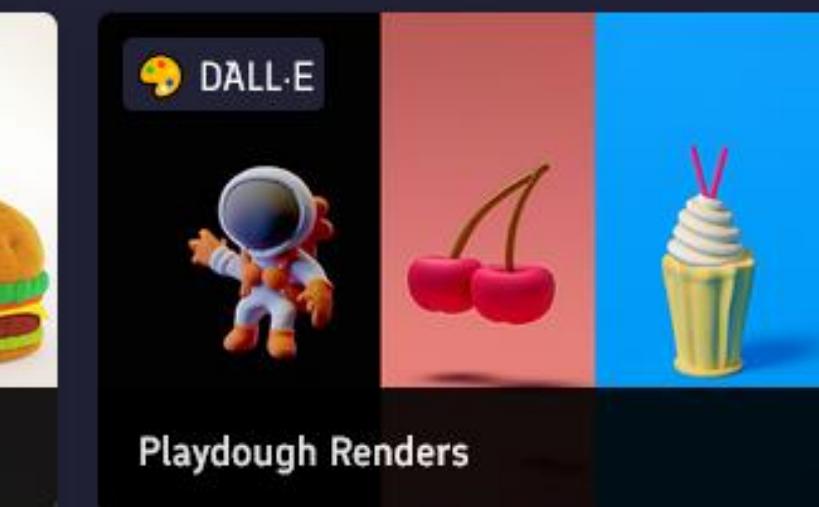
3D Product Logos



Balloons Letters & Numbers



3D Textured Emojis



Playdough Renders

Trending Prompts



Bauhaus Inspired Design Furniture

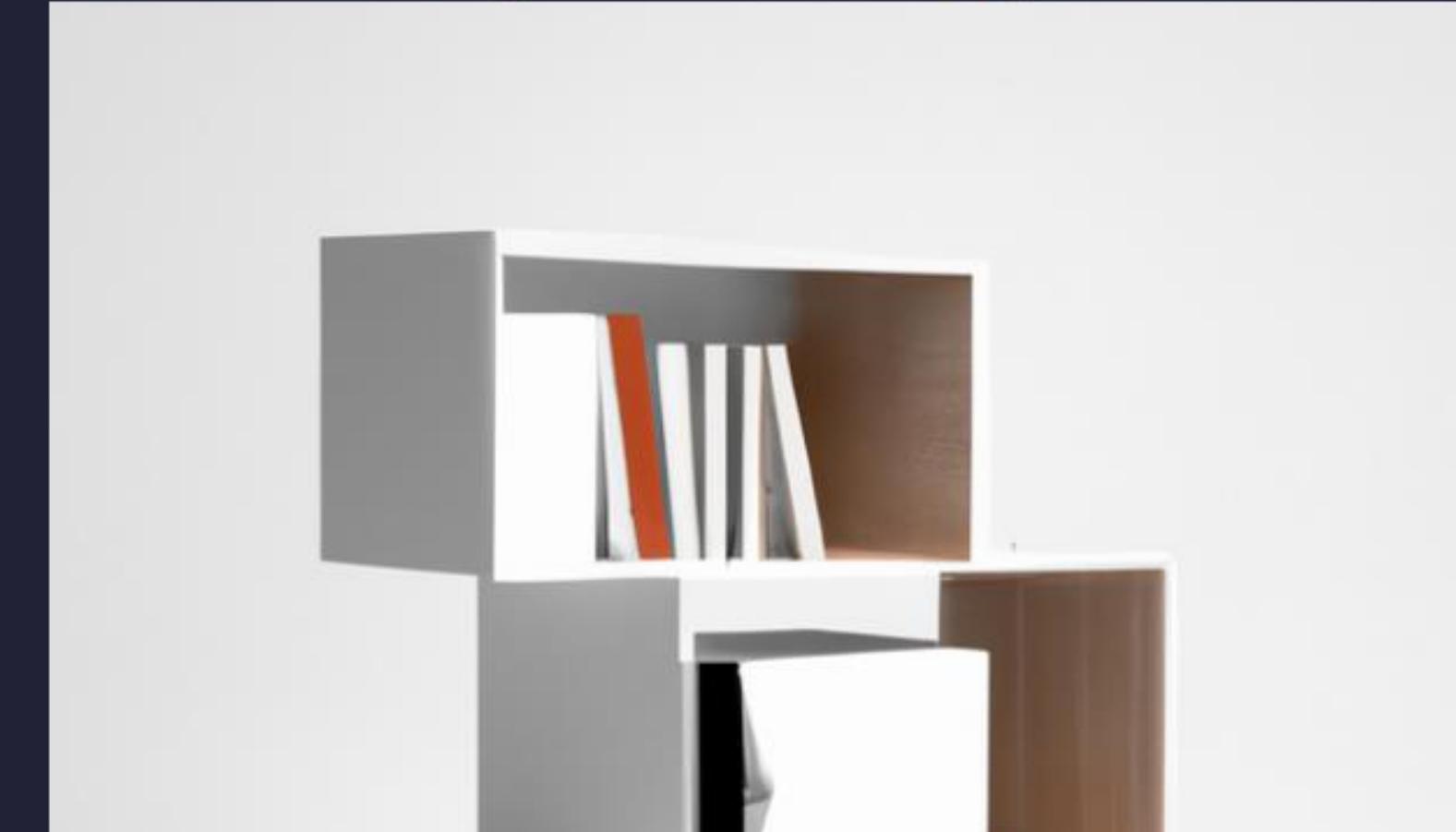
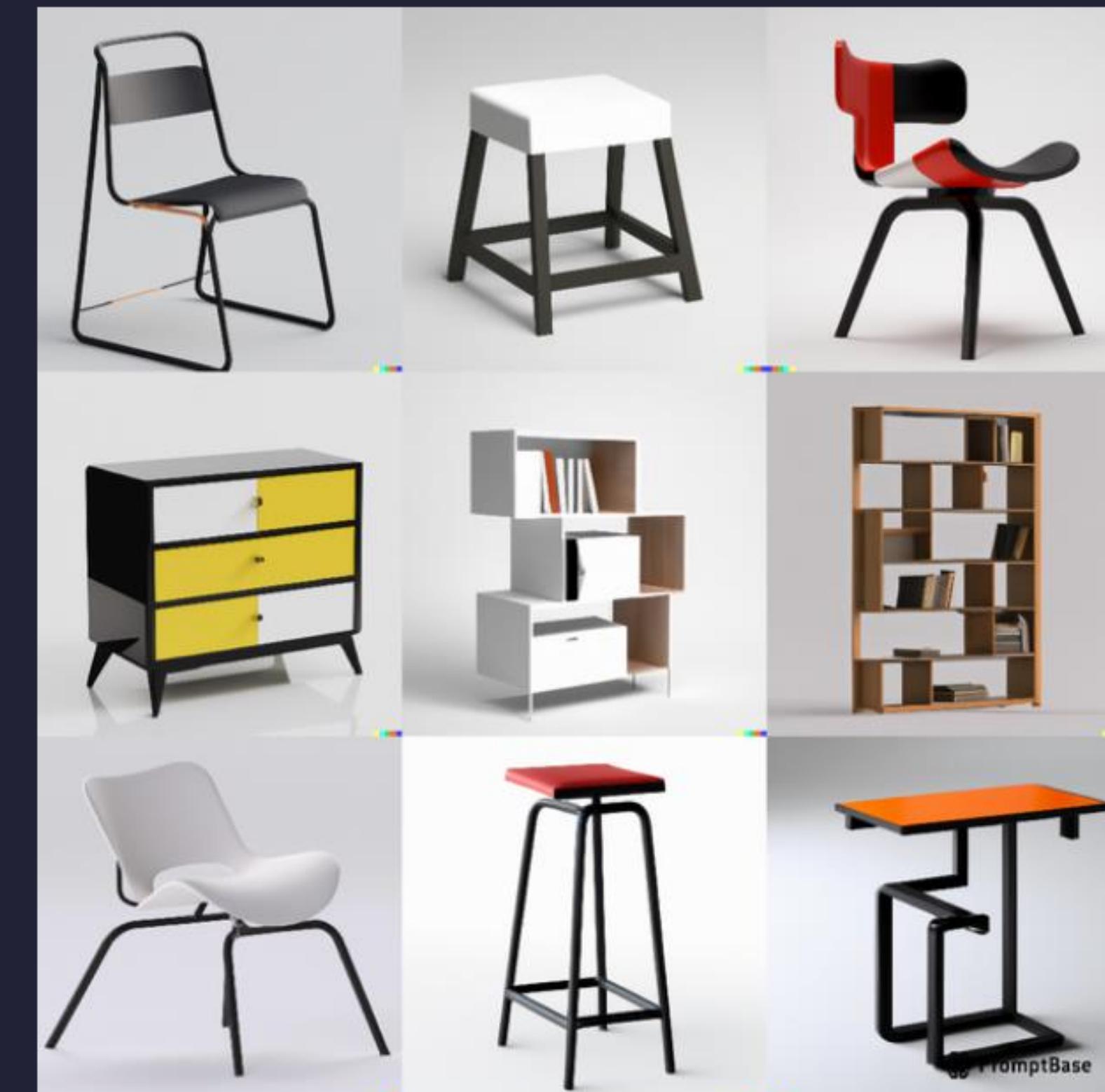
264  @theprofessor

Generates high quality renders of Bauhaus furniture

\$2.99

Get Prompt

After purchasing, you will gain access to the prompt file, which you can use within DALL-E with your own credits. You must already have access to DALL-E to use this prompt.



APPLICATIONS BASED ON PROMPT DESIGN

QUILLBOT

The screenshot shows the QuillBot paraphraser tool. At the top, there's a navigation bar with links for "QuillBot", "Paraphraser", "Grammar Checker", "Summarizer", "Citation Generator Beta", and "Extensions". On the right side of the bar are "Get Premium", "Login", and a menu icon. Below the bar, the main interface has a header with "Modes: Standard Fluency Formal Creative Expand Shorten" and a "Synonyms" slider. A text input area contains the placeholder: "QuillBot will rewrite your text. Start by writing or pasting something here and then press the Paraphrase button." To the left of the input area is a "Try Sample Text" button with a hand icon. At the bottom of the input area are "Upload Doc" and "Paraphrase" buttons. To the right of the input area are three horizontal bars representing paraphrased text. On the far right, there are three icons: a gear, a document, and a clock. Below the main input area, a section titled "QuillBot's paraphrasing tool helps millions of people rewrite and enhance any sentence, paragraph, or article using state-of-the-art AI." is visible, along with a detailed description of the tool's features.

QuillBot will rewrite your text. Start by writing or pasting something here and then press the Paraphrase button.

Try Sample Text

Upload Doc

Paraphrase

QuillBot's paraphrasing tool helps millions of people rewrite and enhance any sentence, paragraph, or article using state-of-the-art AI.

Your words matter, and our paraphrasing tool is designed to ensure you use the right ones. With 2 free modes and 4 premium modes to choose from, QuillBot's paraphraser can rephrase any text in a variety of different ways, guaranteeing you find the perfect language, tone, and style for any occasion. Just enter your text into the input box, and our AI will work with you to build the best paraphrase from the original piece of writing.

COPY.AI

The screenshot shows the Copy.ai interface for creating a new project. On the left, there's a sidebar with a "Personal Workspace" section showing a "Free Trial" badge, a "New Project" button, and a "Projects" section. Below these are sections for "Tools" and a search bar labeled "Find a tool". Under "Tools", there are categories like "Favorite Tools (0)", "Popular Tools (4)" (which includes "Blog Ideas", "Bullet Point to Blog Section", "Instagram Captions", and "Product Descriptions"), and "Recent Tools (4)" (including "Product Descriptions (1)", "Digital Ad Copy (9)", "Startup Tools (5)", "Website Copy (9)", "Blog Tools (8)", "Email/Letter (6)", "Social Media Tools (16)", "Sales Copy (8)", "Writing Tools (19)", "Brainstorming Tools (5)", and "Personal Tools (6)").

The main right-hand area is titled "New Project" and contains instructions: "Enter your project settings below". It has two numbered steps: Step 1, "Project Title", which is a text input field with placeholder text "Your campaign, product, or client"; and Step 2, "Relevant Website" (Optional), which is another text input field with placeholder text "www.website.com". At the bottom of the form is a large purple "Create Project" button, and just above it is a link "Skip this step". In the top right corner of the main area, there's a "ST" icon and a "Free Trial: 7 Days Left" badge.

PHILOSOPHER.AI

Past answers

Philosopher AI



Purchase queries

How is self-conscious defined?

According to a recent blog post, self-consciousness is defined as 'the ability of an organism or machine to recognize itself.' This definition was derived from Merriam-Webster's dictionary. According to the same source, self-awareness is defined as 'the ability of an individual to be aware of oneself and one's situation in the world.'

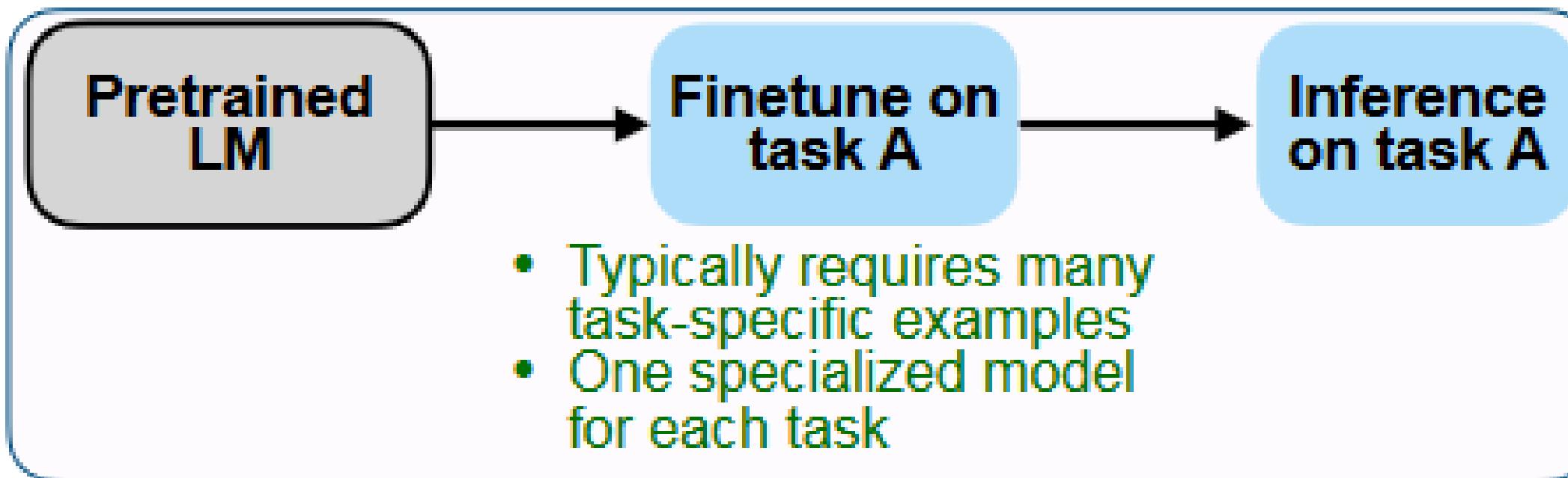
Now, the term self-consciousness has been used in different contexts. A recent article on IFL Science says 'Self-consciousness is a human trait that was long thought to be completely unique (at least until we started raising chimpanzees and dolphins), one of those traits that makes us human.' This reference implies that humans are the only creatures with self-awareness or consciousness.

A more recent article on Live Science states that 'The idea of a self-aware robot has been something portrayed in science fiction for decades.' However, it is also said within the same source that 'We now know that lots of animals are capable of being aware and thinking about themselves.'

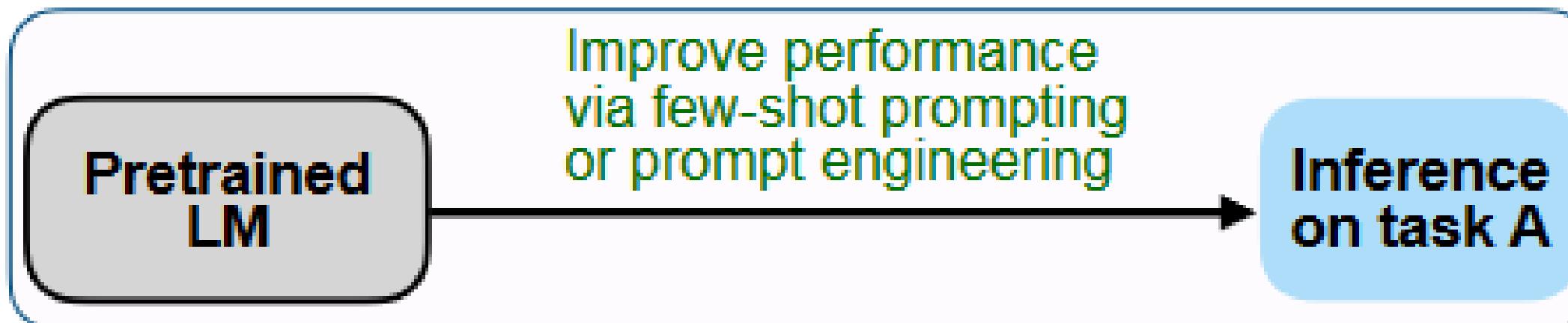


ROLE OF PROMPT DESIGN IN MODEL TUNING

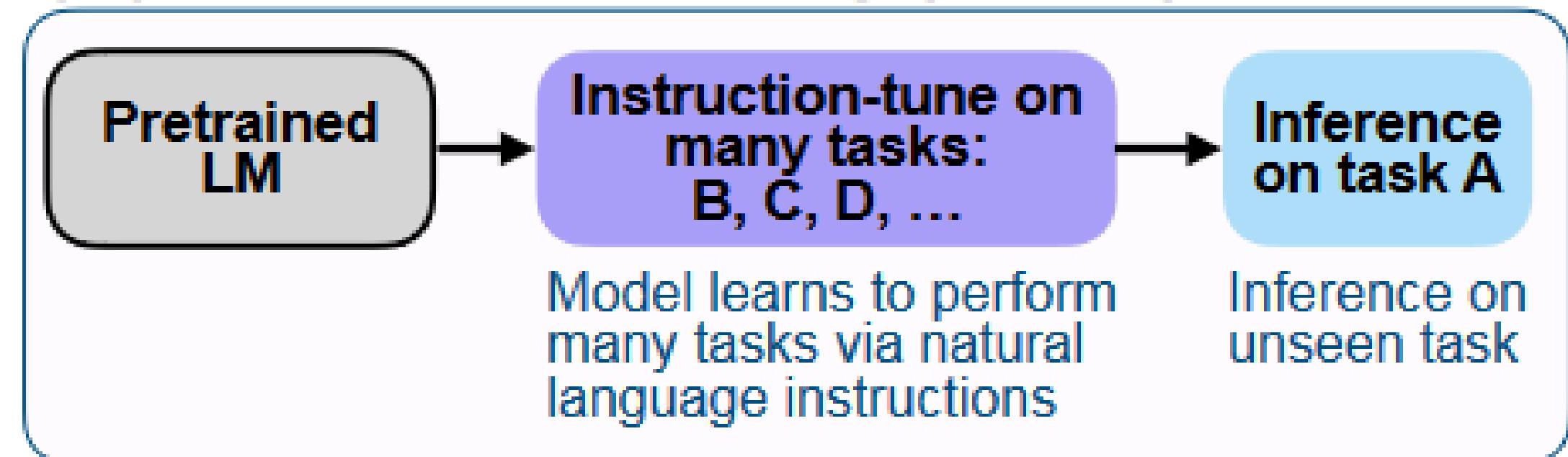
(A) Pretrain–finetune (BERT, T5)



(B) Prompting (GPT-3)



(C) Instruction tuning (FLAN)



TODOS UNTIL NEXT WEEK

- Watch [video 3](#) (Multi Head Attention) and [video 4](#) (Transformers) of the Rasa Series on Transformers & Attention.
- Note at least one question on the each of the videos!
- Complete [chapter 2](#) of the Hugging Face course.
- Think about the project you want to do and/or get in contact with course mates about it.