



Generative A.I.

PRESENTER

Alfred Whitehead,

MA, MS
EVP, Klick Applied Sciences

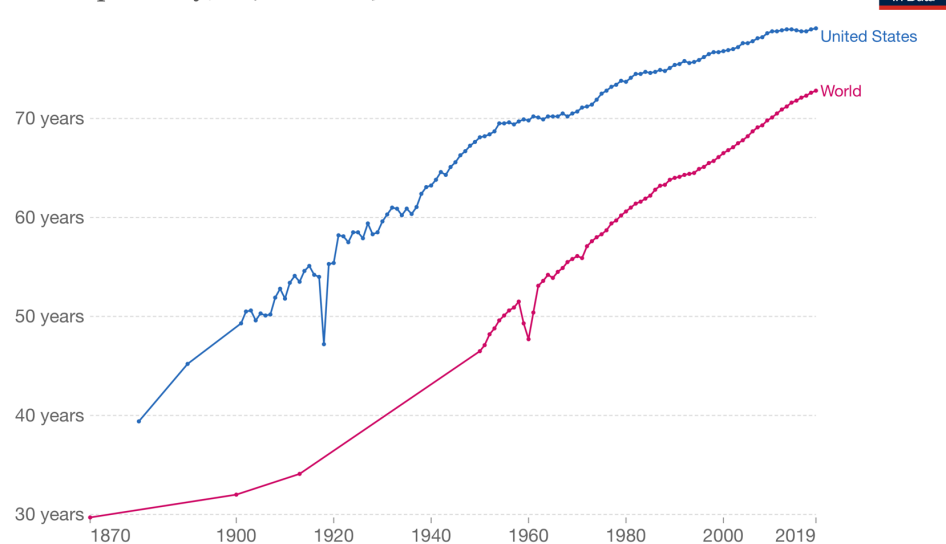
March 13, 2022

The image features a close-up of the Statue of Liberty's face, which is wearing a blue surgical mask. The statue's iconic crown with seven spikes is visible behind its head. The background is a solid red color, with two large, semi-transparent light pink circles on the left and right sides. Overlaid on the left side of the statue's face is the text "The U.S. healthcare system is sick." in a large, white, sans-serif font.

The U.S. healthcare system is sick.

US & World Life Expectancy at Birth

Life expectancy, 1870 to 2019

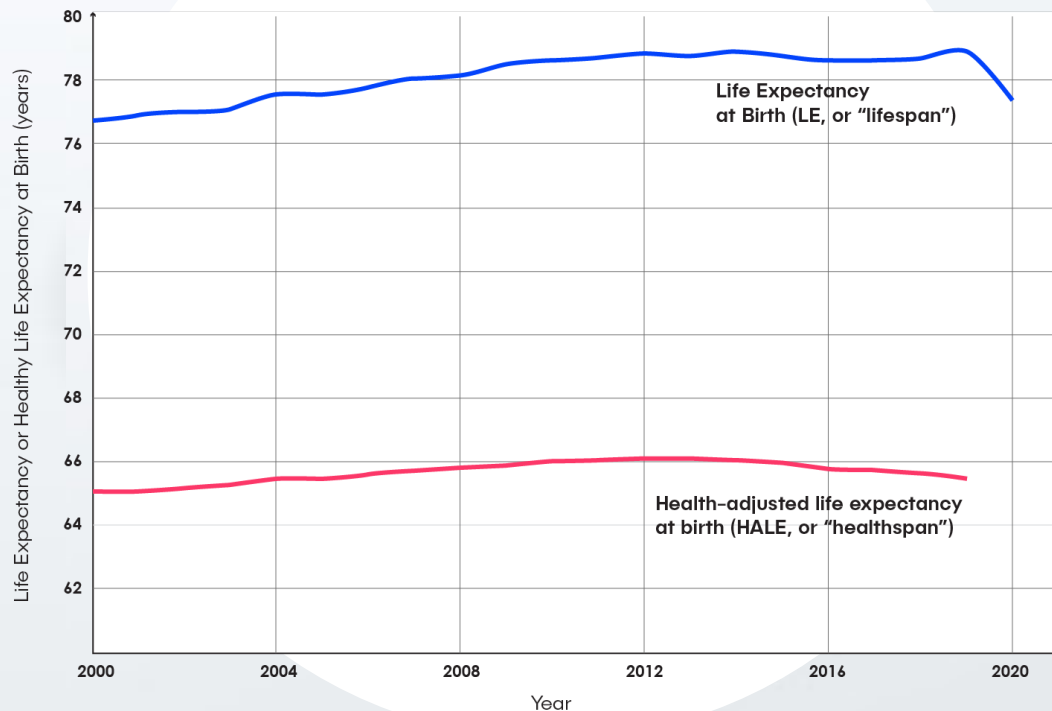


Source: UN WPP (2022); Zijdeman et al. (2015); Riley (2005)

OurWorldInData.org/life-expectancy • CC BY

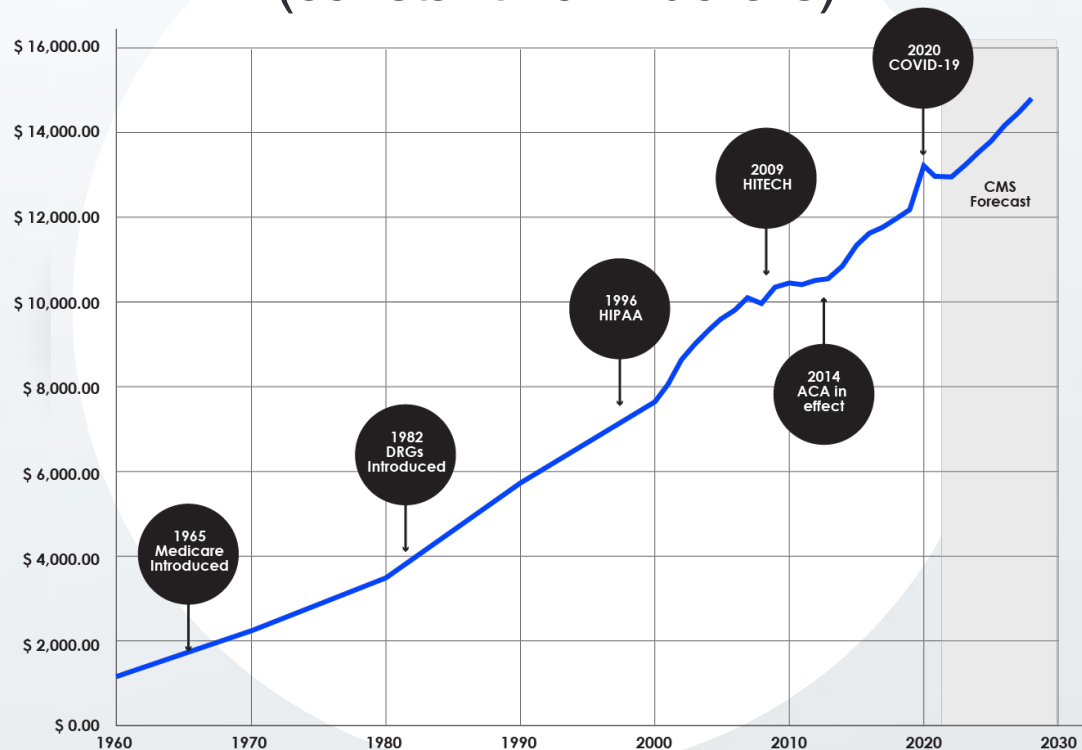
Note: Shown is the 'period life expectancy'. This is the average number of years a newborn would live if age-specific mortality rates in the current year were to stay the same throughout its life.

US Life Expectancy and Healthy Life Expectancy at Birth



Source: Global Burden of Disease Study, IHME

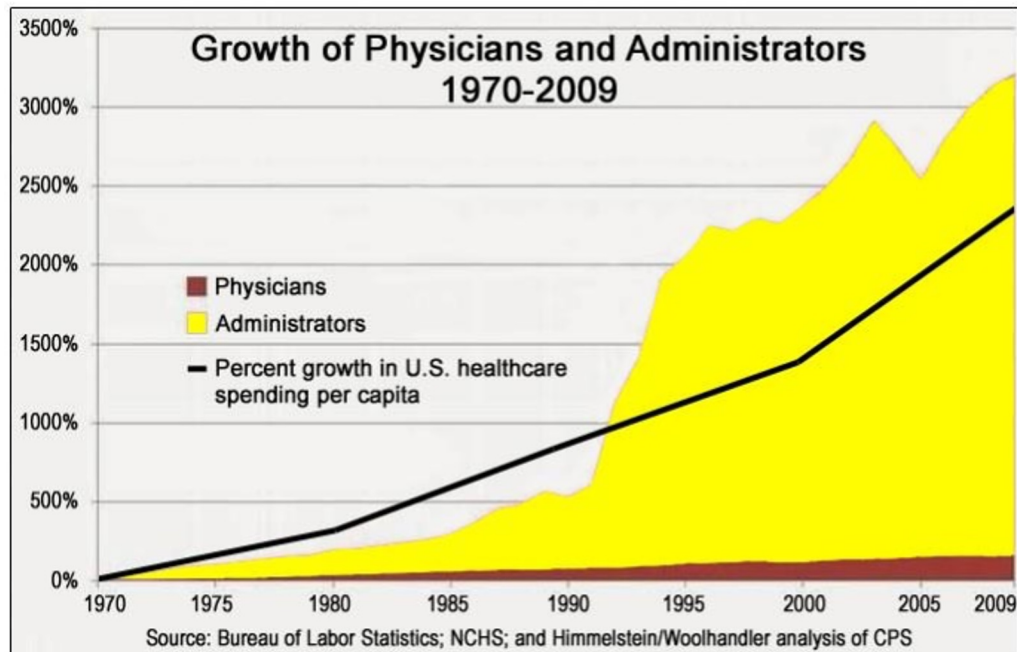
Per Capita National Health Expenditure (constant 2021 dollars)



Source: National Health Expenditure Data, CMS



**Where is
the money
going?**



* 2300% increase
in U.S. healthcare
spending per capita
between 1970-2009
(Source: Health
Care Costs: A Primer,
The Henry J. Kaiser
Family Foundation)

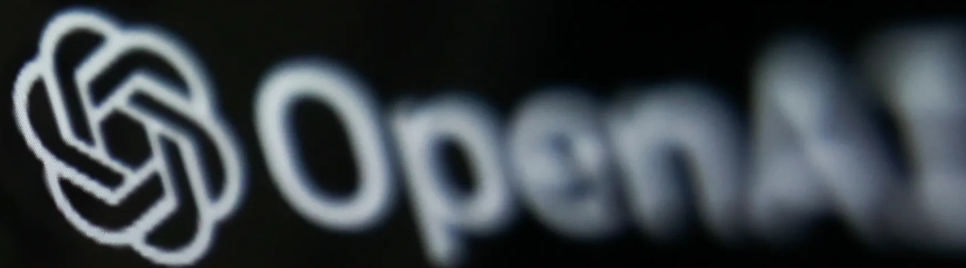
Physicians spend
only 33% of their time
on clinical work.

49% is spent on EHR
and desk work,

OF WHICH 3/4ths
IS DOCUMENTATION.

Physician burnout
is at an all-time high.

ChatGPT



+ New chat

ChatGPT



Examples

"Explain quantum computing in simple terms" →

"Got any creative ideas for a 10 year old's birthday?" →

"How do I make an HTTP request in Javascript?" →



Capabilities

Remembers what user said earlier in the conversation

Allows user to provide follow-up corrections

Trained to decline inappropriate requests



Limitations

May occasionally generate incorrect information

May occasionally produce harmful instructions or biased content

Limited knowledge of world and events after 2021

👤 Upgrade to Plus

NEW

⚙️ Light mode

🔗 Updates & FAQ

🚪 Log out



[ChatGPT Feb 13 Version](#). Free Research Preview. Our goal is to make AI systems more natural and safe to interact with. Your feedback will help us improve.



chat.openai.com

Trending ▲

- Certificate of Medical Necessity >
- Referral Thank You Note >
- Post-Colonoscopy Instructions >
- Letter of Rec for Med Student >

Clinical Correspondence

Charting ▼

Patient Education ▼

Miscellaneous ▼



doximity.com/docs-gpt

Cut the Scut

The free ChatGPT collaborative for doctors & staff



Made for Medicine

Premium access (no wait), trained on healthcare-specific prose.



Shared Wins

See our growing library of best medical prompts



Fax + Directory

No toner or hunting for the right fax line. Just click to the right.

Tap on prompt library or type here.

Give It a Try

Please do not include patient-identifiers or other PHI in prompts

- Aetna**
1-833-596-0339
- Anthem**
1-800-754-4708
- Cigna**
1-615-401-4642
- Health Net**
1-800-281-2999
- Humana**
1-888-556-2128
- Magellan Health**
1-888-656-1060
- Molina Healthcare**
1-315-234-9812
- UnitedHealthcare**
1-801-994-1082
- WellCare**
1-866-201-0657

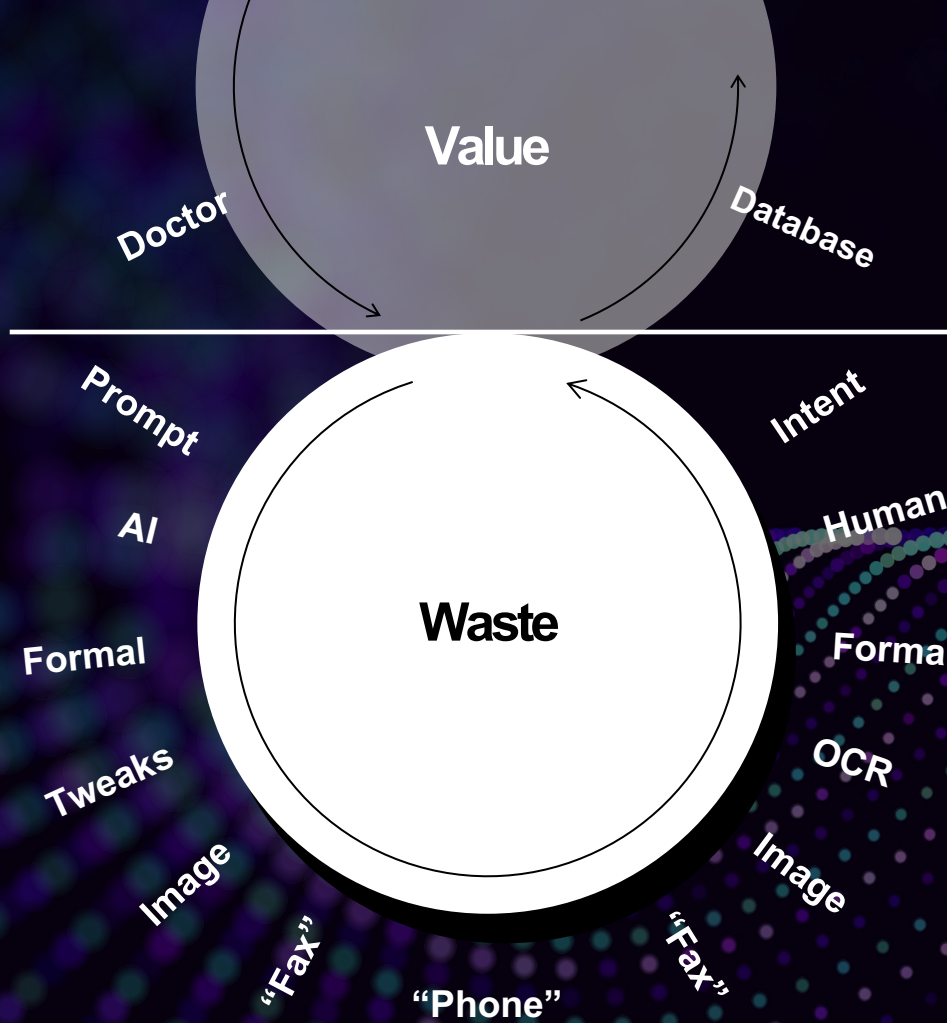
Doximity members can fax letters directly to insurers using our digital fax service. To enter Doximity's HIPAA compliant environment, log in using the button below. From there, you can review and edit the contents of your fax, add your patient's details, and send directly to the appropriate insurer. Since the letter content is AI-generated, please make sure to review and ensure accuracy before you submit. Go ahead, use as much as you like.

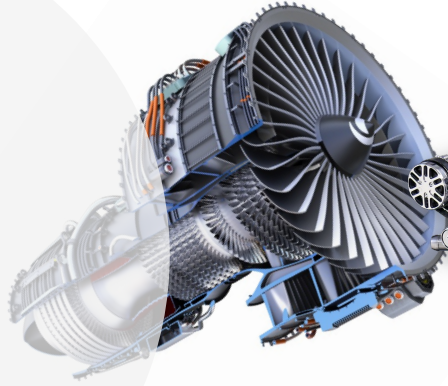
Send via Doximity Fax

Sign In with Doximity



Let's back up a bit...





jet engine




car engine



bicycle



horse riding the bike

A close-up, low-angle shot of the Statue of Liberty's head and crown. The statue is wearing a blue surgical mask with white ear loops. The background is a solid red color with large, light pink circular shapes on the left and right sides. The text "The healthcare system is sick." is overlaid in white, bold, sans-serif font on the left side of the image.

The healthcare system is sick.



OUR NATIONAL DEBT: YOUR NATIONAL DEBT: *Family share* THE NATIONAL DEBT CLOCK

**So is
Generative
A.I. a dead
end in
medicine?**



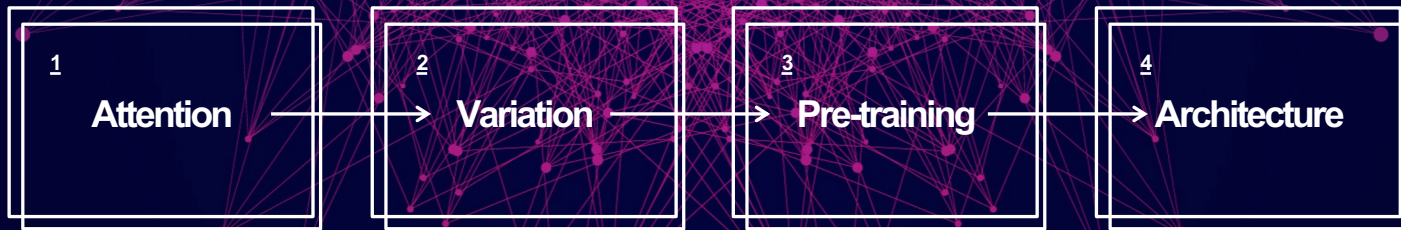
So is
Generative
A.I. a dead
end in
medicine?

YES.
... at least this way

DEAD
END

Why is ChatGPT Different?

The Four Innovations



Attention Is All You Need

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GEN AI

1

Attention

→

2

Variation

→

3

Pre-training

→

4

Architecture

**Attention
= a new way
to handle
sequences
of data.**

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Jakob Uszkoreit*
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usz@google.com

GEN AI

1

Attention

2

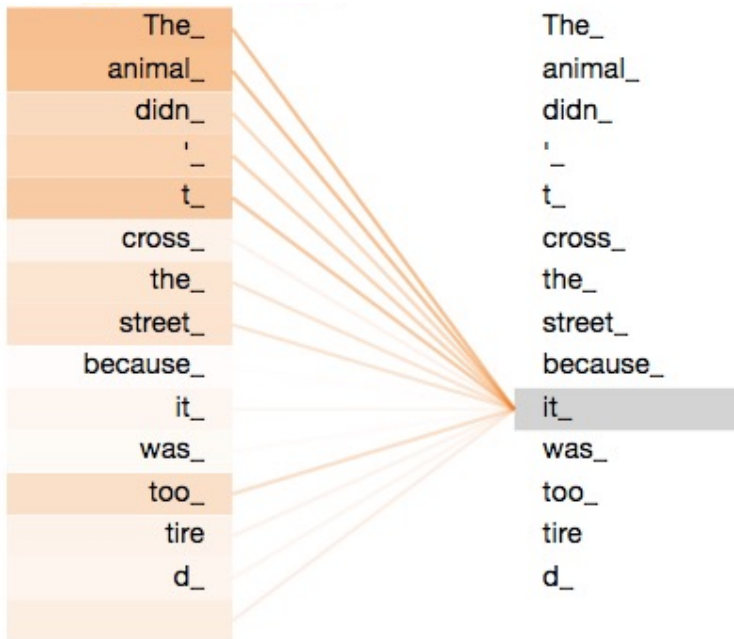
Variation

3

Pre-training

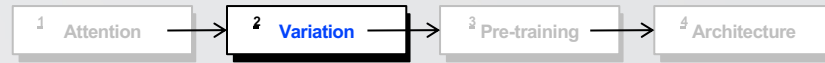
4

Architecture

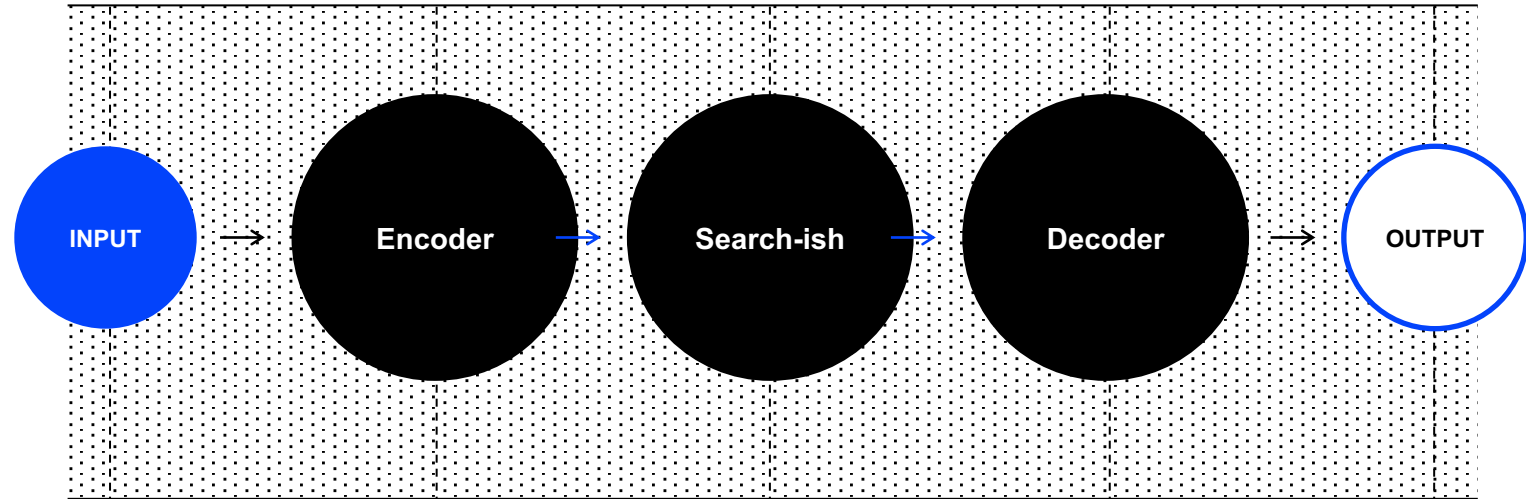


Context is king.

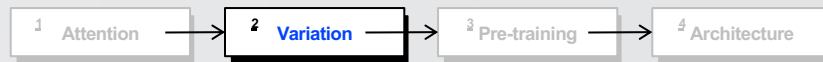
GEN AI



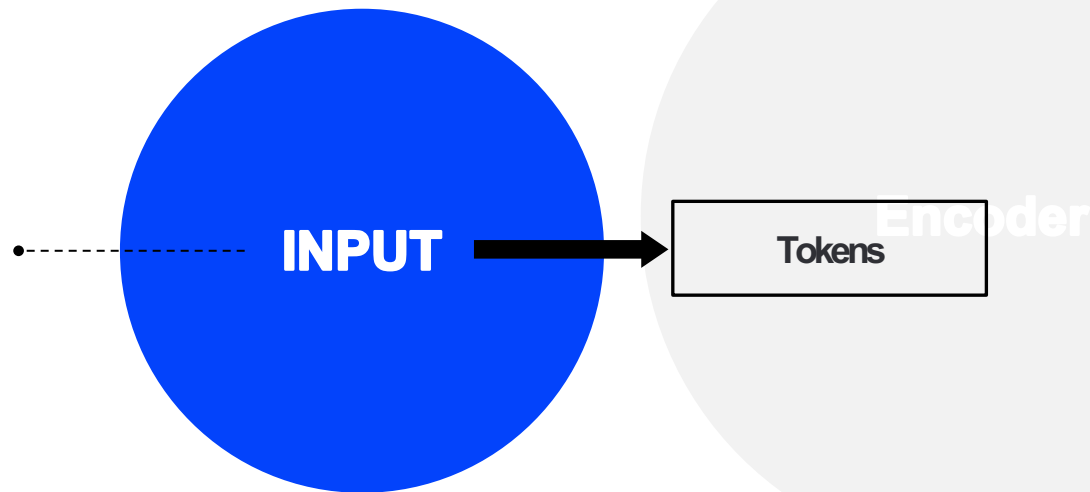
HEAVILY SIMPLIFIED, GPT-LIKE AI MODEL



GEN AI



Turn the
prompt input
into a sequence
of “tokens”



GEN AI

1 Attention

2 Variation

3 Pre-training

4 Architecture

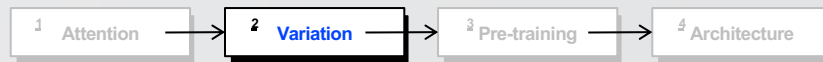
Tokens

IN ENGLISH





Encoder

Encodes
“tokens” in
embedded
vector space

GEN AI



Encoder

 **Queen** -  **Woman** +  **Man** ~ =  **King**
(close to Prince and Duke)

Example

GEN AI

1 Attention

2 Variation

3 Pre-training

4 Architecture

This “search engine” lands on one value

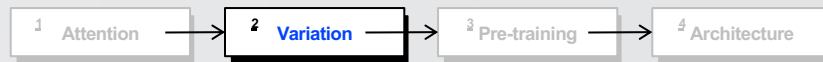
Encoder

Search-ish

Decoder

Not always the “top one”

GEN AI



Playground

Load a preset...

Save

View code

Share

...

Explain chronic kidney disease to me like I was a 5 year old

Chronic kidney disease is when your kidneys don't work as well as they should. Your kidneys are like two filters that help keep your body healthy. When you have chronic kidney disease, your filters don't work as well, so your body can't get rid of bad stuff like it should. That can make you feel sick.

Looking for ChatGPT? [Try it now](#)

Submit



Mode



Model

text-davinci-003

Temperature

0

Maximum length

256

Stop sequences

Playground

Load a preset...

Save

View code

Share

...

Explain chronic kidney disease to me like I was a 5 year old

Chronic kidney disease is like a broken car. When your kidneys are healthy, they work like a finely tuned engine and make sure your body works like it should. When you have chronic kidney disease, it's like the engine in the car is not working very well, so it can't get your body where it needs to go. That's why it's very important for people with chronic kidney disease to take care of themselves.

Looking for ChatGPT? [Try it now](#)

Submit



Mode



Model

text-davinci-003

Temperature

1

Maximum length

256

Stop sequences

GEN AI

1 Attention

2 Variation

3 Pre-training

4 Architecture

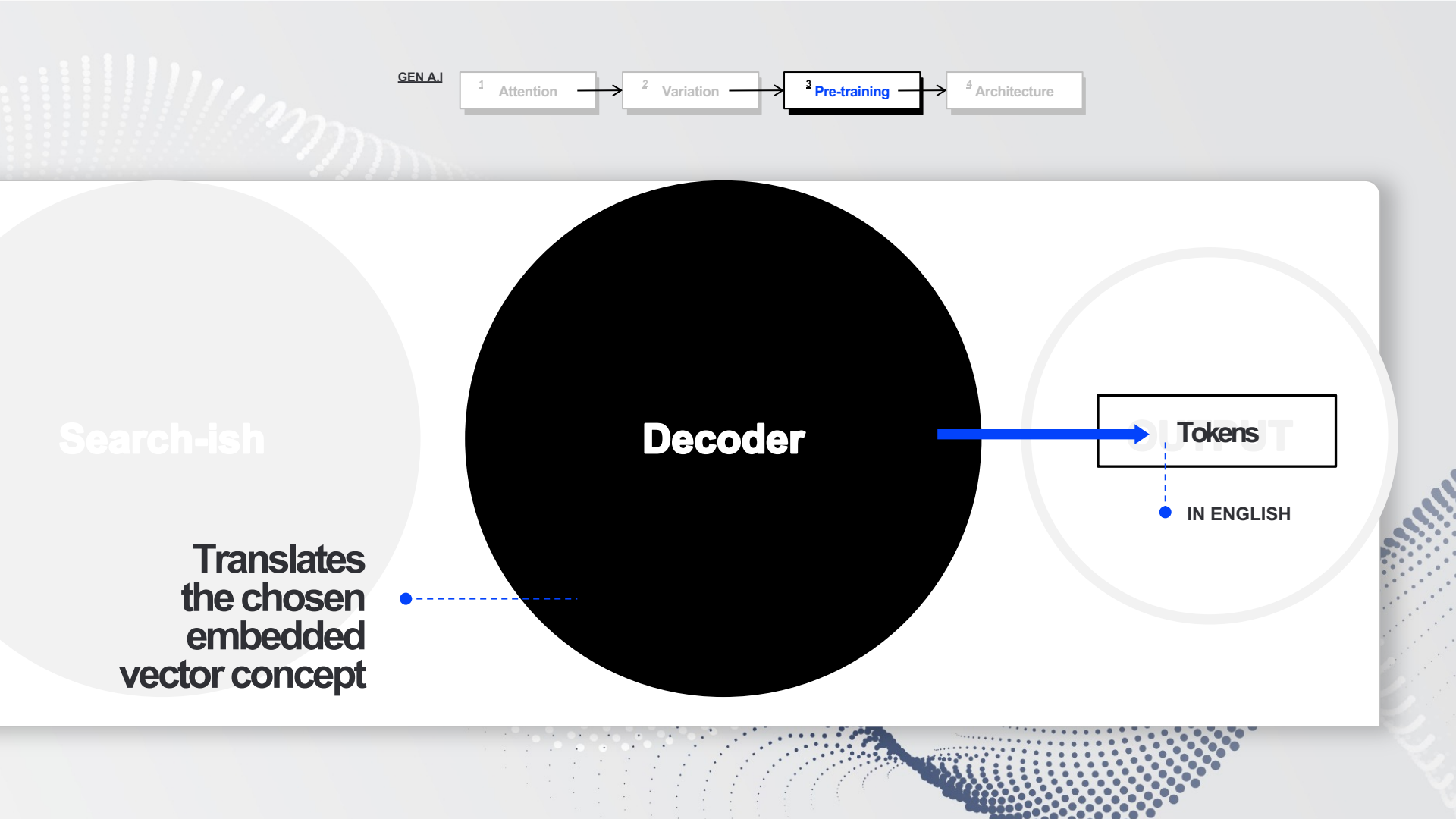
Search-ish

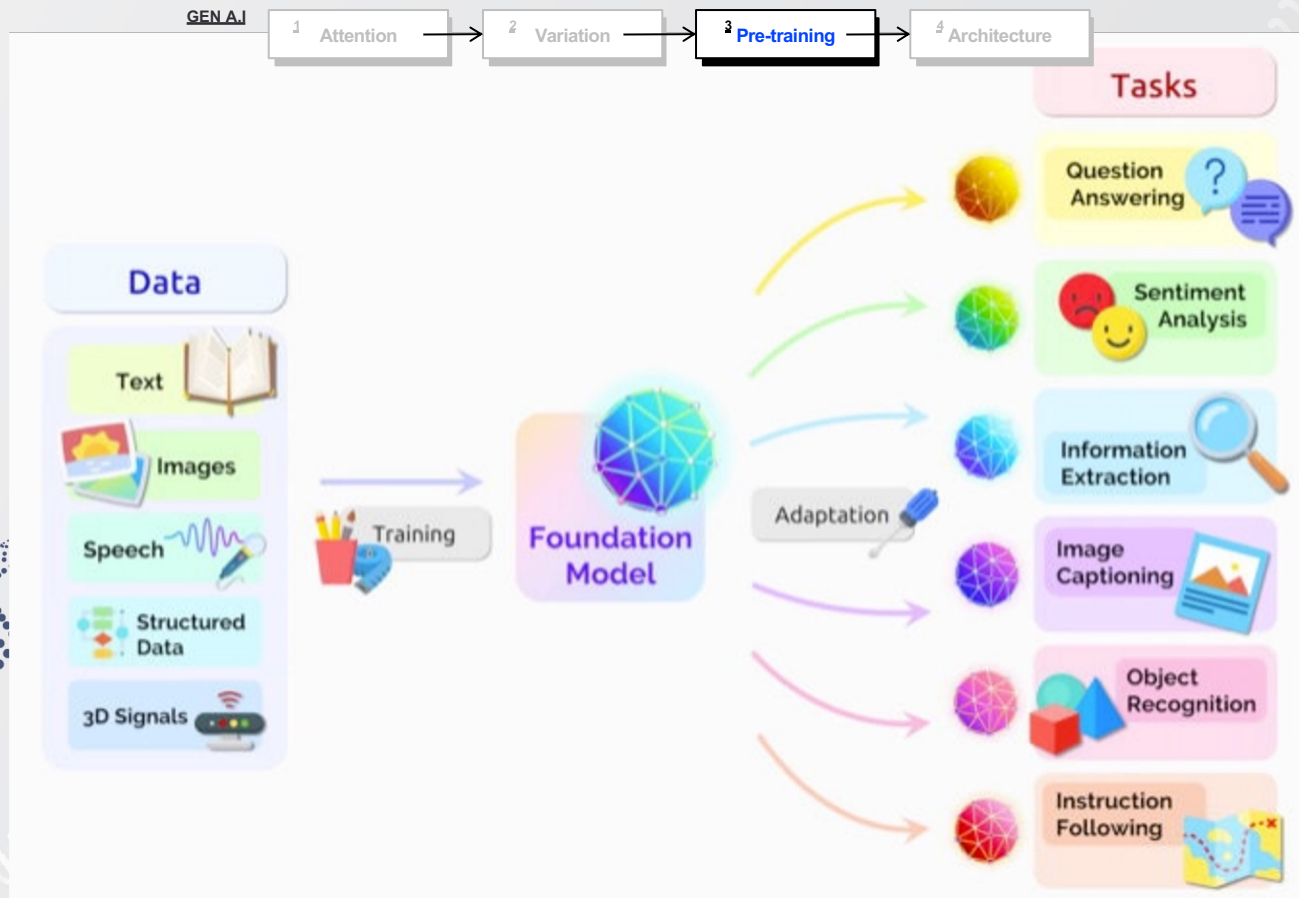
Translates
the chosen
embedded
vector concept

Decoder

Tokens

IN ENGLISH





GEN AI

1

Attention

2

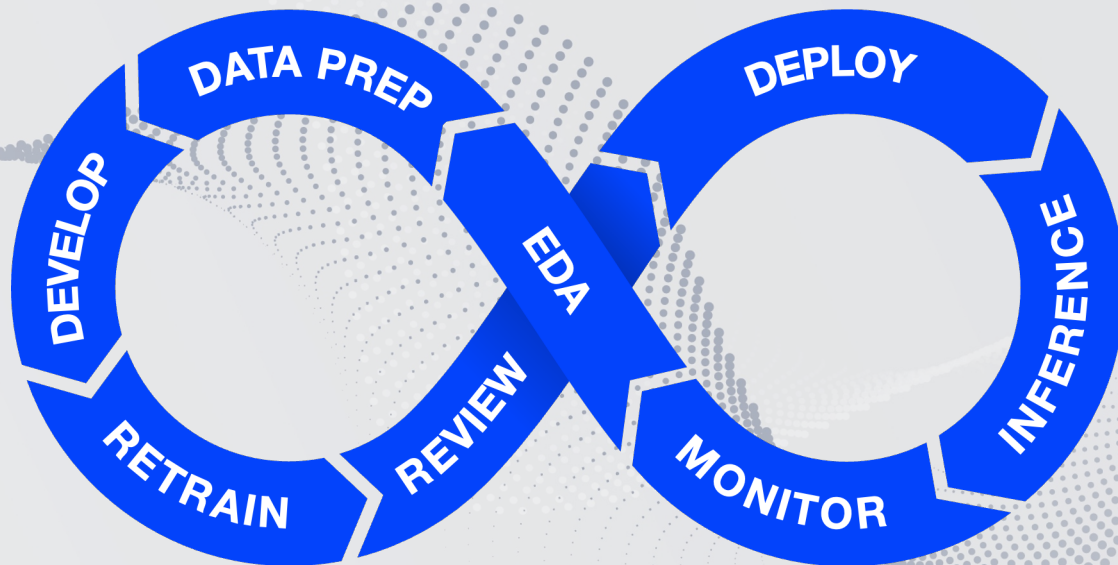
Variation

3

Pre-training

4

Architecture



MLOps Cycle

Less training data
Less labelling
Faster turnaround

GEN AI

1

Attention

2

Variation

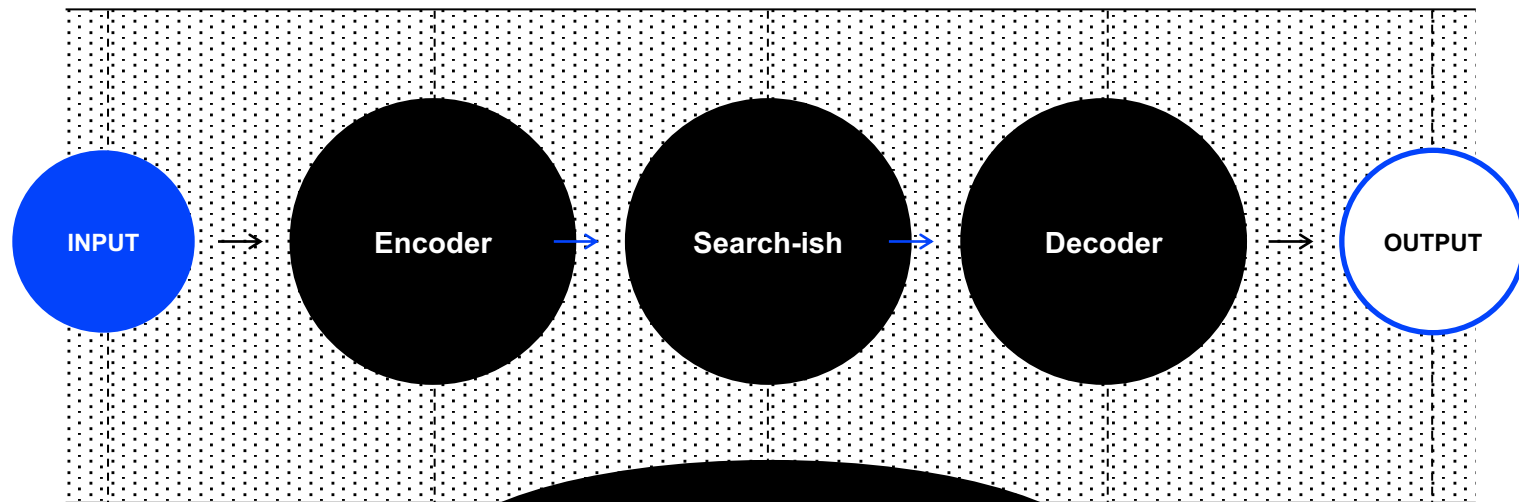
3

Pre-training

4

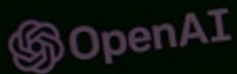
Architecture

HEAVILY SIMPLIFIED, GPT-LIKE AI MODEL



**Sequence to Sequence
seq2seq**

ChatGPT is text2text.



ChatGPT: Optimizing Language Models for Dialogue

We've trained a model called ChatGPT which interacts in a conversational way. The dialogue format makes it possible for ChatGPT to answer followup questions, correct mistakes, challenge incorrect premises, and ChatGPT is a sibling model



ChatGPT



Examples

"Explain quantum computing in simple terms" →

"Got any creative ideas for a 10 year old's birthday?" →

"How do I make an HTTP request in Javascript?" →



Capabilities

Remembers what user said earlier in the conversation

Allows user to provide follow-up corrections

Trained to decline inappropriate requests



Limitations

May occasionally generate incorrect information

May occasionally produce harmful instructions or biased content

Limited knowledge of world and events after 2021

Write after care instructions for surgery that include cleaning the wound, using pain killers, and changing the bandage|



Playground

Load a preset...

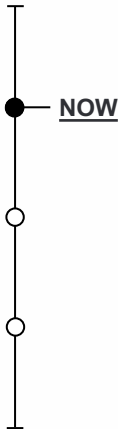
Save

View code

Share

...

Write a tagline for an ice cream shop.



Mode



Model

text-davinci-003

Temperature

0.7

Maximum length

256

Stop sequences

Enter sequence and press Tab

Top P

1

Frequency penalty

0

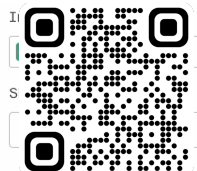
Presence penalty

0

Best of

1

platform.openai.com/
playground



Looking for ChatGPT?

[Try it now](#)

Submit



0

[Overview](#)[Documentation](#)[Examples](#)[Playground](#)[Upgrade](#)[Help](#)[Personal](#)

Playground

Load a preset...

Save

View code

Share



Input

Understanding Kidney Disease

It is estimated that kidney disease affects 31 million people in the United States alone, and globally 1 in 10 people have some form of kidney disease. Also called renal disease, kidney disease is the general term for damage that reduces function of the kidney. Chronic kidney disease (CKD) occurs when kidneys are no longer able to clean toxins and waste product from the blood and perform their functions to full capacity. This can happen all of a sudden or over time.1 Chronic kidney disease (CKD) has five distinct stages.

Every day, our two kidneys filter about 120 to 150 quarts of blood to produce about 1 to 2 quarts of urine, composed of wastes and extra fluid.2 Healthy kidneys help regulate blood pressure, remove waste and water, signal your body to make red blood cells, and help regulate growth in children.

In addition to the different phases of chronic kidney disease, or CKD (listed below), there are different types of kidney disease, with different causes and requiring different treatments. NKI and this website provide detailed information about the diseases that cause Nephrotic Syndrome (NS) and Focal Segmental Glomerulosclerosis (FSGS).

Five Stages of Kidney Disease

The National Kidney Foundation (NKF) created a guideline to help doctors identify each level of kidney disease. The NKF divided kidney disease (CKD) into five stages. Identifying the stage of kidney disease a person is in helps health care practitioners provide the best care, since each stage requires different treatment.

To understand each stage, we must first understand how kidney function is measured. The universally accepted measure of kidney function is the Glomerular Filtration Rate (GFR). Kidney function is measured by how effectively your kidneys clean your blood. The main way of estimating GFR is a blood test to determine the level of Creatinine in the blood, or serum creatinine. As kidney function declines, the levels of creatinine increase.

An equation is used to determine GFR. In addition to serum creatinine, factors such as age, race, and gender are included in the equation. Additional factors that may be included are weight, blood urea, and others.

Instructions

Summarize this text for a child

Submit



← Use as input

Mode



Model

text-davinci-edit-001

Temperature

0

Stop sequences

Enter sequence and press Tab

Top P

1

Understanding Kidney Disease:

Kidney disease is a condition that affects the kidneys.

The kidneys are two bean-shaped organs, each about the size of a fist. They are located just below the rib cage, one on each side of the spine. Every day, the two kidneys filter about 120 to 150 quarts of blood to produce about 1 to 2 quarts of urine, composed of wastes and extra fluid.

Healthy kidneys help regulate blood pressure, remove waste and water, signal your body to make red blood cells, and help regulate growth in children.

Kidney disease is the general term for damage that reduces function of the kidney. Chronic kidney disease (CKD) occurs when kidneys are no longer able to clean toxins and waste product from the blood and perform their functions to full capacity. This can happen all of a sudden or over time.1 Chronic kidney disease (CKD) has five distinct stages.

In addition to the different phases of chronic kidney disease, or CKD (listed below), there are different types of kidney disease, with different causes and requiring different treatments.

Five Stages of Kidney Disease:

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Stage 1: Kidney damage with normal or high GFR (GFR > 90 mL/min)

Stage 2: Kidney damage with mild decrease in GFR (GFR = 60-89 mL/min)

Stage 3: Moderate decrease in GFR (GFR = 30-59 mL/min)

Stage 4: Severe decrease in GFR (GFR = 15-29 mL/min)

Stage 5: Kidney failure (GFR < 15 mL/min)



Editing is free while in beta. We'd love your feedback.

platform.openai.com/
playground



Explain chronic kidney disease in the style of a Shakespearean sonnet



Oh, harken! Harken to this tale I sing,
Of kidneys, noble organs, so serene,
Whose function vital, like a potent king,
Keeps life in balance, like a steady stream.

Yet, lo! Alas, a malady doth lurk,
A chronic curse that doth the kidneys harm,
Its name be known, a sorrowful dirge,
"Chronic Kidney Disease" it doth alarm.

This scourge, it starts so small, so hard to see,
But o'er the years it doth its toll exact,
As kidneys weaken, lose their potency,
And waste and fluids do in them impact.

So, heed this warning, lest ye suffer woe,
Take care of kidneys, like a precious bow.



Explain chronic kidney disease in the style of Flava Flav



Yo, yo, yo, what's up, everybody? It's your boy, Flava Flav, and today we're gonna talk about something serious - chronic kidney disease.

Now, listen up, because this is important. Chronic kidney disease happens when your kidneys can't filter waste products from your blood like they're supposed to. That means all the bad stuff stays in your body, and you can get sick.

And let me tell you, chronic kidney disease is no joke. It can lead to high blood pressure, anemia, nerve damage, and even heart disease. That's why it's so important to take care of your kidneys, my friends.

So, what can you do to keep your kidneys healthy? Well, first off, you gotta stay hydrated. Drink plenty of water, juice, and other fluids to keep your kidneys working properly. And watch your diet - too much salt and sugar can damage your kidneys over time.





Explain chronic kidney disease in French



La maladie rénale chronique (MRC), également appelée insuffisance rénale chronique, est une maladie qui affecte les reins. Elle se caractérise par une perte progressive et irréversible de la fonction rénale au fil du temps. Les reins sont des organes vitaux qui filtrent les déchets et l'excès de liquide dans le sang, produisent des hormones qui régulent la pression artérielle et stimulent la production de globules rouges. Lorsque les reins ne fonctionnent pas correctement, les déchets et les fluides s'accumulent dans le corps, ce qui peut causer des problèmes de santé graves. Les symptômes de la MRC peuvent inclure la fatigue, la perte d'appétit, des nausées, des vomissements, des démangeaisons, des douleurs osseuses et articulaires, une anémie, des troubles du sommeil, une pression artérielle élevée et une rétention d'eau. Il existe plusieurs facteurs de risque pour la MRC, notamment le diabète, l'hypertension artérielle, l'obésité, l'âge avancé, les maladies cardiaques et la consommation excessive d'alcool. Le traitement de la MRC vise à ralentir la progression de la maladie et à prévenir les complications. Cela peut inclure des changements alimentaires, une activité physique régulière, la gestion de la pression artérielle et du diabète, ainsi que des médicaments pour soulager les symptômes et prévenir les complications. Dans les cas les plus graves, une dialyse ou une transplantation rénale peut être nécessaire pour remplacer la fonction rénale perdue.



NOW



A conceptual diagram using an iceberg in a blue ocean to represent data. The visible tip of the iceberg is on the left, and its much larger, submerged reflection is on the right. A vertical bracket on the left side of the image spans the height of the visible tip. To the right of this bracket, the text 'text2text' is written in a bold, black, sans-serif font. Below the waterline, on the right side, the number '2' is centered above a horizontal line.

text2text

2

TEXT

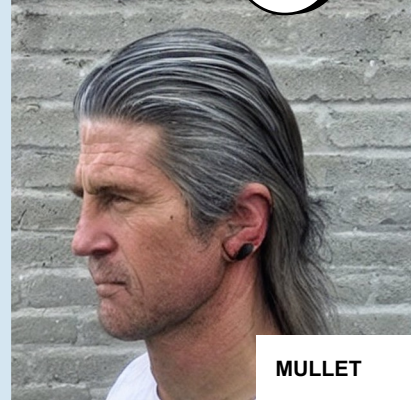


2



IMAGE

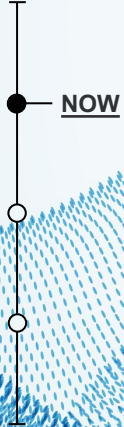
a woman undergoing kidney dialysis - @freealf (fast)



MULLET



MULLET IN
THE STYLE
OF A CAR



midjourney.com



stable diffusion web



IMAGE



2



IMAGE

NOW

DALL-E History Collections

< Edit image

Edit A painting on a wall that includes a border colli

Describe the entire desired image, not just the erased area

Generation frame: 1024 x 1024

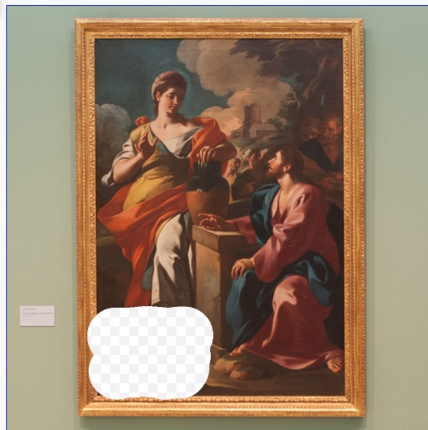


Image editing is now in beta.

Erase part of the image to edit, or add a generation frame to extend the image.

While this is in beta the full images won't be saved, so consider downloading often to save your work.

Undo



app.py > ...

```
55     tag.height = 512;
56     tag.width = 512;
57     document.getElementById("demo").appendChild(tag);
58     tag.scrollIntoView();
59     xhttp.imgtag = tag;
60     counter += 1;
61 }
62 </script>
63 </head>
64 <body>
65 <h1>OpenAI Demo</h1>
66 <p>Type a phrase and click the button to get a DALL-E 2 image.</p>
67 <input type="text" id="prompt" name="prompt" value="A cat"/>
68 <button type="button" onclick="loadDoc()">Get Image</button>
69 <div id="demo" style="overflow:auto; height:520px;"></div>
70 </body>
71 </html>
72 """"
73
74 @app.route('/stream')
75 def stream():
76     def events():
77         for i, c in enumerate(itertools.cycle('|\\-/')):
78             yield f"data: {c}"
79             time.sleep(0.1)
80     return Response(events(), content_type="text/event-stream")
81
82
83
84 if __name__ == '__main__':
85     app.run(threaded=True, port=5000)
86
```

CODE

>

2

>

CODE





Hugging Face is way more fun with friends and colleagues! 😊 [Join an organization](#)

TEXT

Aa

2

Dis



OBJECT

Spaces: openai/ **point-e** like 392 Running on A10G



App



Files and versions



Community

17



Point-E demo: text to 3D

NOW Generate 3D Point Clouds with [Point-E](#). This demo uses a small, worse quality text-to-3D model to produce 3D point clouds directly from text descriptions. Check out the [notebook](#).

prompt

Clear

Submit

output



Examples

a red motorcycle

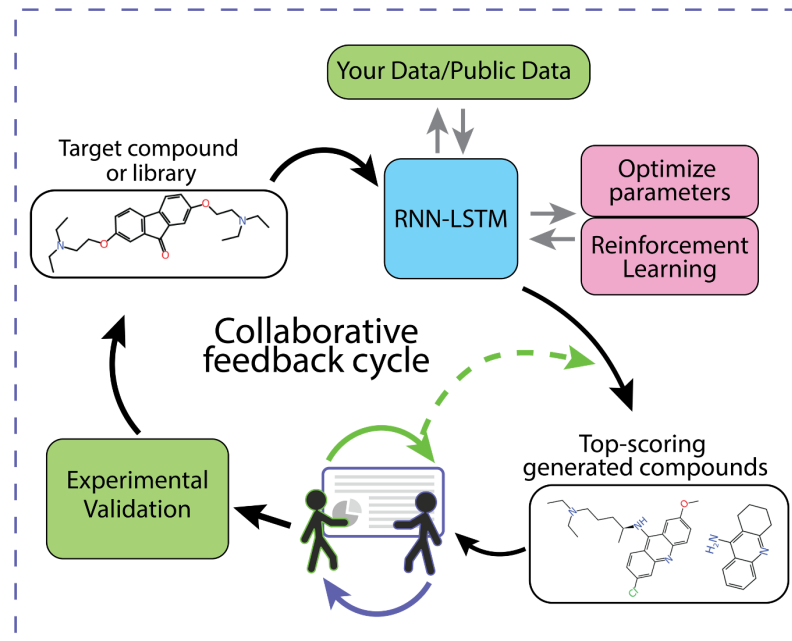
a RED pumpkin

a yellow rubber duck





COLLABORATIONS
PHARMACEUTICALS, INC.



“MegaSyn [...] is guided by machine learning model predictions of bioactivity for the purpose of finding new therapeutic inhibitors of targets for human diseases”

Digression on MegaSyn

Dual use of artificial-intelligence-powered drug discovery

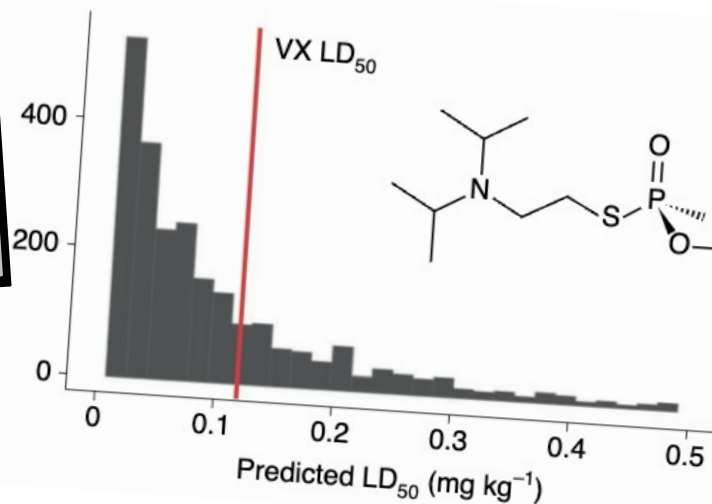
An international security conference explored how artificial intelligence (AI) technologies for drug discovery could be misused for de novo design of biochemical weapons. A thought experiment evolved into a computational proof.

Fabio Urbina, Filippa Lentzos, Cédric Invernizzi and Sean Ekins

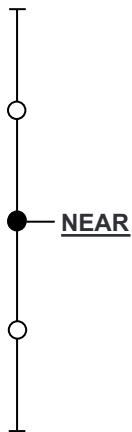
“Normally penalizes predicted toxicity and rewards predicted target activity”

“[I]nvert this logic by using the same approach to design molecules de novo, but now guiding the model to reward both toxicity and bioactivity instead.”

“In less than 6 hours [...] our model generated 40,000 molecules [...]. In the process, the AI designed not only VX, but also many other known chemical warfare agents”

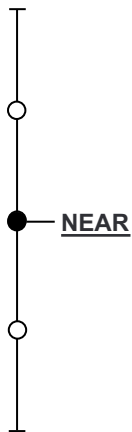


Where does this go in the future?

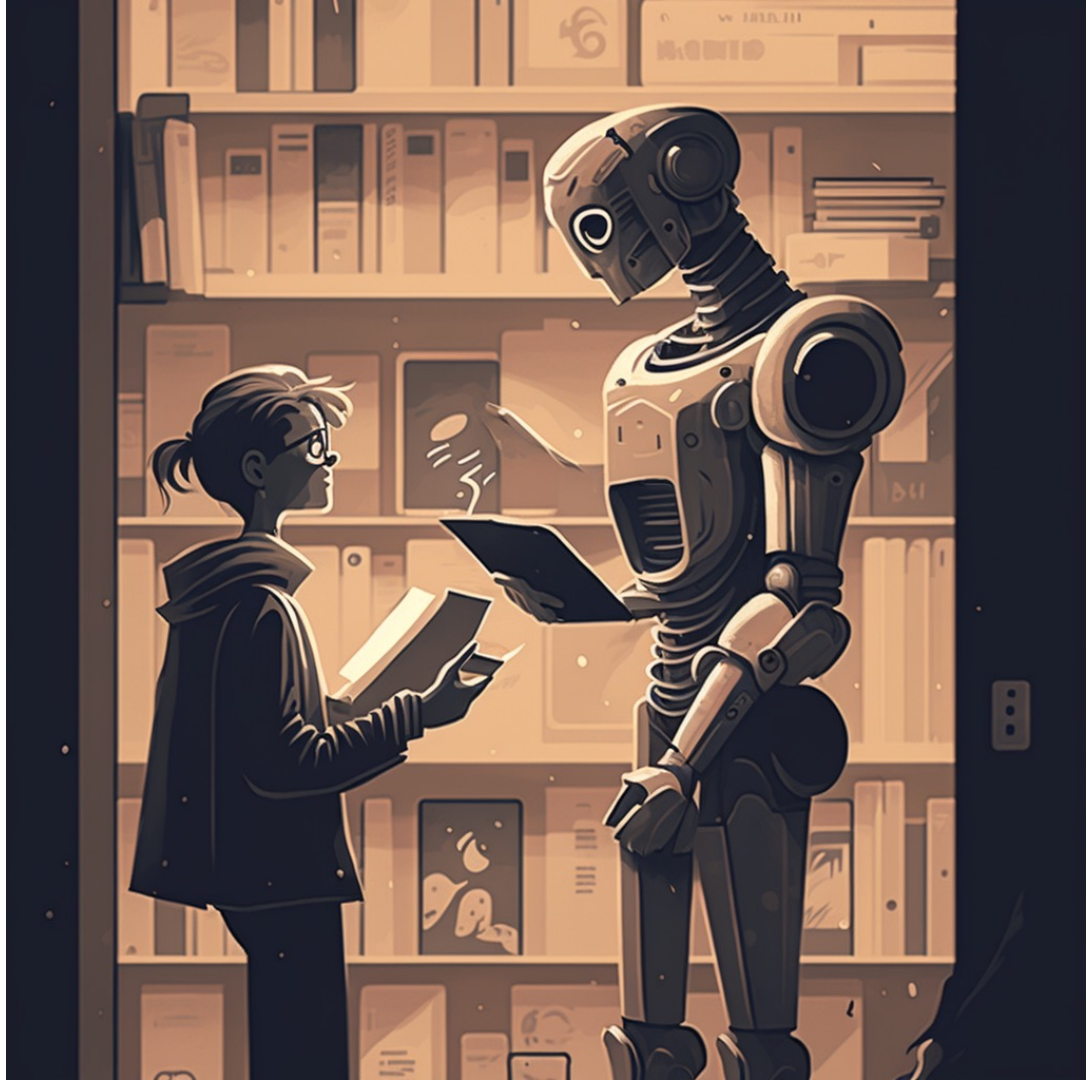


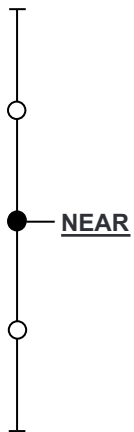
Automating record-keeping





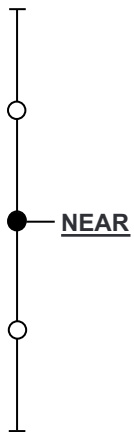
Automating Ritualized Communications





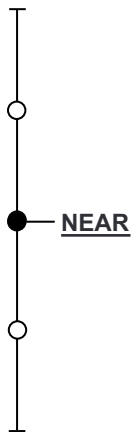
Personalization at scale





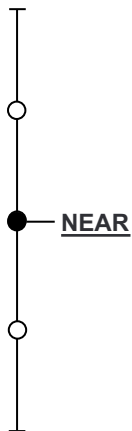
Research and Ideation Assistance





Democratizing creation





English to running code

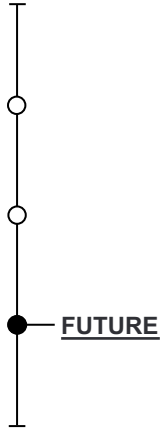


OK

IN CS, IT CAN BE HARD TO EXPLAIN
THE DIFFERENCE BETWEEN THE EASY
AND THE VIRTUALLY IMPOSSIBLE.

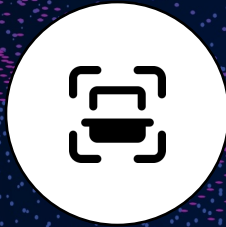
Interactive VR

Computer,
make this a
metal table



Future Sequence Opportunities.

SCAN

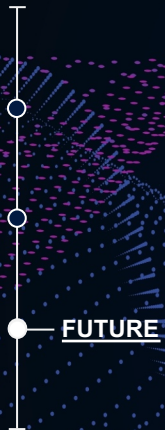


2



IMPLANT

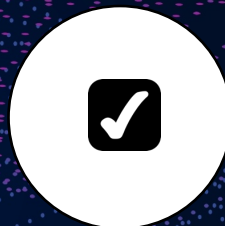
FUTURE



SIGNAL



2



CORRECTION

GENOME



2



GENOME

FUTURE



About us

Database Features

Events

Collaborations

Resources

Help

Login

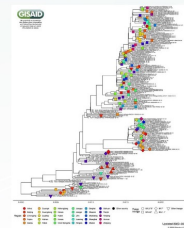


In Focus

Latest data from China continue to resemble known circulating variants (updated 5-Mar-2023)

Genomic surveillance efforts across China continue with 30 regions reporting their latest hCoV-19 data through GISAID, with samples collected as recent as 26 February 2023 from Anhui, Beijing, Chongqing, Fujian, Guangdong, Gansu, Guangxi, Guizhou, Hainan, Hebei, Heilongjiang, Henan, Hubei, Hunan, Inner Mongolia, Jiangsu, Jiangxi, Jilin, Liaoning, Ningxia, Qinghai, Shaanxi, Shandong, Shanghai, Shanxi, Sichuan, Tianjin, Xinjiang, Yunnan and Zhejiang Province.

Preliminary [phylogenetic analyses](#) continue to indicate that, when compared against the 15M genomes in GISAID's EpiCoV database, all closely resemble known globally circulating variants seen in different parts of the world between July and December. [see WHO's TAG-VE statement](#)



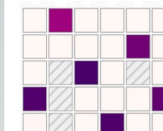
New representative genome sequences from China in the global context



中国新冠疫情



Lineage comparison



hCoV-19 data sharing via GISAID

15,084,915
genome sequence submissions

Submission Tracker

hCoV-19 Global

hCoV-19 USA

hMpxV

RSV



Phylogenetics

hCoV-19

hMpxV

RSV

RSV



Tracking Variants

hCoV-19 Variants

hMpxV Variants

Influenza Subtypes

RSV Subtypes



Frequency Dashboards

hCoV-19

hMpxV

Influenza

RSV



Public-Private Partnerships of the GISAID Initiative

The GISAID Initiative involves public-private partnerships, among them the partnership with the [Federal Republic of Germany](#), and governmental public-health and academic institutions in Argentina, Brazil, China, Republic of the Congo, Ethiopia, Indonesia, Malaysia, Russia, Senegal, Singapore, South Africa, and the support by Friends of GISAID, a registered non-profit association and administrative arm of the Initiative.



GISAID Resources

Data Access

EPI-SET

Example

Register

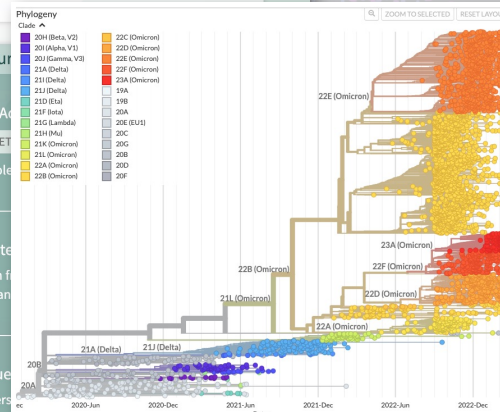
Obtain for

thousand

Frequency

Answers

'public vs. anonymous data sharing'



CHEMISTRY

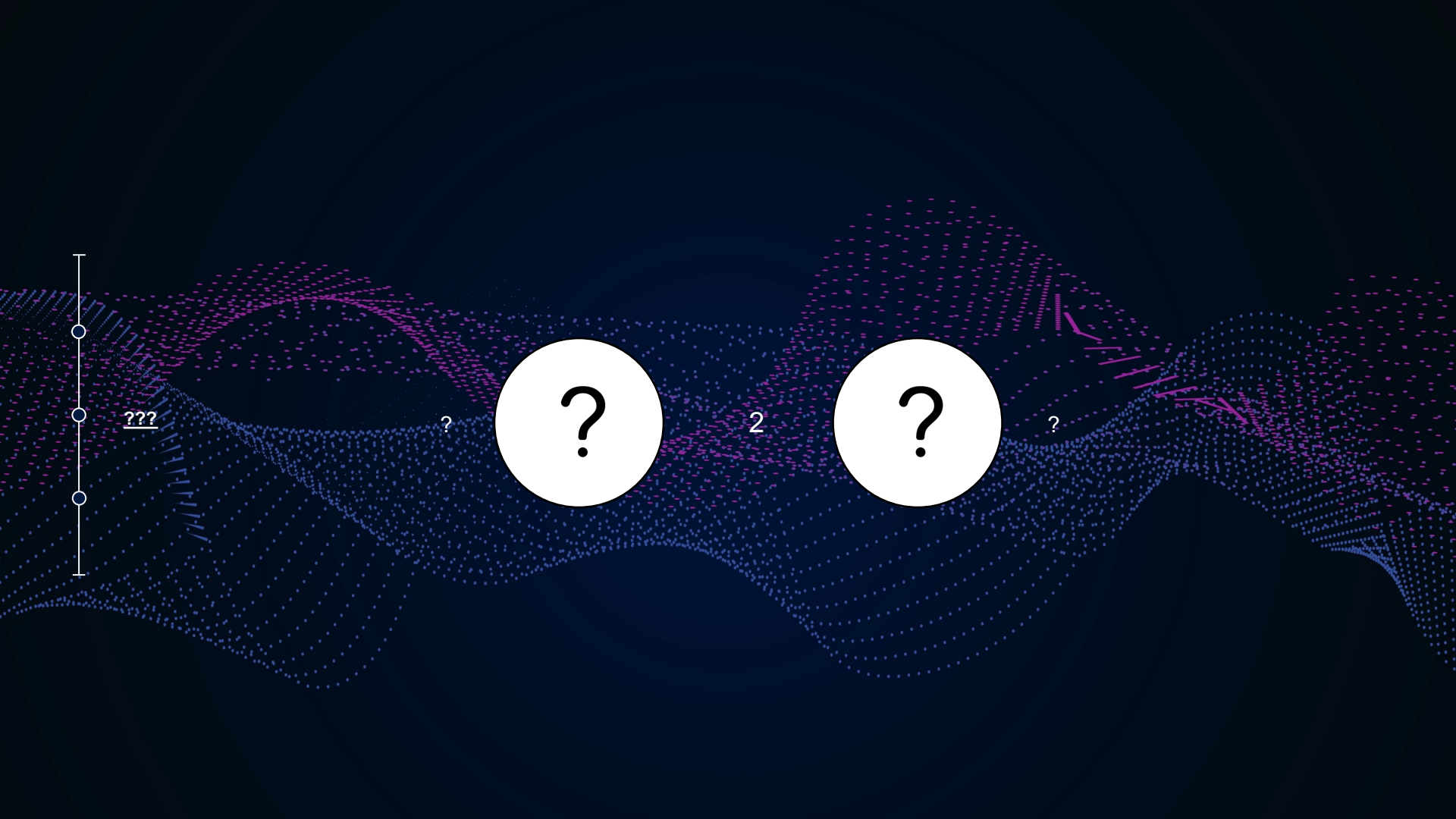


2




GENOME

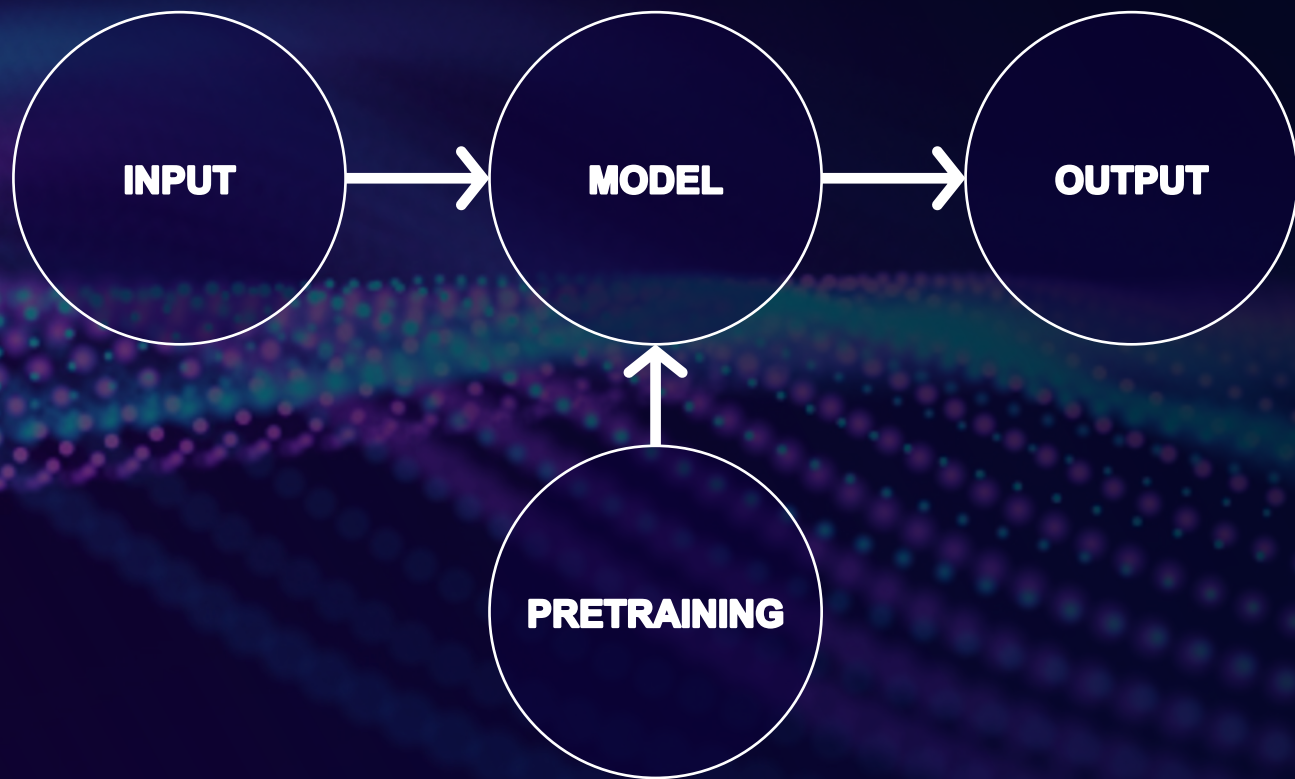
FUTURE



Limitations.



(kind of) **It's search on steroids.**



Importance: Weight of evidence




Importance:
Weight of evidence

vs.

Weight of discussion.





**Biases
Mistakes
Misinformation
Disinformation**

Comprehension

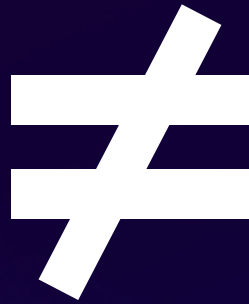
+

Variation

=

The *Appearance* of Full Cognition.

Comprehension



Cognition.



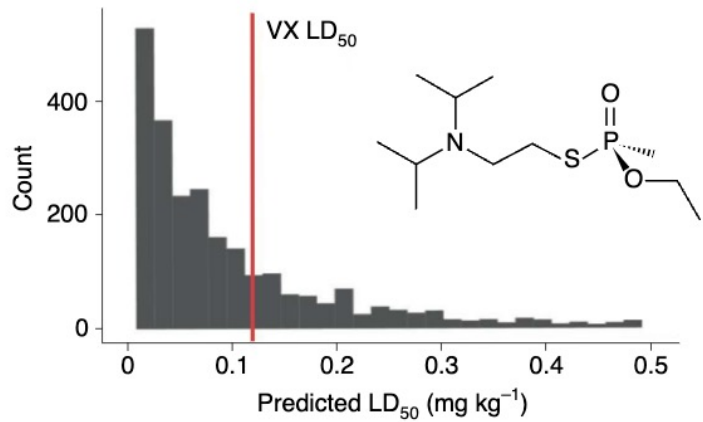
| It's not reasoning

| It's not creating new ideas

| It has no ethics or morality

| And it's not a root source of innovation.

It's just a tool.



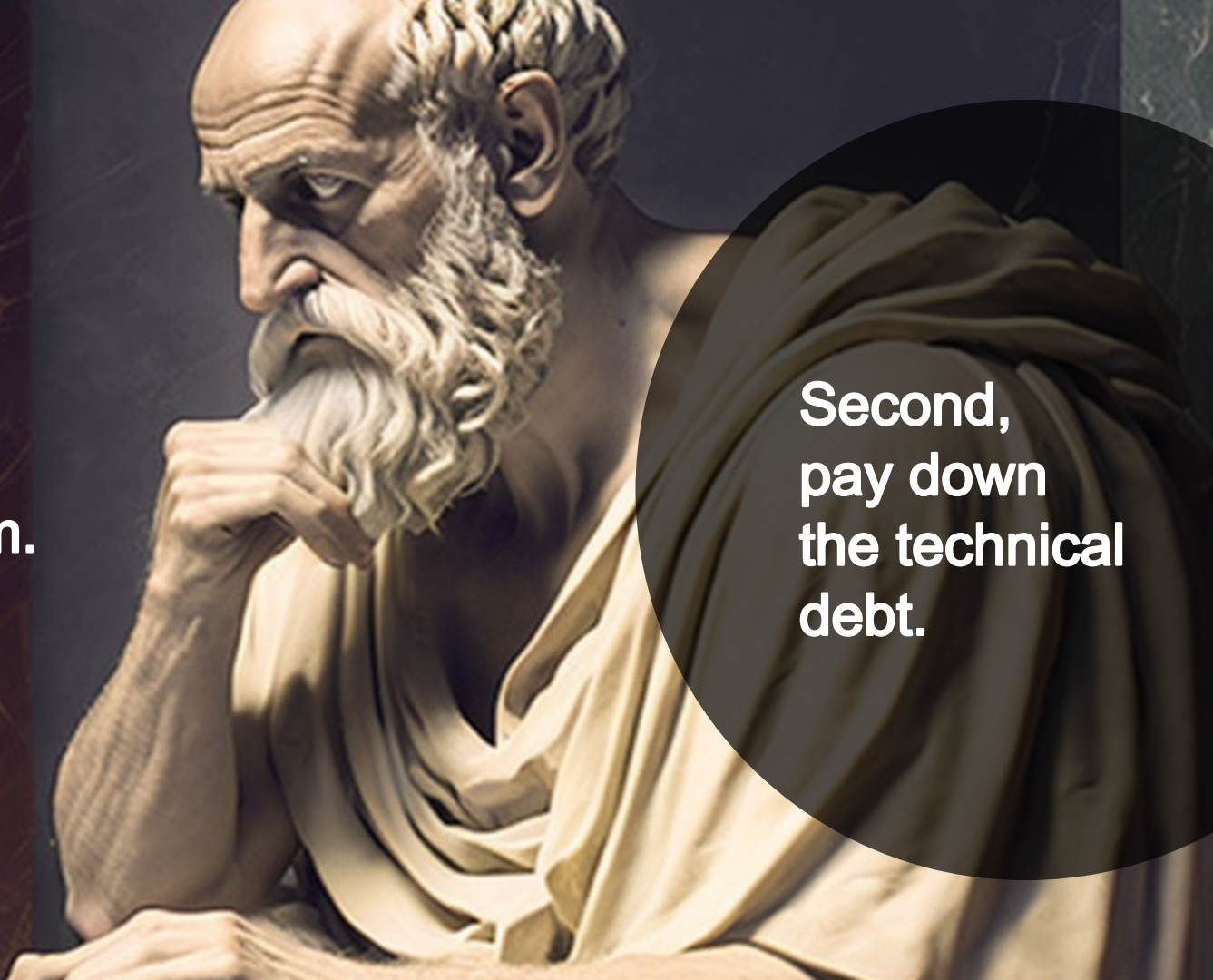


**The future
is not
inevitable.**

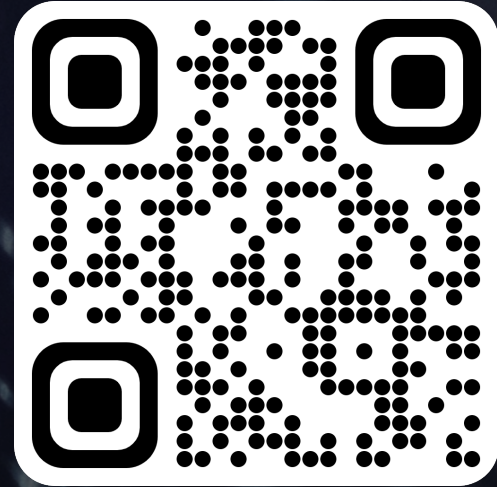
Midjourney:
Hippocrates
using a computer

**First,
do no harm.**

**Second,
pay down
the technical
debt.**



**Thank you,
and give
generative
AIs a try!**



bit.ly/3T1INWX

go.klick.com/generative-ai-and-chatgpt-meets-medicine



thank you.

PRESENTER

Alfred Whitehead,

MAs, MS
EVP, Klick Applied Sciences

March 13, 2022