

What is generative AI?

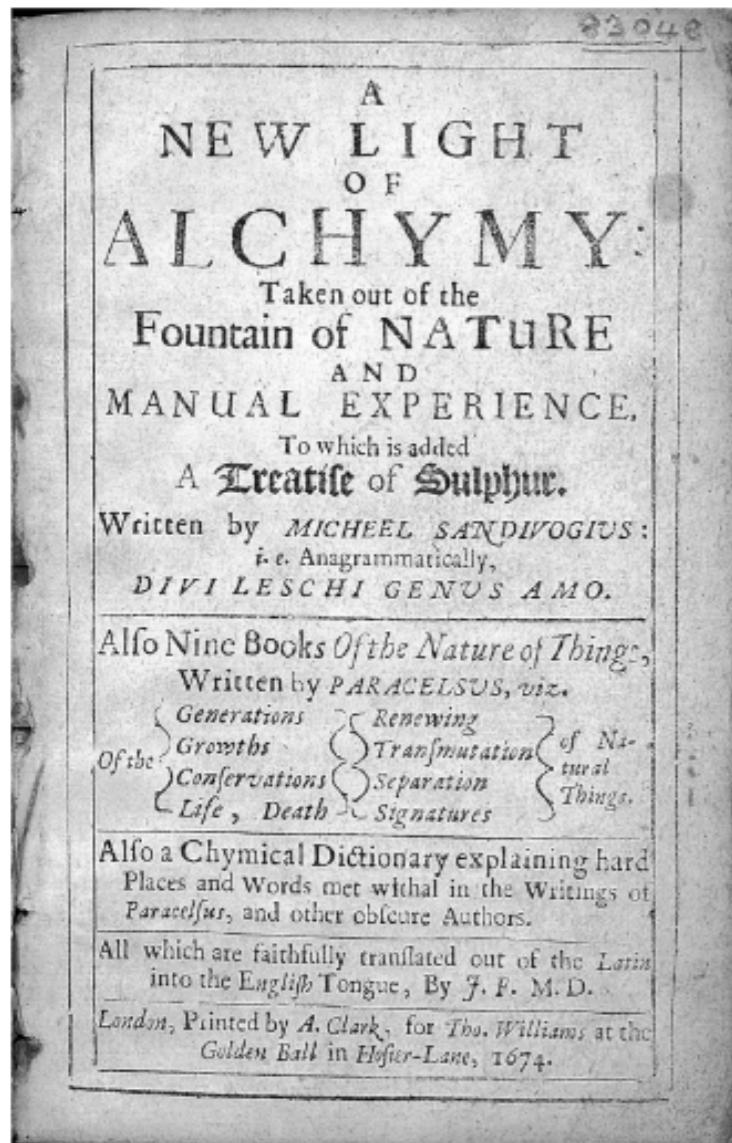
GENERATIVE AI CONCEPTS



Daniel Tedesco
Data Lead, Google

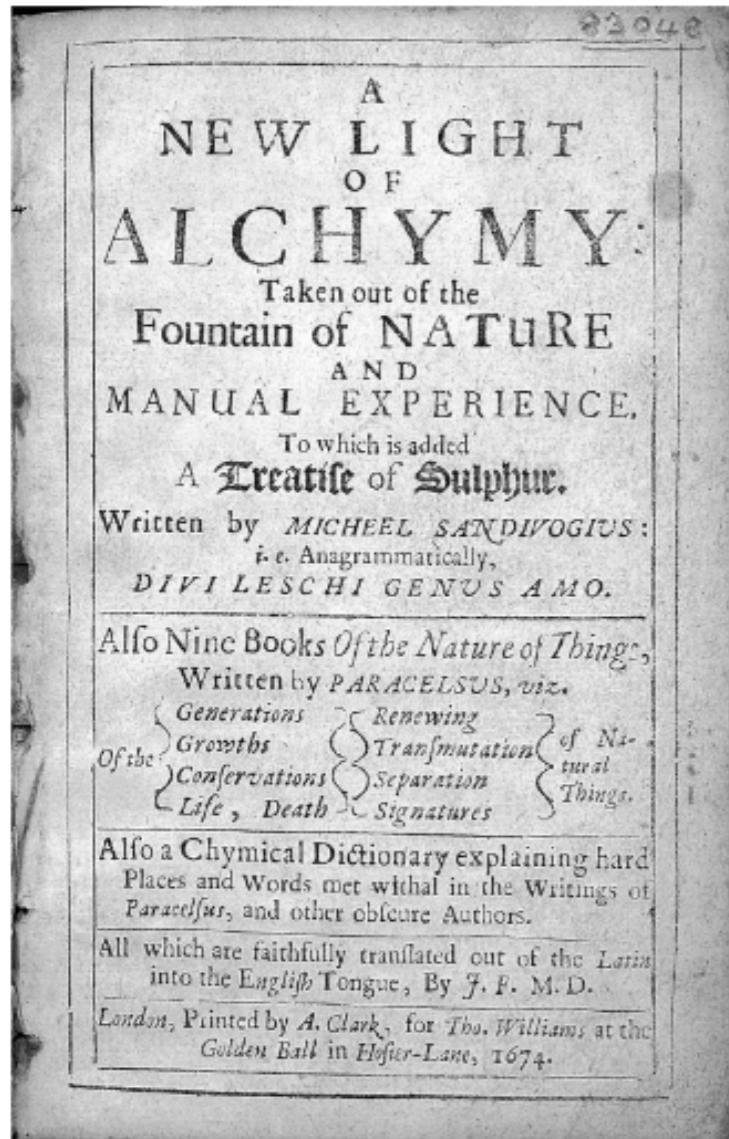
We've long dreamed of tools that can create

In ancient stories...

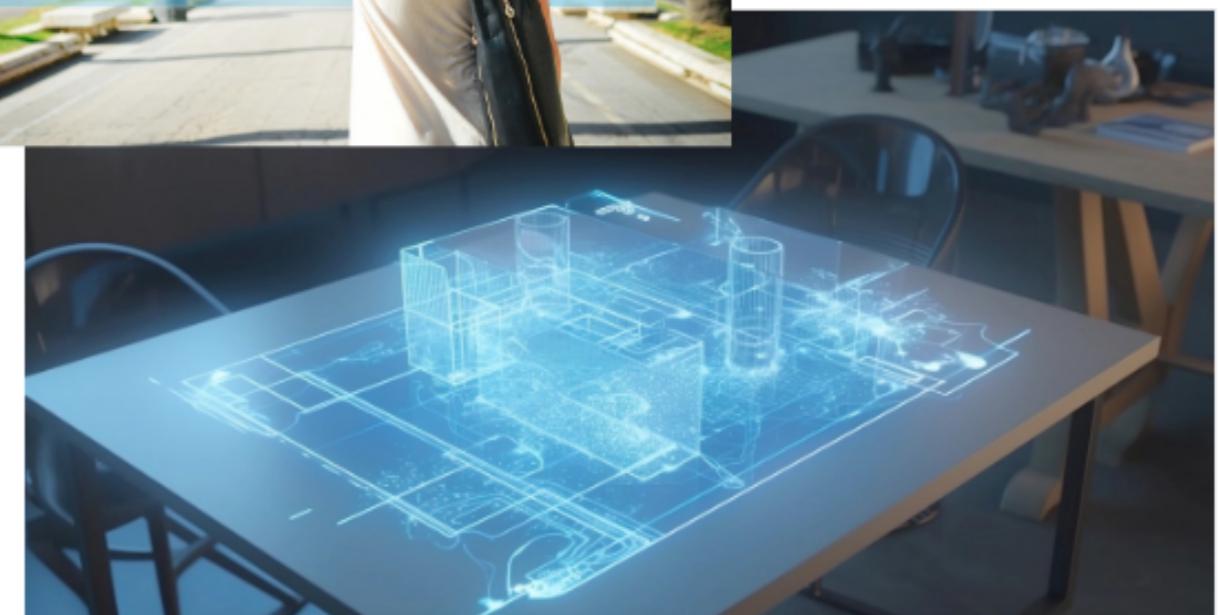
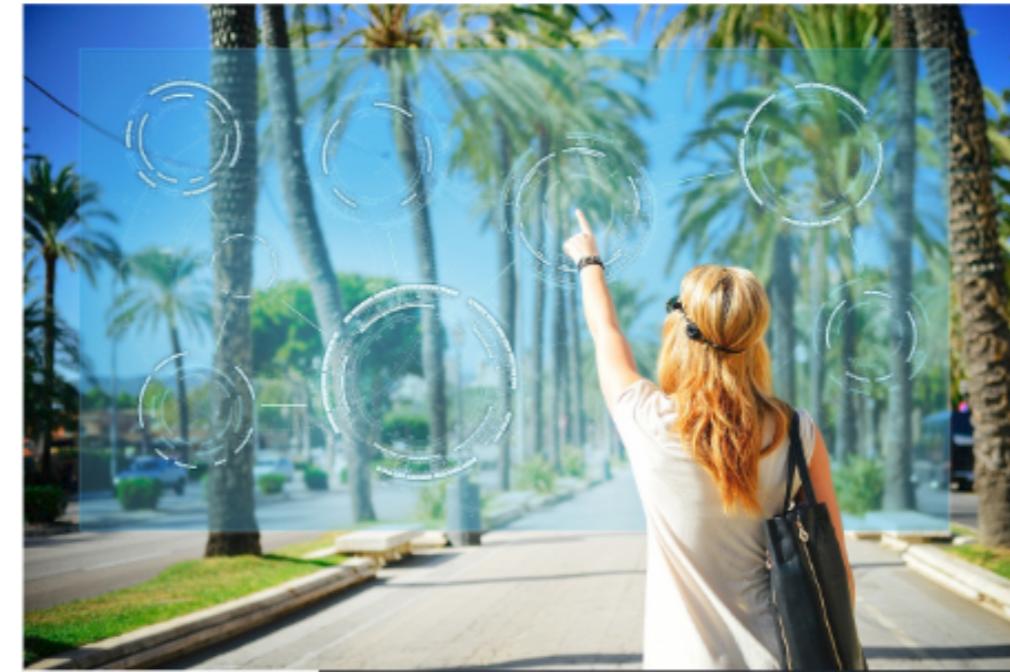


We've long dreamed of tools that can create

In ancient stories...



...and modern virtual worlds



Unparalleled creative tools

AI Images



AI Chatbots

A screenshot of a mobile phone displaying a messaging app. The screen shows a conversation between a user and an AI named Claude. The user asks, "Where's the best place to see cherry blossoms in Tokyo?". Claude responds with a detailed answer: "The best place to see cherry blossoms in Tokyo is Ueno Park. During late March to early April, the many cherry blossom trees in the park bloom beautifully. It's a very popular spot for 'hanami', the Japanese custom of cherry blossom viewing. Other great spots in Tokyo include: • Chidorigafuchi - a picturesque moat area surrounding the Imperial Palace, lined with hundreds of cherry blossom trees. It's a more tranquil spot with fewer crowds. • Sumida Park - a large riverside park with around 1,000 cherry blossom trees. It hosts a popular cherry blossom festival in late April." To the right of the main message, there is a vertical sidebar with additional text and user interaction options like "Like", "Dislike", and "Share".

spot but the large space means it doesn't feel as crowded as some other places.

- Inokashira Park - a scenic park in the western suburbs of Tokyo centered around a large pond. It has many cherry blossom trees which are beautifully reflected in the pond water. It's a lovely spot away from the busier city center.

Tell me more.

What other activities can I do in Ueno Park?

What's the best time to visit Sumida Park?

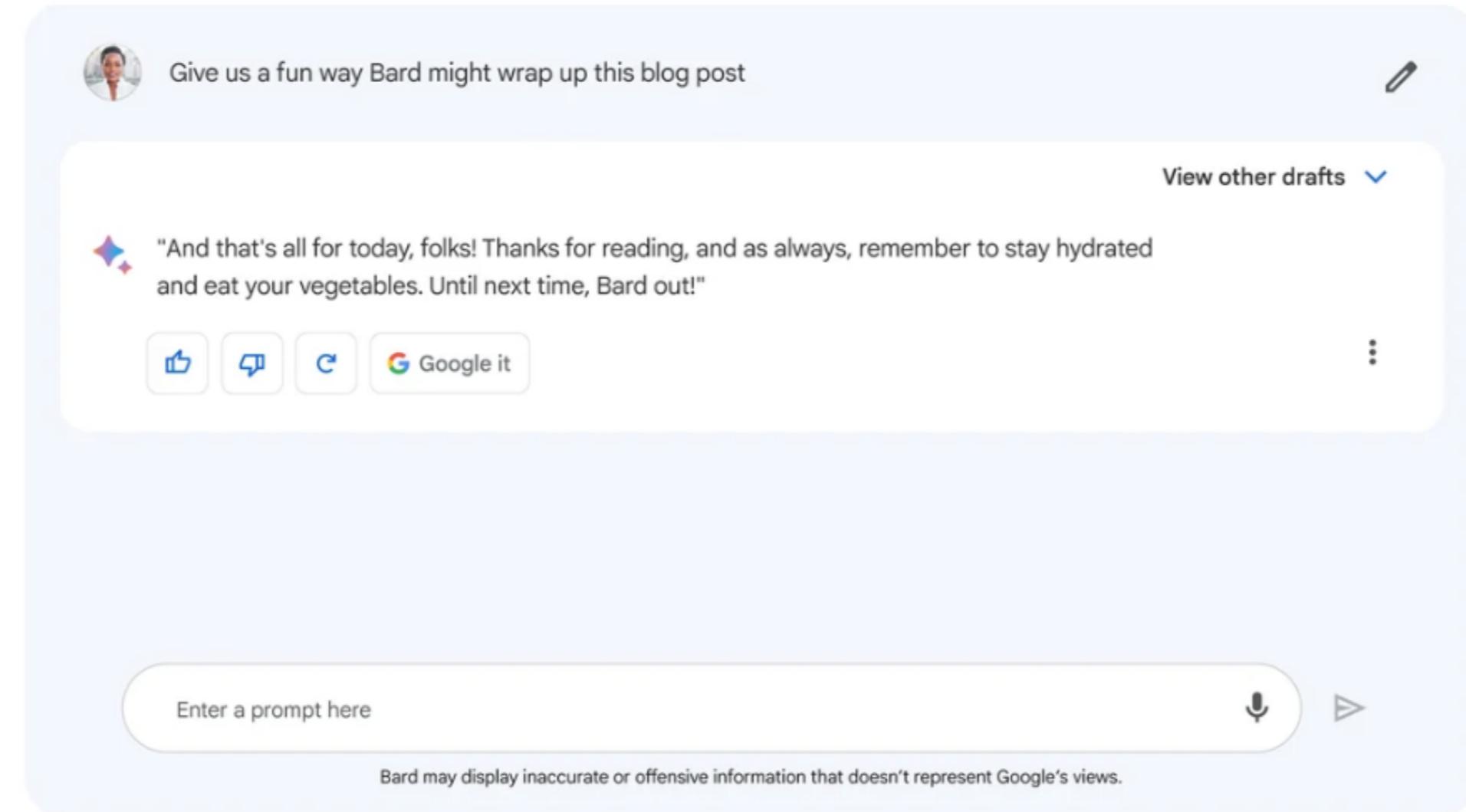
Are there any other parks in Tokyo with cherry blossoms?

See other topic ideas

¹ Cosmopolitan Magazine, Anthropic PBC

What is generative AI?

Machine learning models that generate new content



¹ Google Bard

What is generative AI?



(a) A dog wearing a superhero outfit with red cape flying through the sky.

¹ Facebook Make-a-Video

What is generative AI?

✖️ Uncaught ReferenceError: decomp is not defined



Debug with Ghostwriter

It seems like the problem is that the `decomp` library is not available in the global scope. Here's a fix:

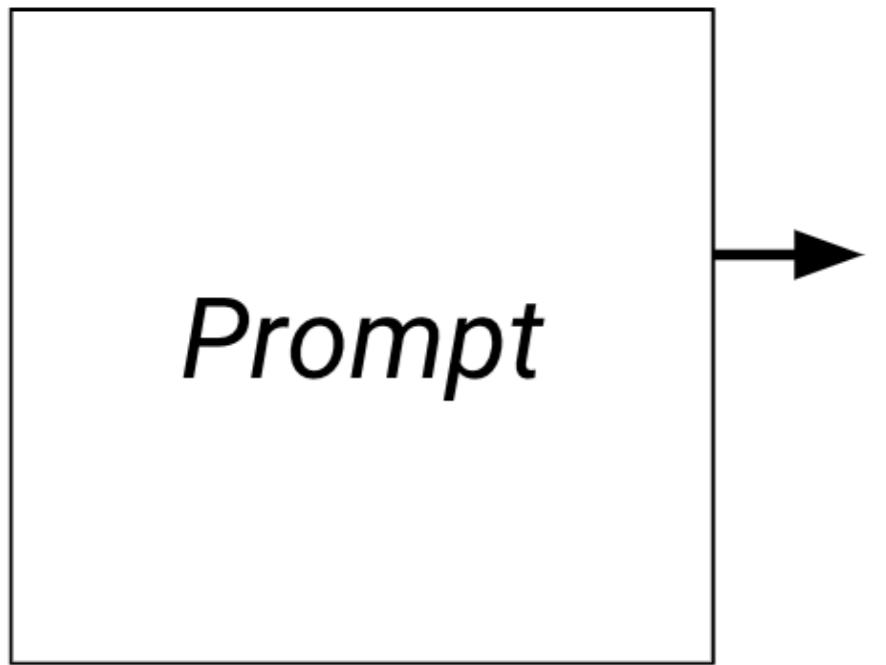
```
(function (decomp) {  
    let points = font.textToPoints(letter, x, y  
        sampleFactor: 0.1,  
        simplifyThreshold: 0,  
    ...})
```



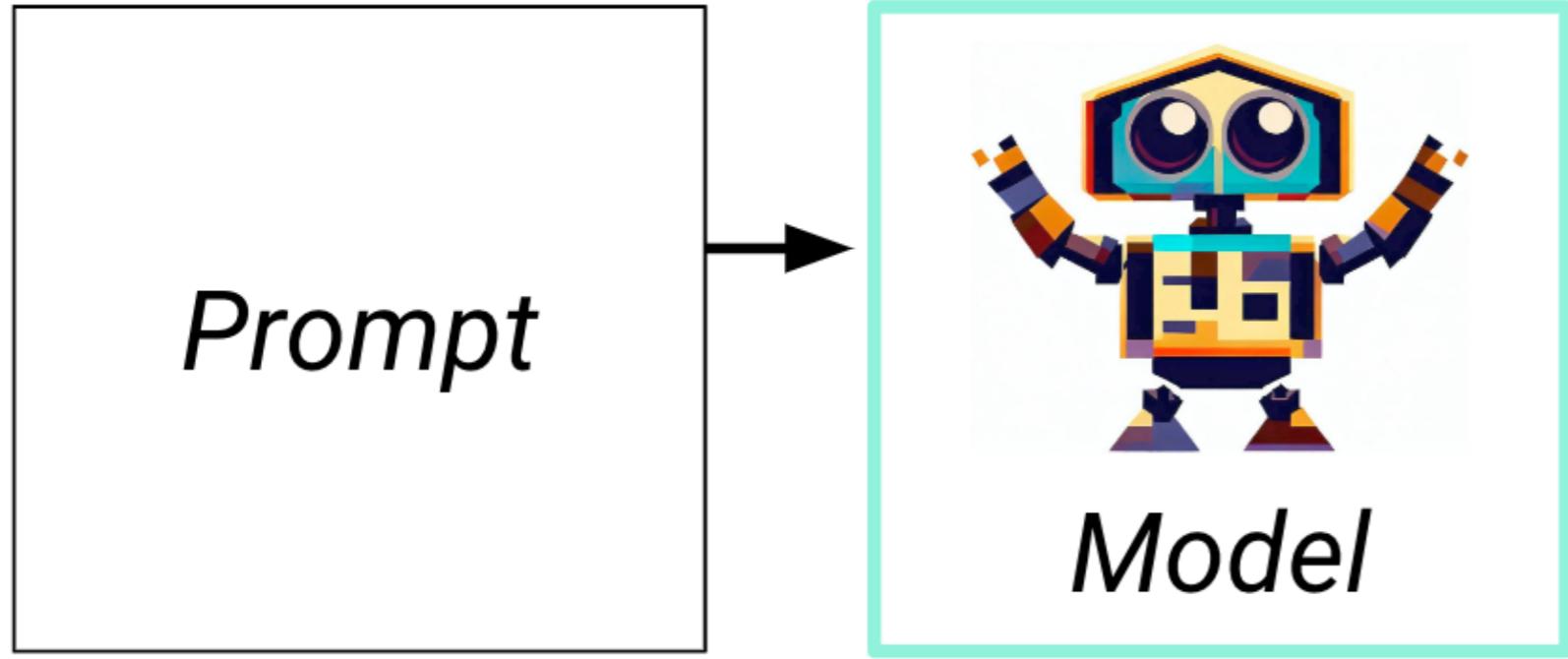
Javascript

¹ Replit Ghostwriter

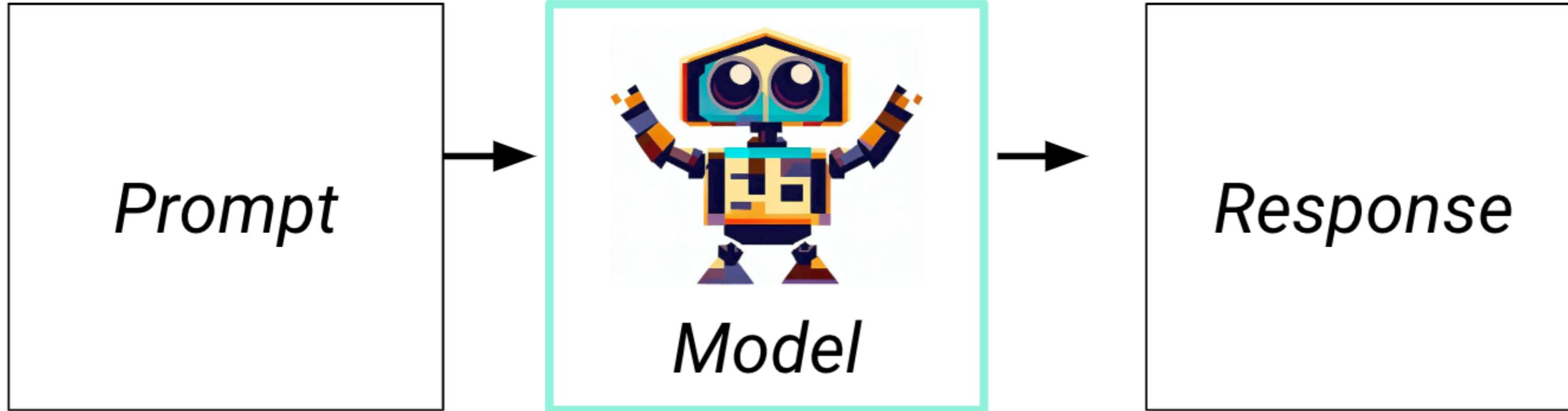
How does it work?



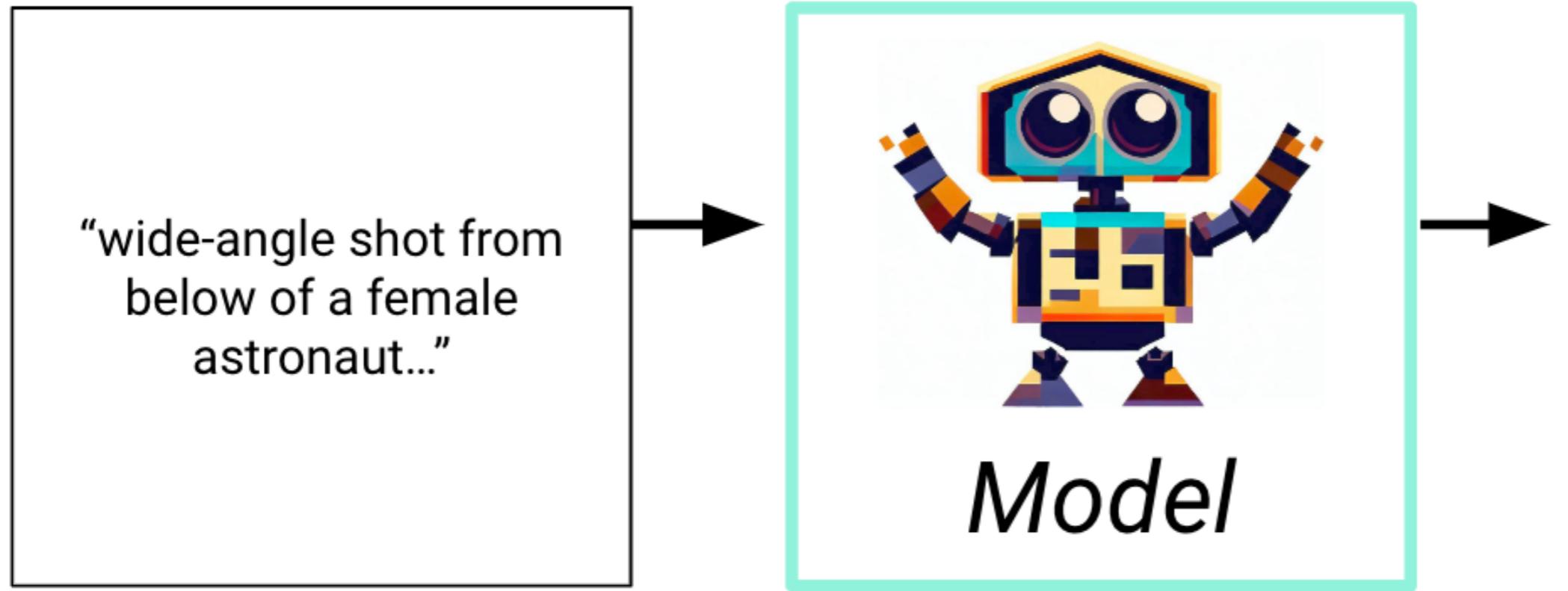
How does it work?



How does it work?

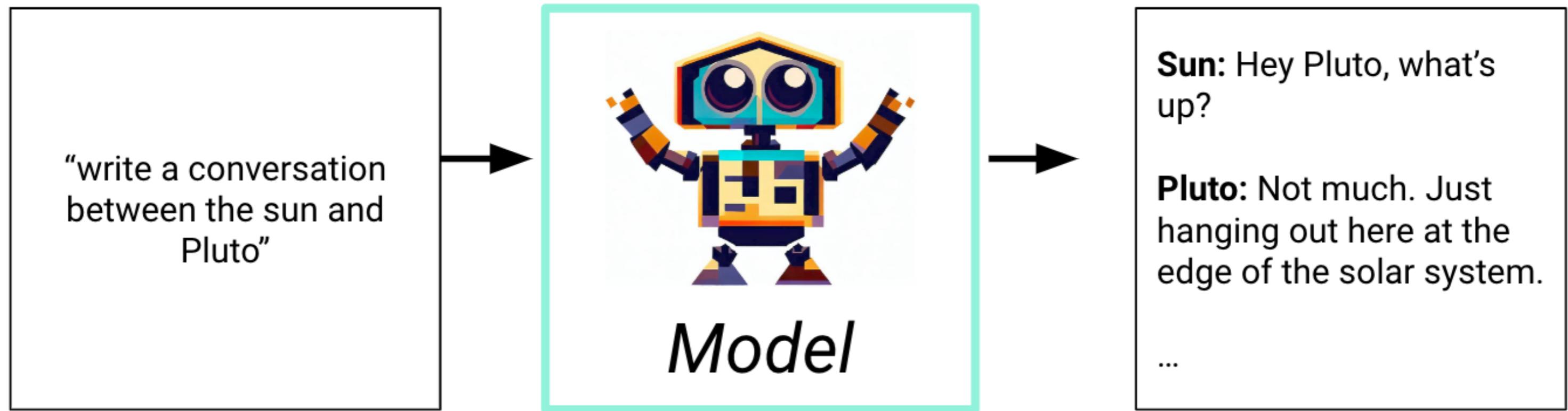


Create images



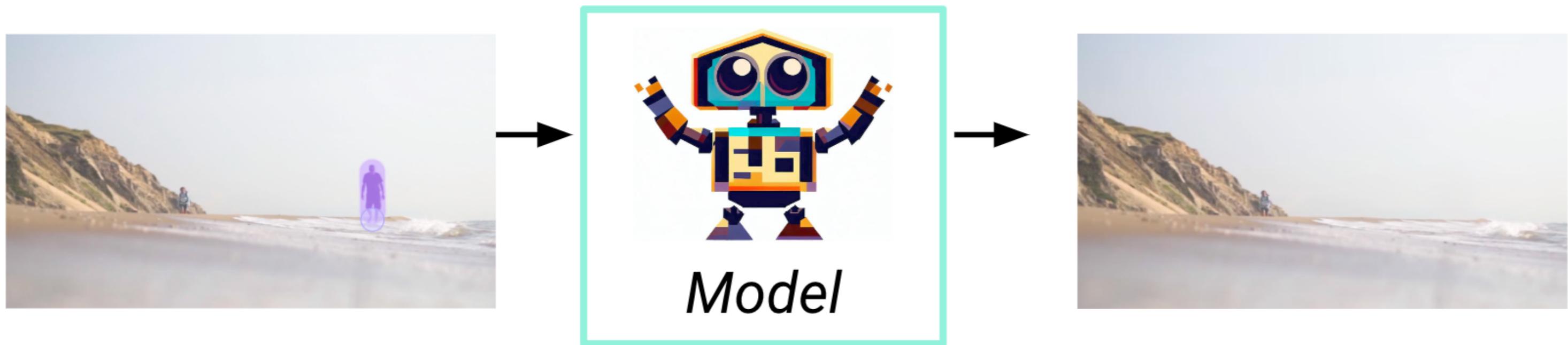
¹ Cosmopolitan Magazine using the Dall-E model

Hold conversations



¹ Facebook's LLaMA model

Input more than text



¹ Runway ML's InPainting Tool, <https://runwayml.com/inpainting/>

Real-world applications

Generative AI will impact a variety of industries and functions:

- **Sales:** draft sales outreach emails
- **Finance:** analyze financial data
- **Marketing:** generate marketing ads to test
- **Legal:** Simply explain complex regulations
- **Education:** Customize learning for individual students
- **Medical:** Read and analyze medical data
- **Industrial:** Automate repetitive tasks for industrial engineering and design
- **Games & Entertainment:** Create 3D models and scenes

The end of work?

- Lots of implementation *challenges* and *risks*
- Still, lots of **opportunity** to utilize



Course goals

We'll learn how these models:

- Generate content
- Present new legal and ethical considerations
- Impact society in the coming years

Let's practice!

GENERATIVE AI CONCEPTS

Generative AI in the machine learning landscape

GENERATIVE AI CONCEPTS



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Models that analyze

Discriminative models



- Answer closed-ended questions
- Learn from training data
- Guess correct answer or categorize



¹ Wikimedia Commons

Bagels and puppies



Puppy



Puppy



Bagel



Bagel

¹ Wikimedia Commons

Guessing with confidence

Puppy or bagel?



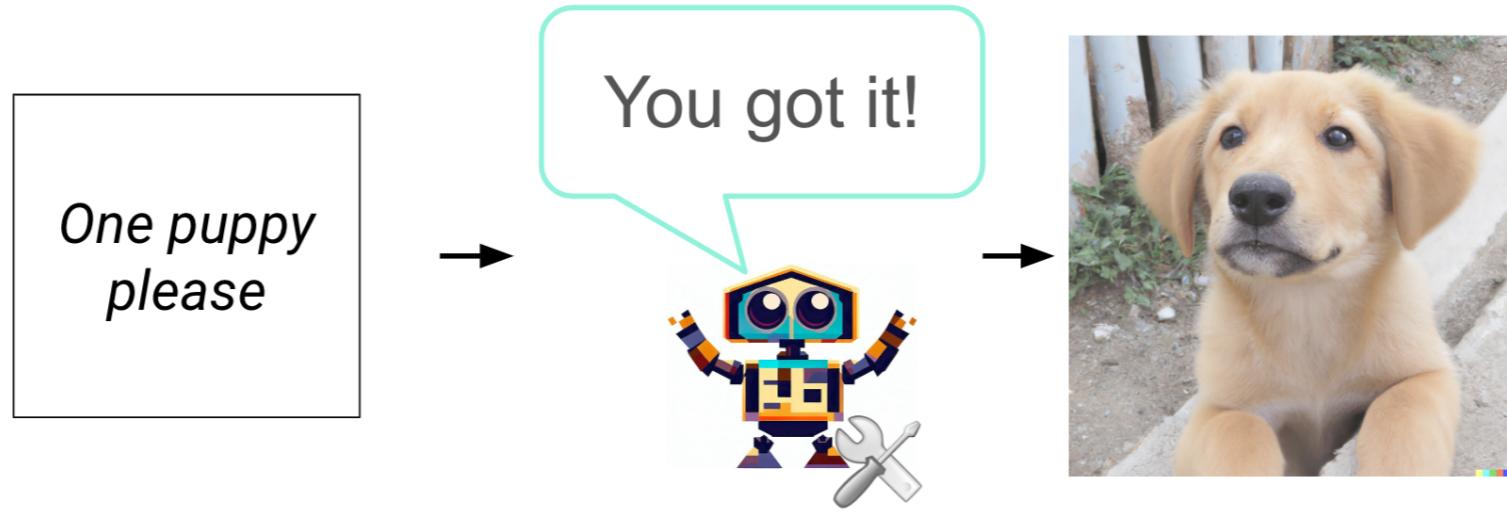
Puppy!



¹ Puppy image from DALL·E 2

Models that imagine

Generative models



- Guess data for a prediction
- Still require training
- Generate new content

¹ Puppy image from Dall-E 2

Mixing for effect

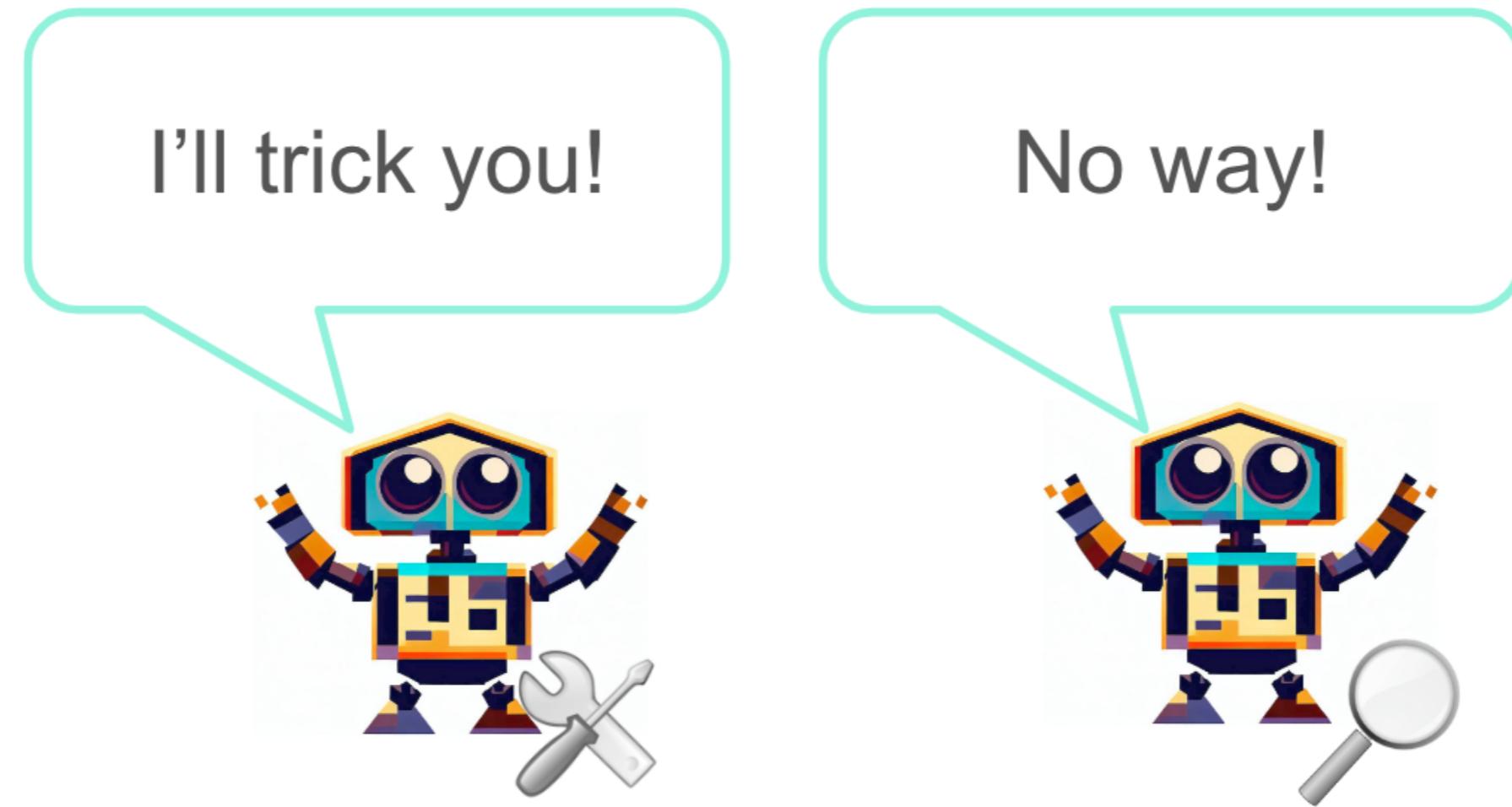
Generative AI:

- Combines generative models with other ML
- Models must work together like parts of a machine
- Produce complex creative work



¹ Cosmopolitan Magazine

Generative adversarial networks (GANs)



- Generators try to trick discriminators
- Compare notes and get better in multiple rounds

Bagel Puppy GAN

Try these!



???



¹ <https://twitter.com/teenybiscuit/media>

Artificial general intelligence (AGI)

An AI that exhibits intelligence like a human would

- Scope of knowledge
- Reasoning across domains
- Social skills
- Creative thinking
- Other cognitive competencies (vision, language)

Use the right tool for the job

Discriminative Models

- Predict tomorrow's weather
- Categorize books
- Determine if a picture is a puppy or a bagel

Generative AI

- Write code for a website
- Answer unique customer service questions
- Draw a picture of a cat scuba diving

Artificial General Intelligence

- Complete traditionally human jobs

Let's practice!

GENERATIVE AI CONCEPTS

The evolution of generative AI

GENERATIVE AI CONCEPTS



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Generative AI burst on the scene in 2023



¹ Yahoo Finance

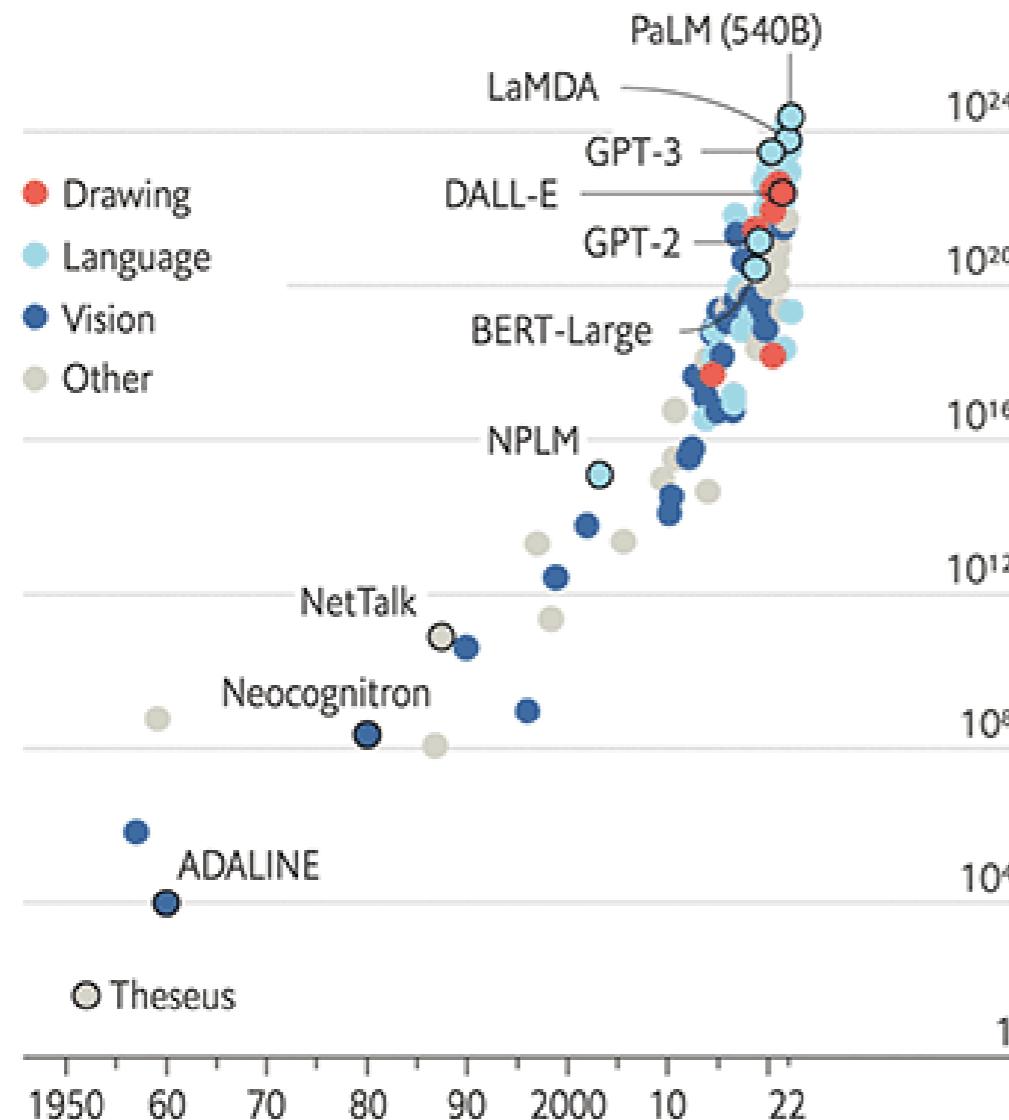
Key factors driving development

Several factors drive generative AI development:

- Computing power
- Dataset availability
- Competitive interests
- Model design

Computational power allowed large models

AI training runs, estimated computing resources used
Floating-point operations, selected systems, by type, log scale

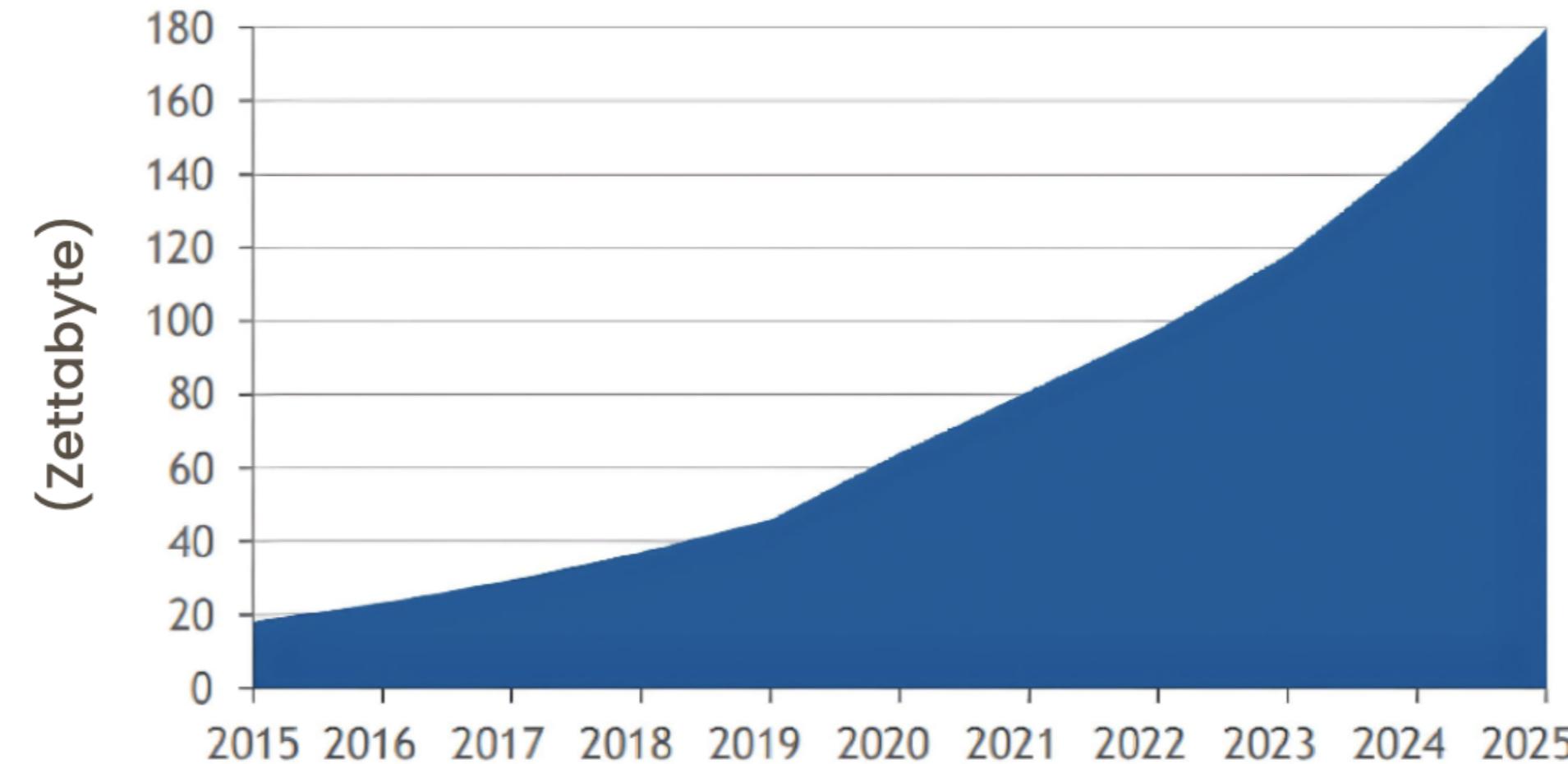


- Parallelization and specialized hardware
 - Graphics Processing Units (GPUs)
 - Tensor Processing Units (TPUs)
- Cloud computing
- Hardware-software optimization

¹ Compute Trends Across Three Eras of Machine Learning, <https://arxiv.org/abs/2202.05924>

Models improved with massive datasets

Global Datasphere Growth



¹ IDC's Global DataSphere, 2021

Competitive pressures encouraged faster development

Commercial



Political



GANs unleashed high quality generation

I'll trick you!



No way!



Transformers brought context and coherence

'it' refers to 'animal'

The
animal
didn't
cross
the
street
because
it
was
too
tired
.

'it' refers to 'street'

The
animal
didn't
cross
the
street
because
it
was
too
wide
.

¹ <https://ai.googleblog.com/2017/08/transformer-novel-neural-network.html>

Transformers brought context and coherence

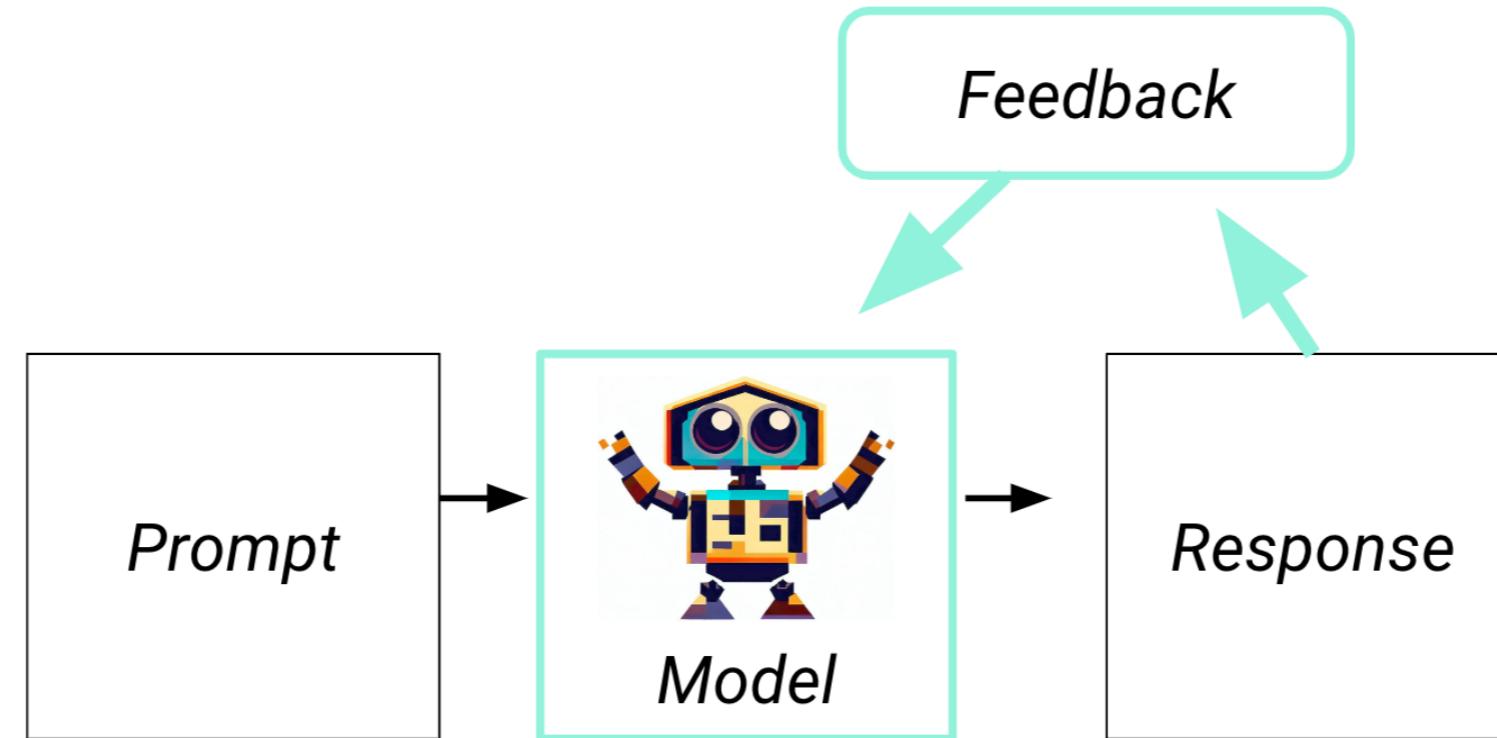
Transformers:

- Grasp the context of a given text
- Analyze relationships between words
- Generate responses that feel natural and informative

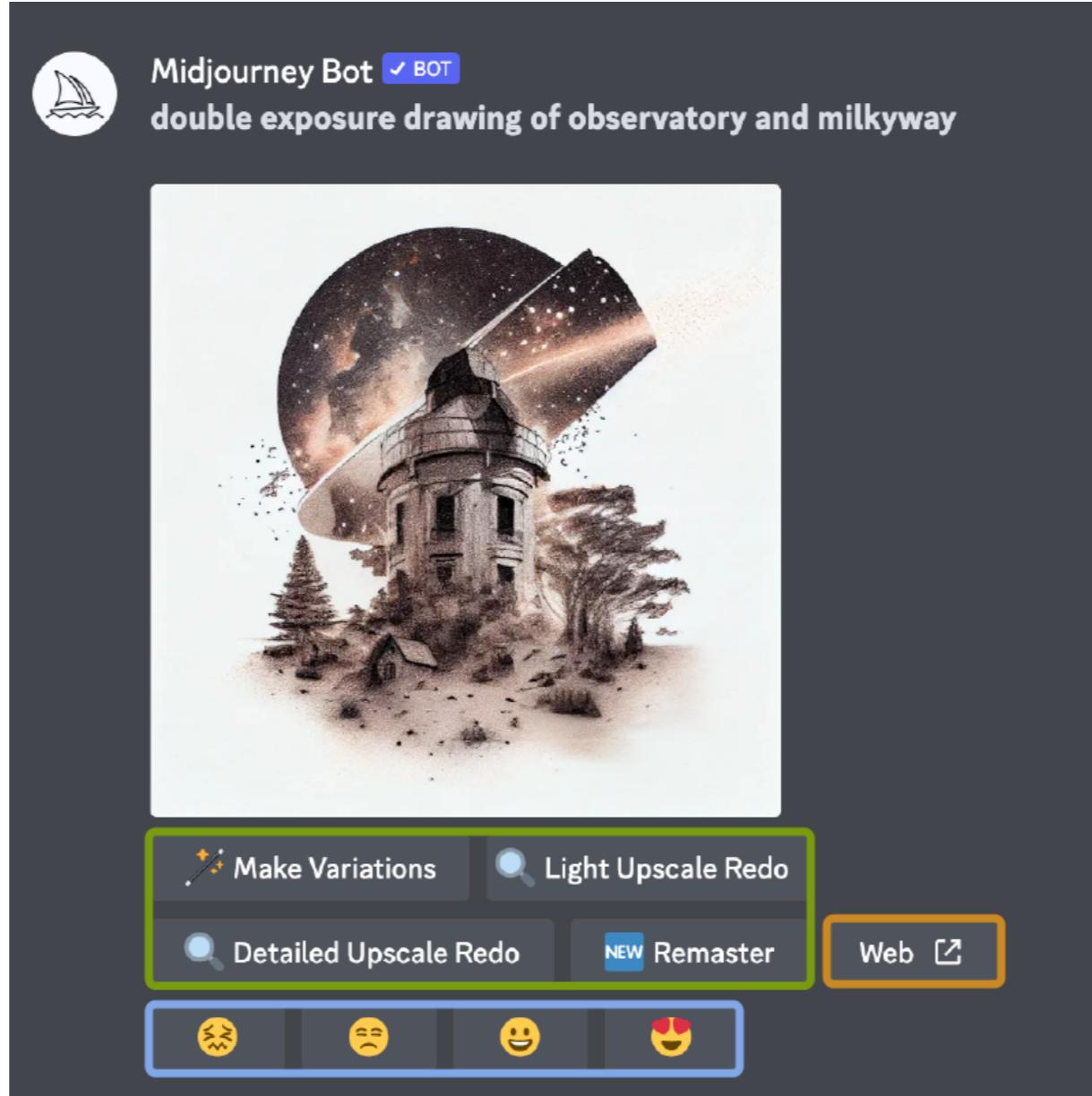
RLHF engaged user feedback

Reinforcement Learning with Human Feedback (RLHF):

- Reinforcement learning trains models through trial-and-error
- Human feedback comes from users scoring model responses



RLHF engaged user feedback



¹ Midjourney

Let's practice!

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