

# Generative Artificial Intelligence

Paul Dubois

[Info@Lèze](mailto:Info@Lèze)



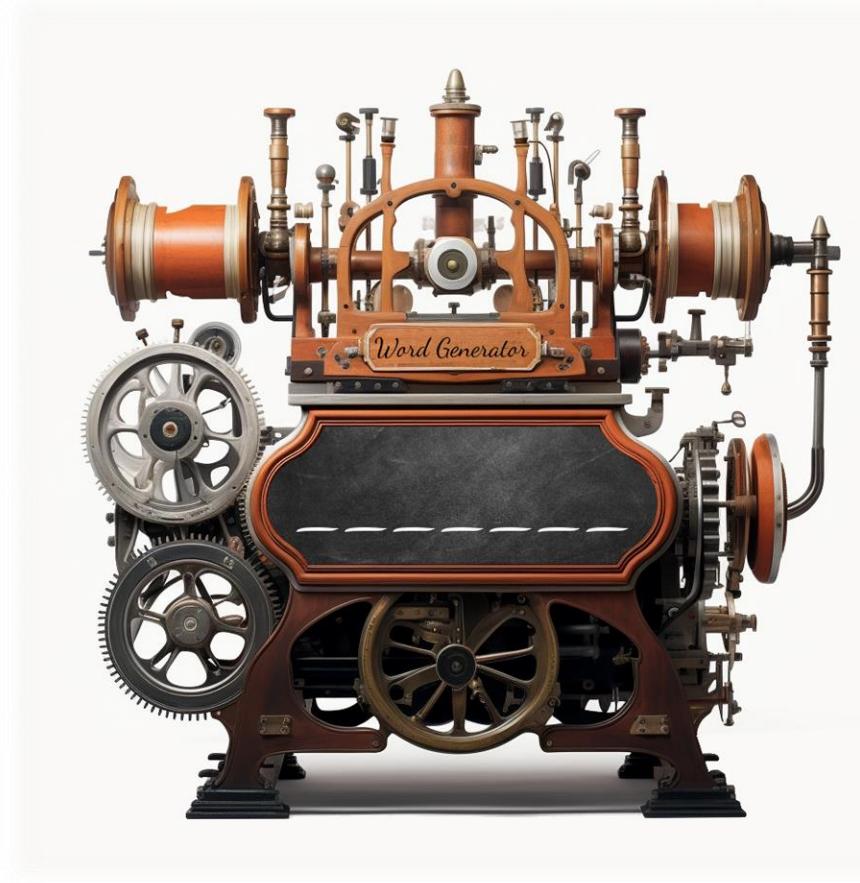


# Method 1:



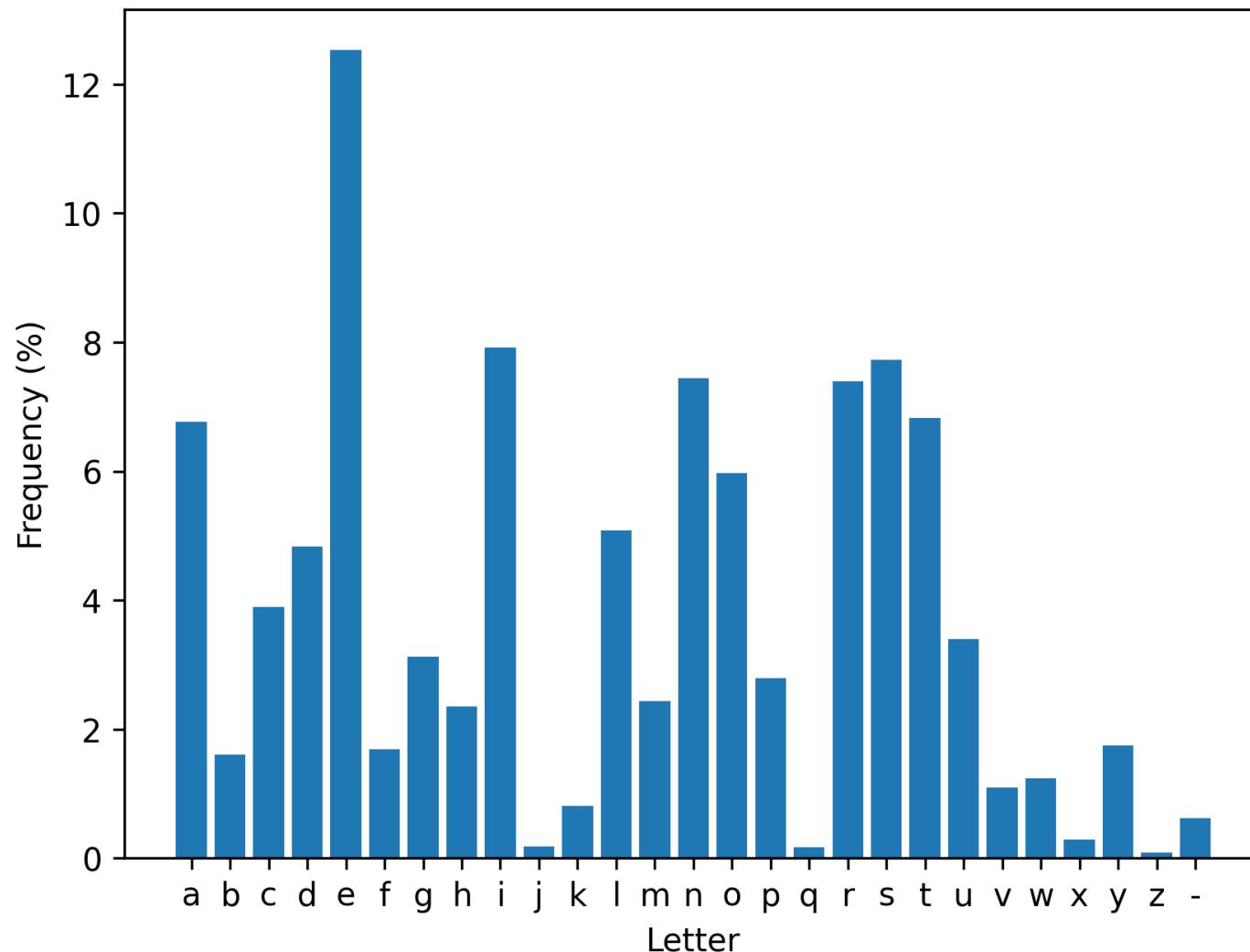
Randomly type on a keyboard

# Words Generator Machine 1

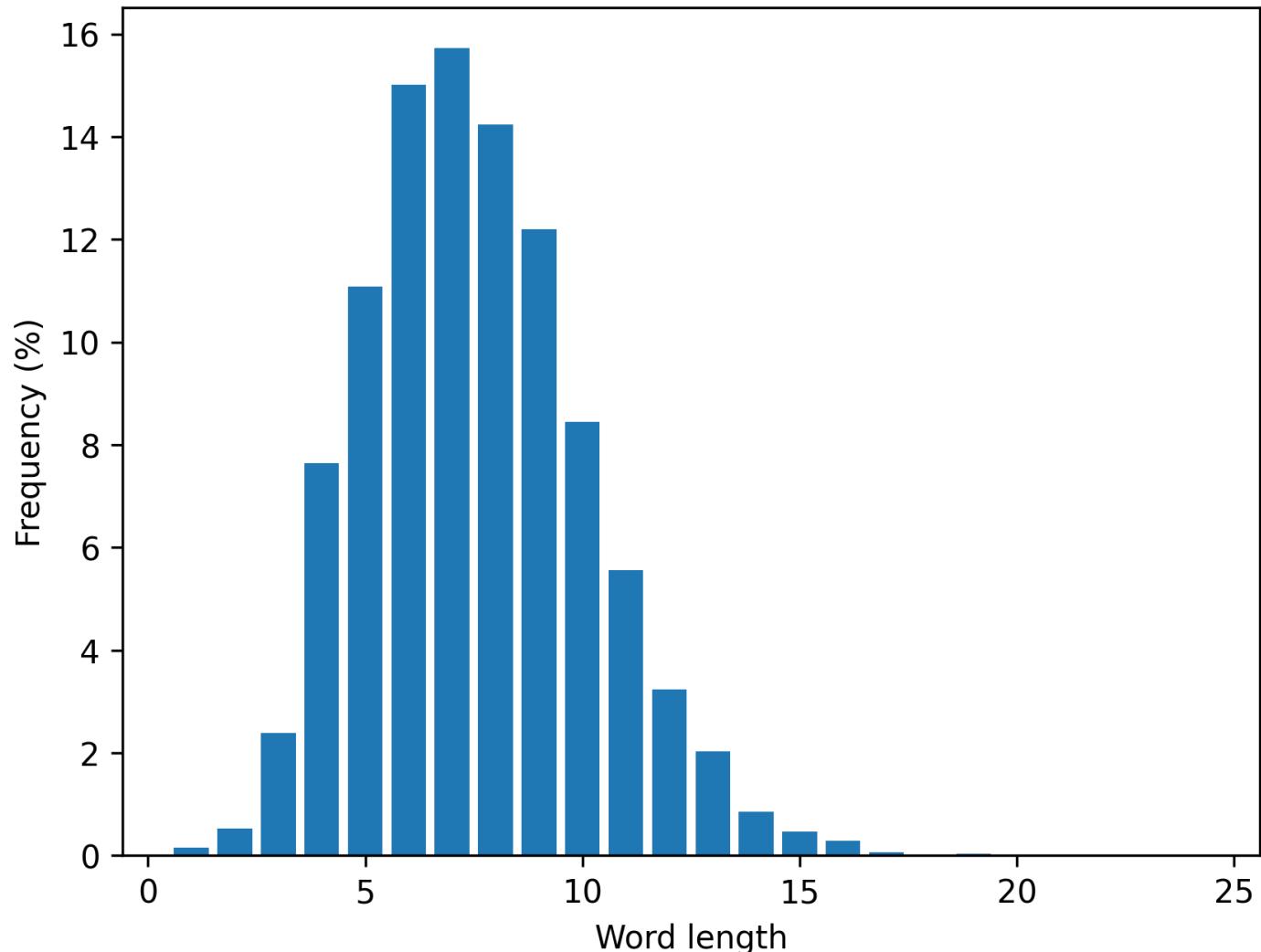


[https://pauldubois98.github.io/GenerativeAI/word\\_generator1.html](https://pauldubois98.github.io/GenerativeAI/word_generator1.html)

# Letters usage (in dictionary)



# Words lengths (in dictionary)



## Method 2:



Type on a weighted keyboard

# What is a “weighted” keyboard?

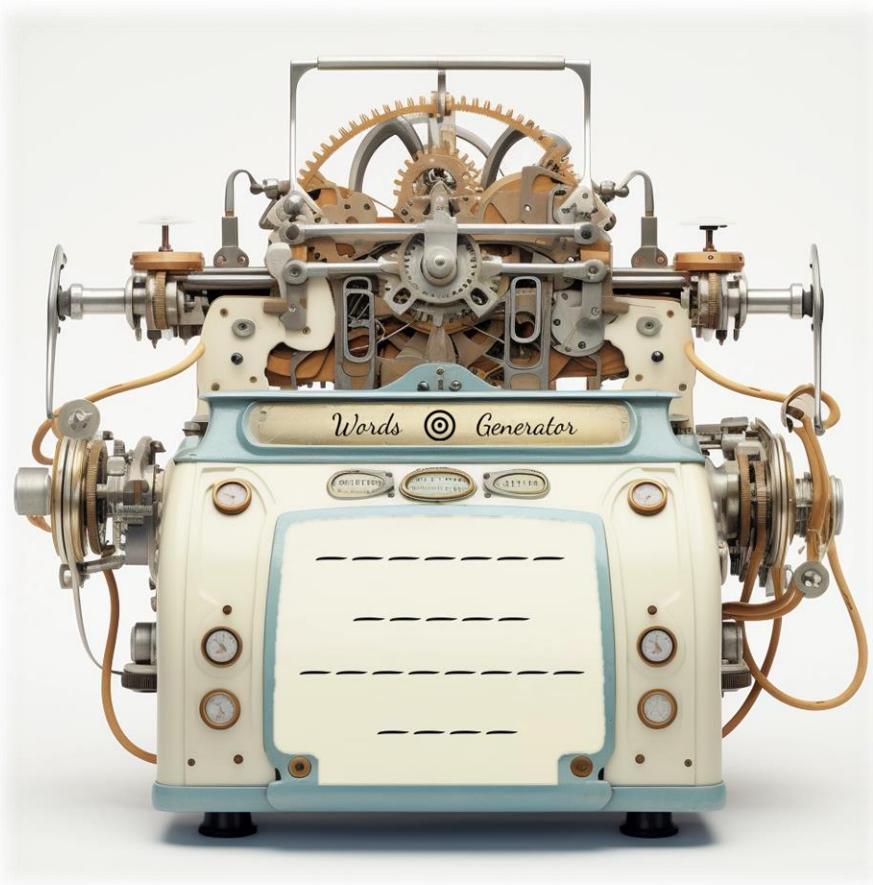
Non-weighted

ung p e q y ī  
or b c m t d j s  
r k v f a i x  
z l w h

Weighted

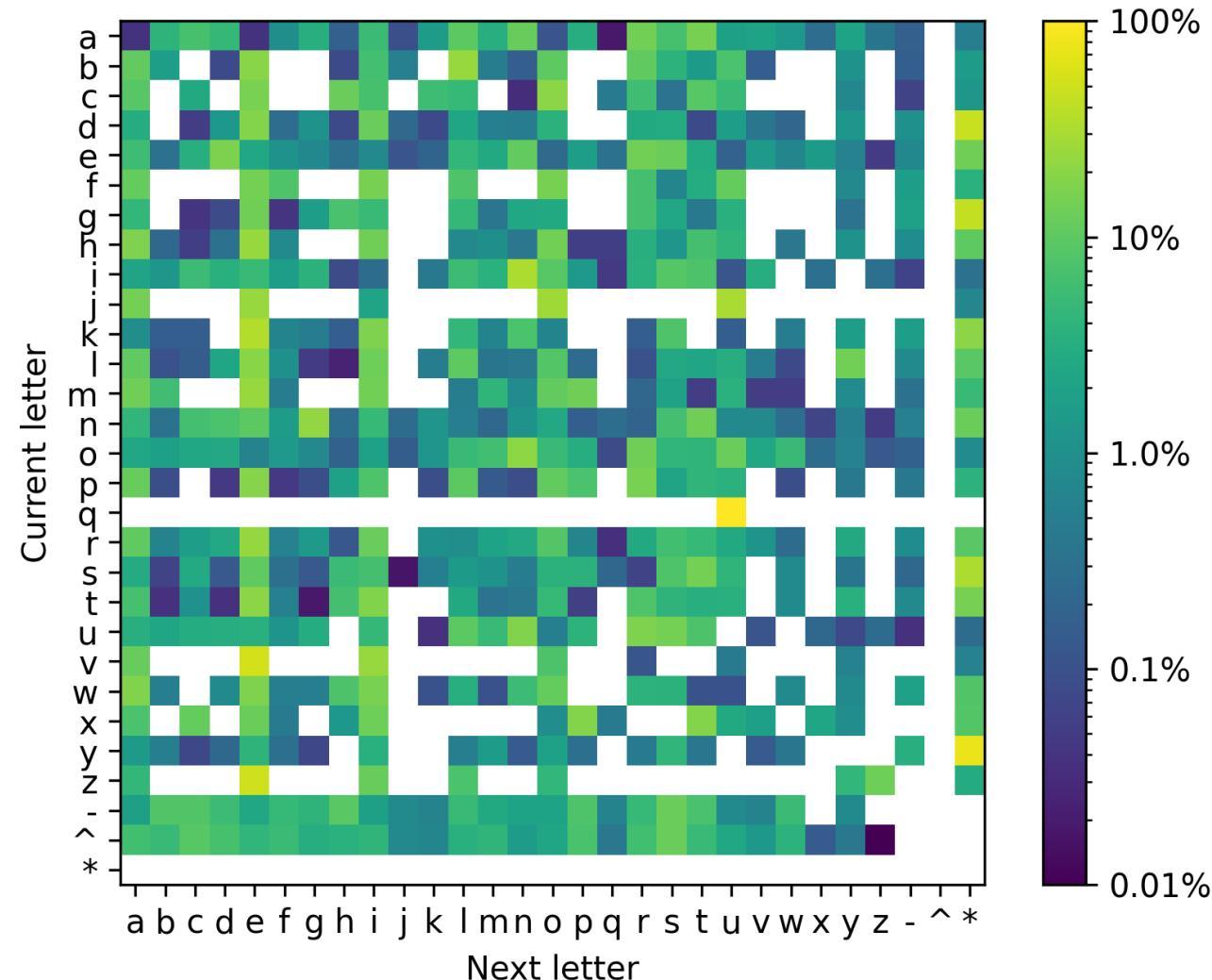
h v o s m b  
z k e o S p id  
l r u c y t n id  
w f a g

# Words Generator Machine 2

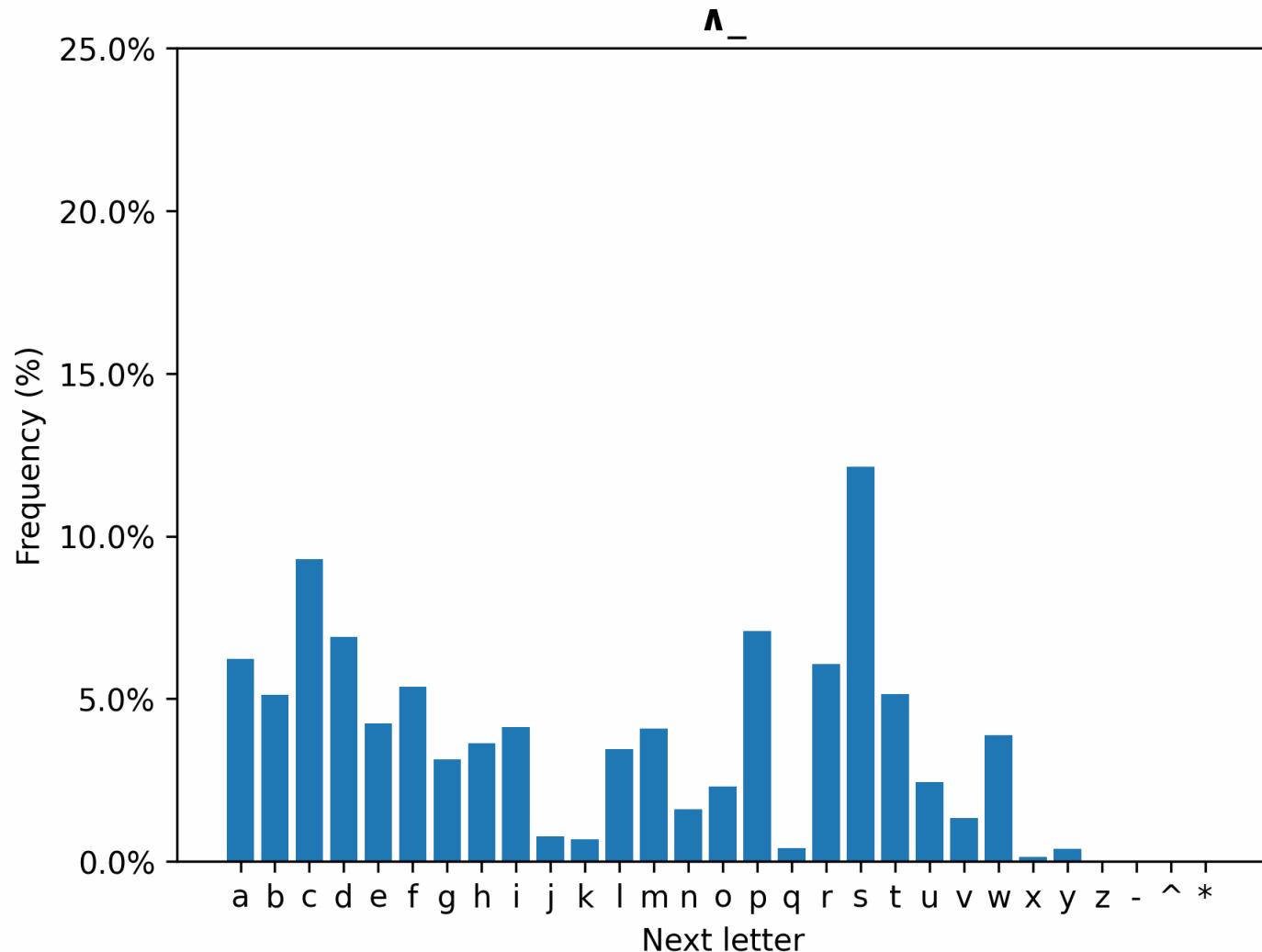


[https://pauldubois98.github.io/GenerativeAI/word\\_generator2.html](https://pauldubois98.github.io/GenerativeAI/word_generator2.html)

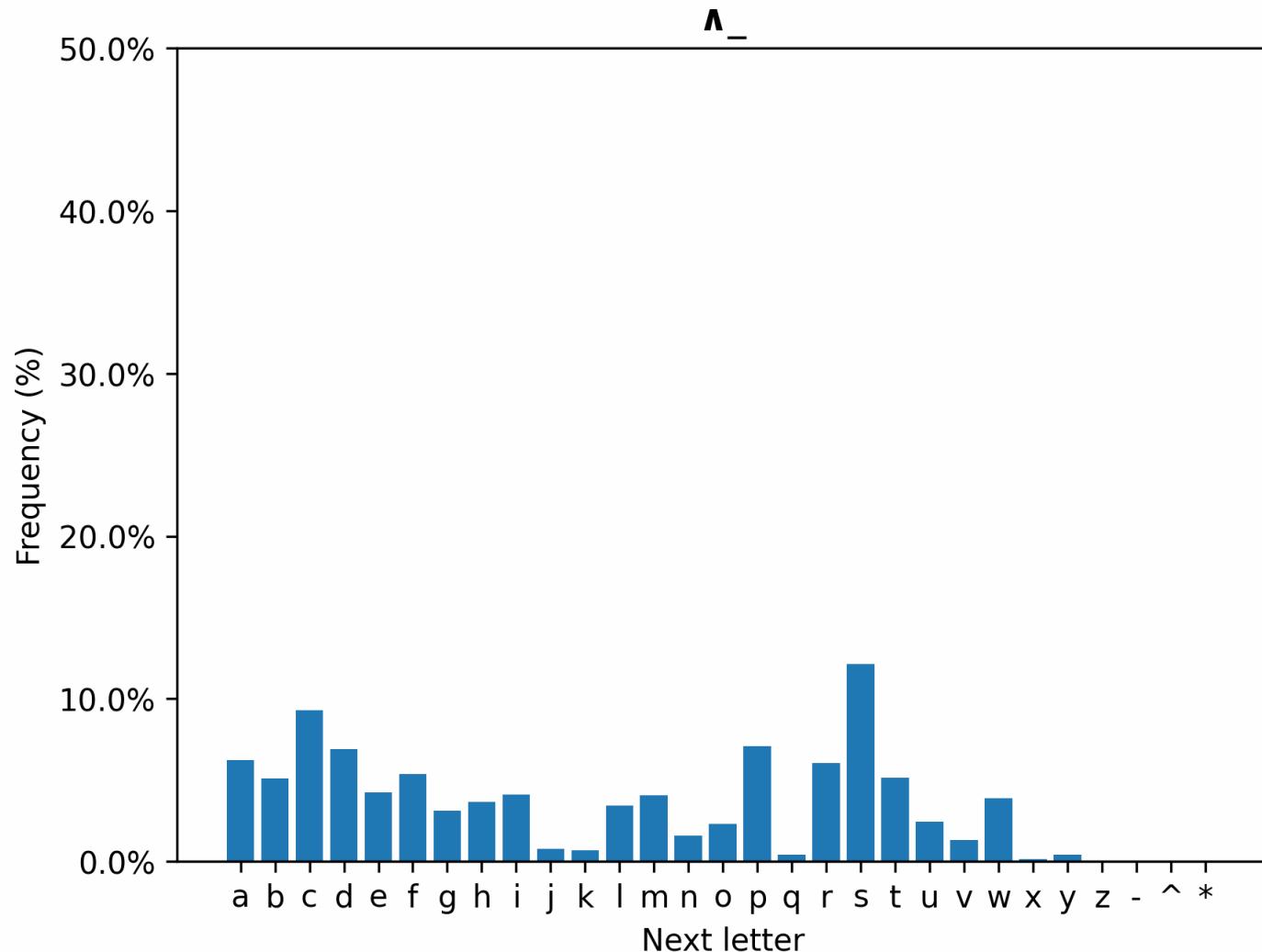
# Markov Heatmap



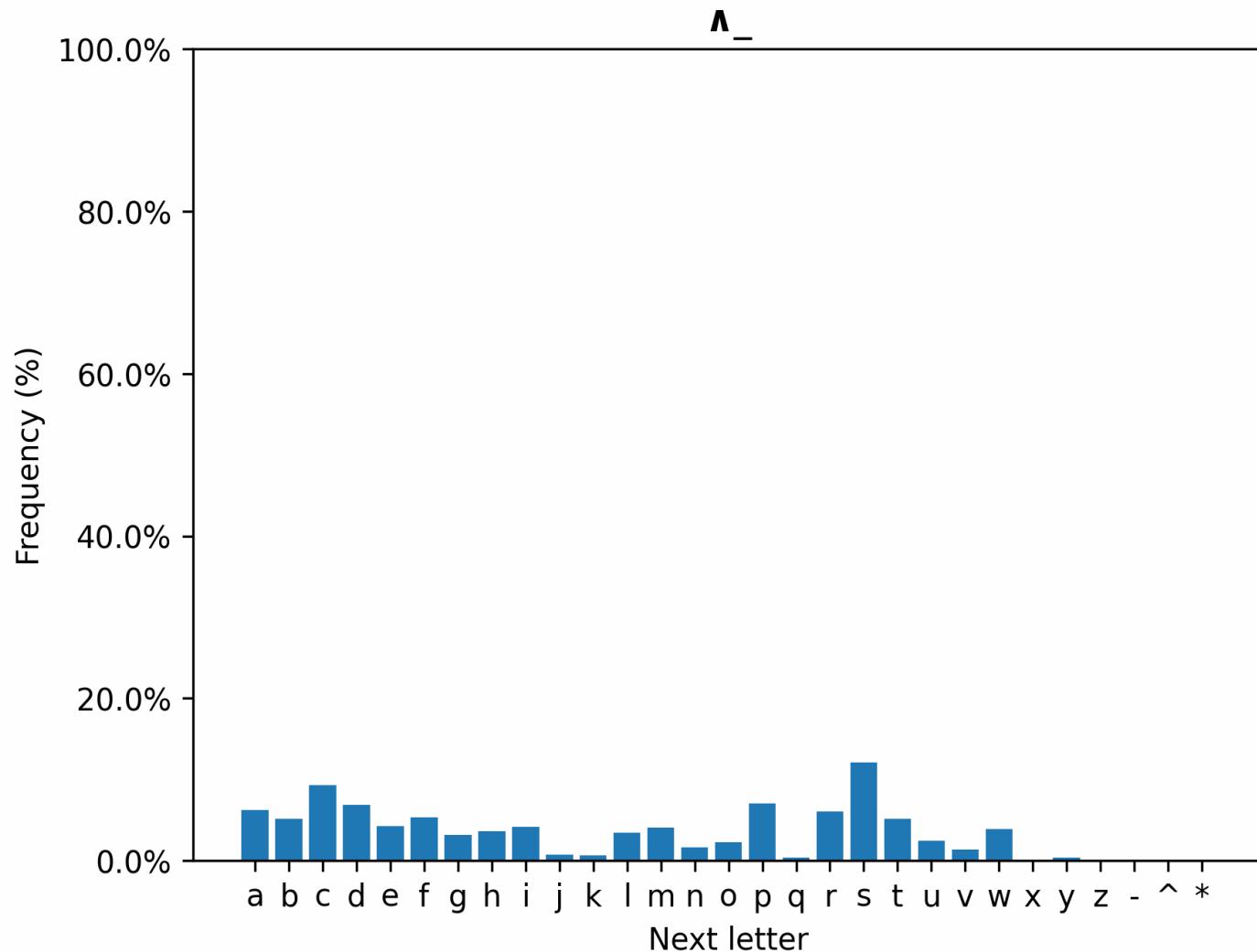
# Next Letter



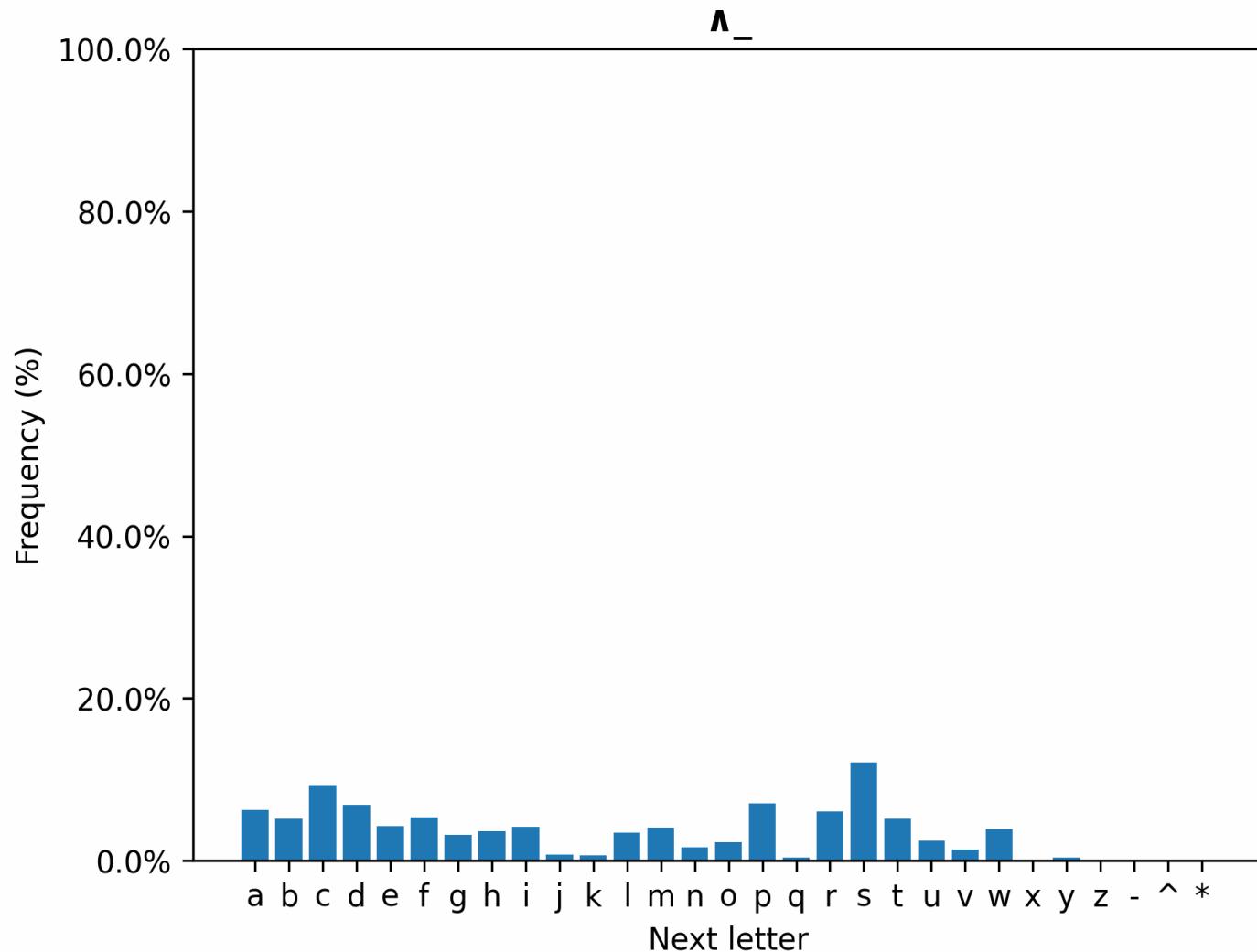
# Next Letter (2)



# Next Letter (3)



# Next Letter (4)



# Method 3:



Dynamically weighted keyboard

# Words Generator Machine 3



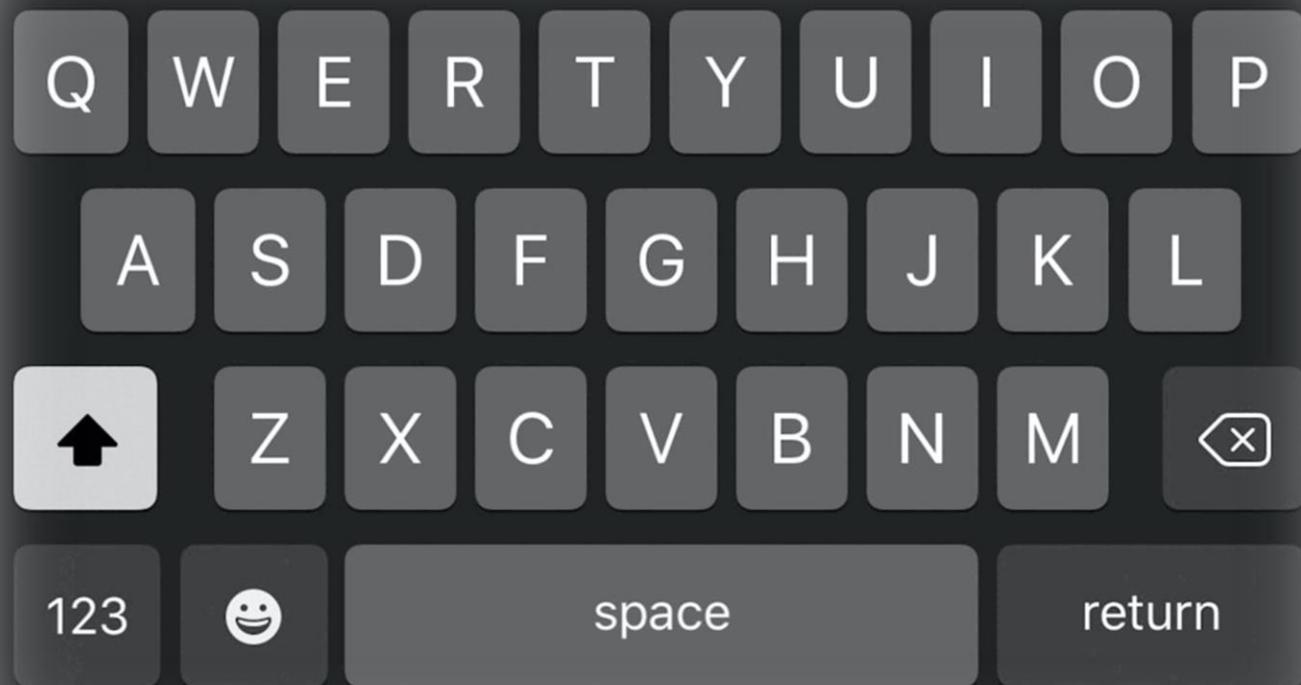
[https://pauldubois98.github.io/GenerativeAI/word\\_generator3.html](https://pauldubois98.github.io/GenerativeAI/word_generator3.html)

# Custom Words Generator Machine 3 (bis)



[https://pauldubois98.github.io/GenerativeAI/next\\_letters.html](https://pauldubois98.github.io/GenerativeAI/next_letters.html)

# This is useful!



A



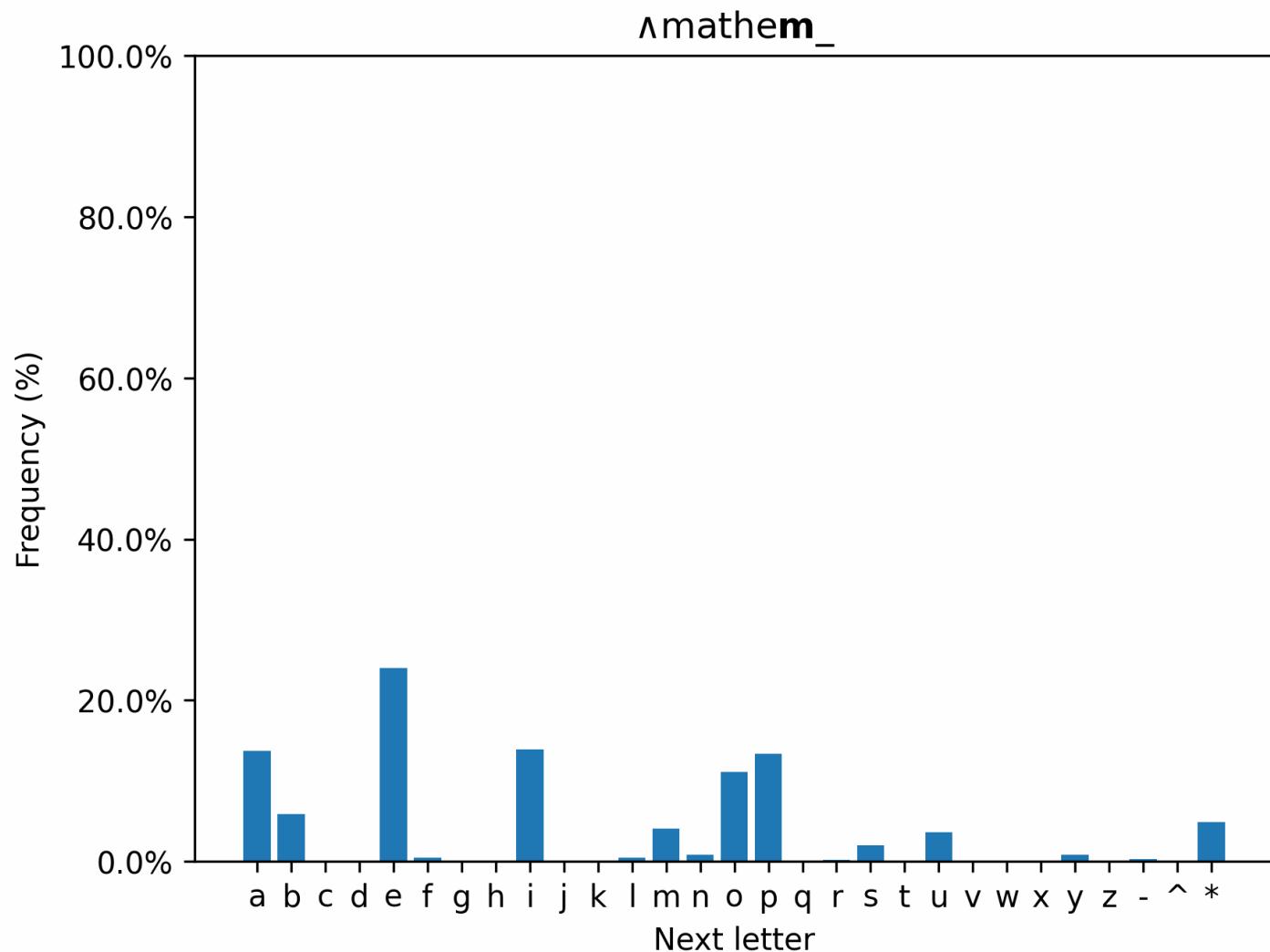
Predict letters

# Complete the word...

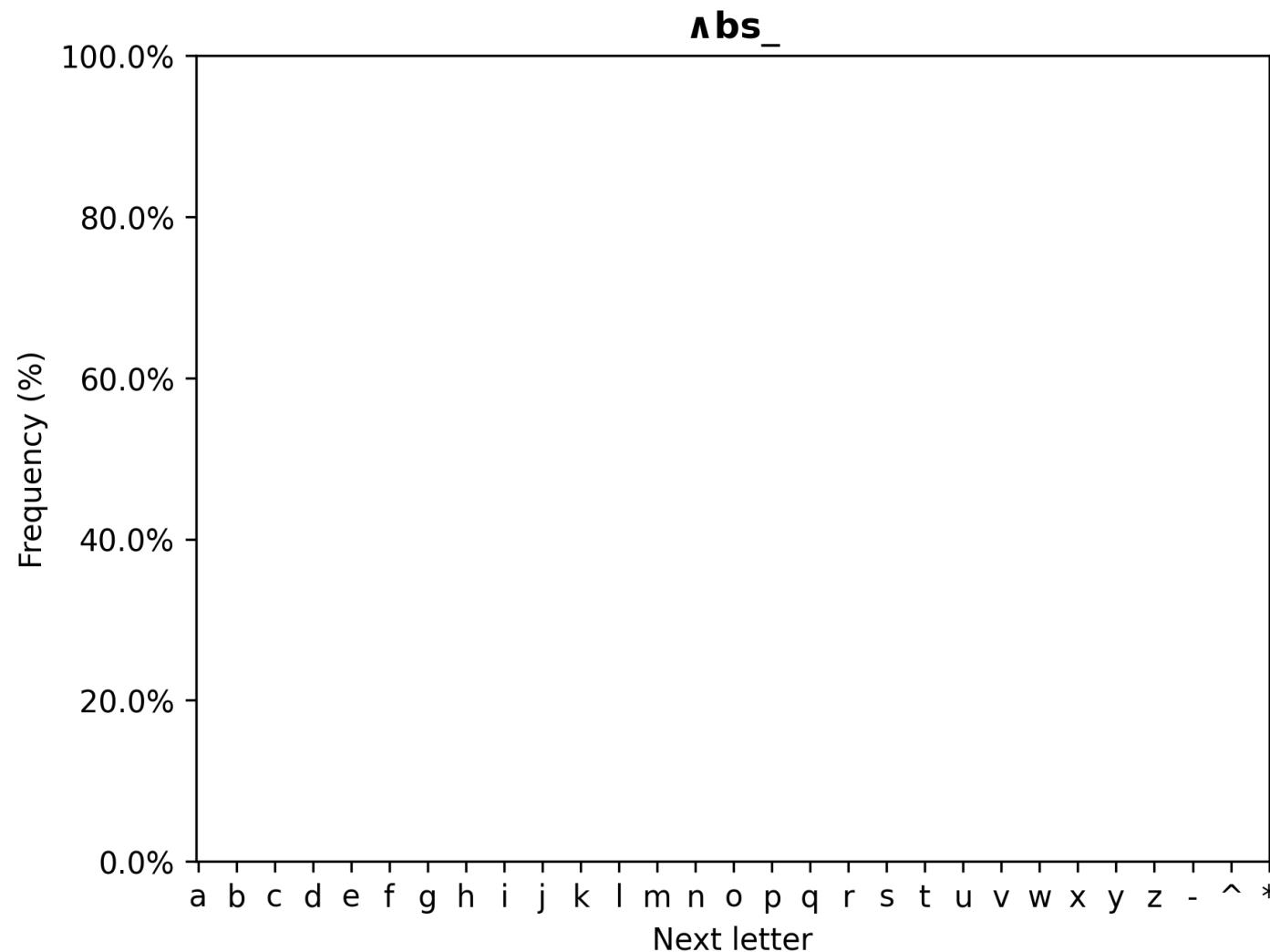
# ...with context

- ...h\_?
  - ...e\_?
  - ...m\_?
  - ...a\_?
  - ...t\_?
  - ...i\_?
  - ...c\_?
  - ...s\_?
- ^math\_?
  - ^mathe\_?
  - ^mathem\_?
  - ^mathema\_?
  - ^mathemat\_?
  - ^mathemati\_?
  - ^mathematic\_?
  - ^mathematics\_?

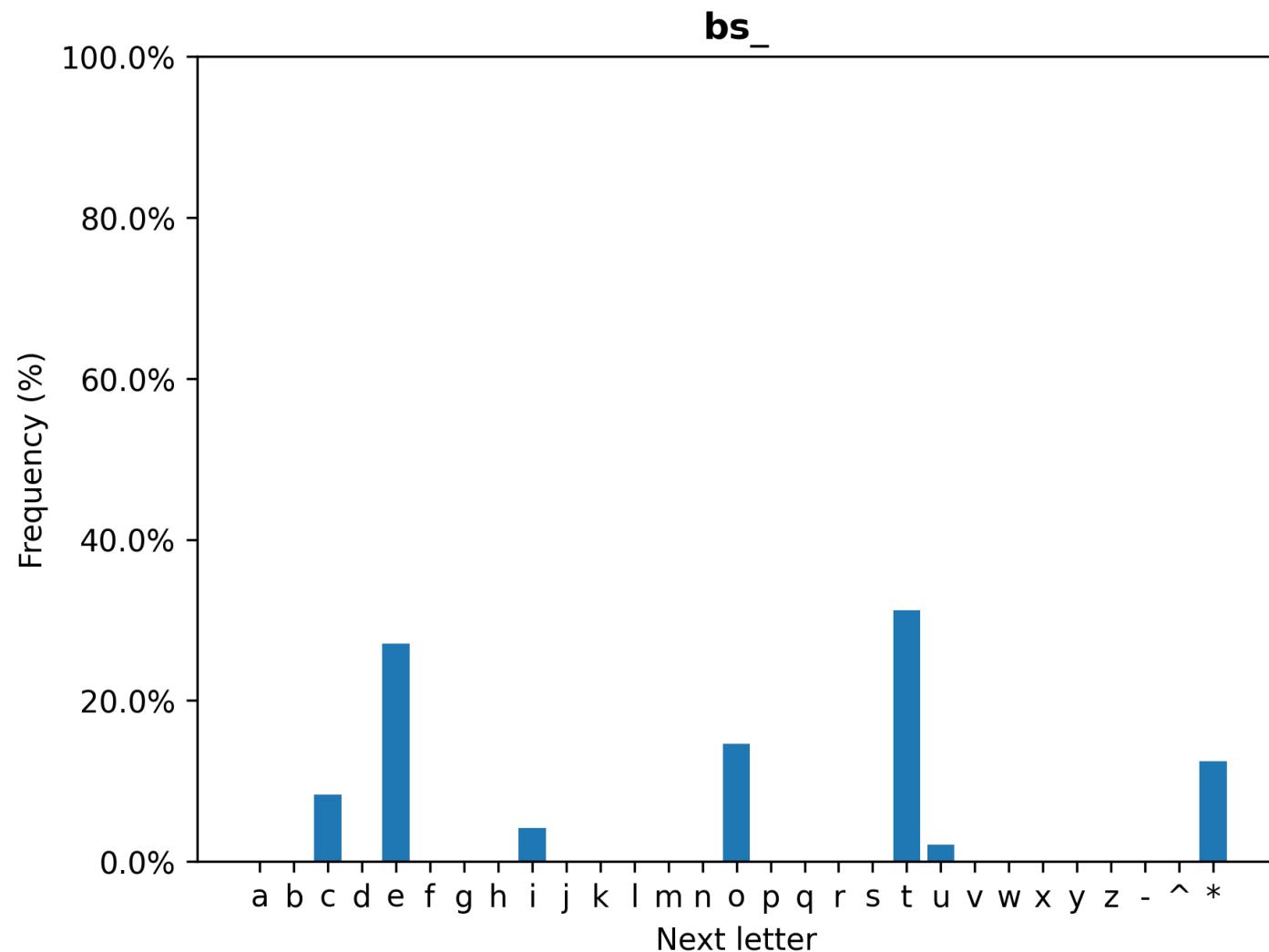
# Context really helps!



# Dictionary search



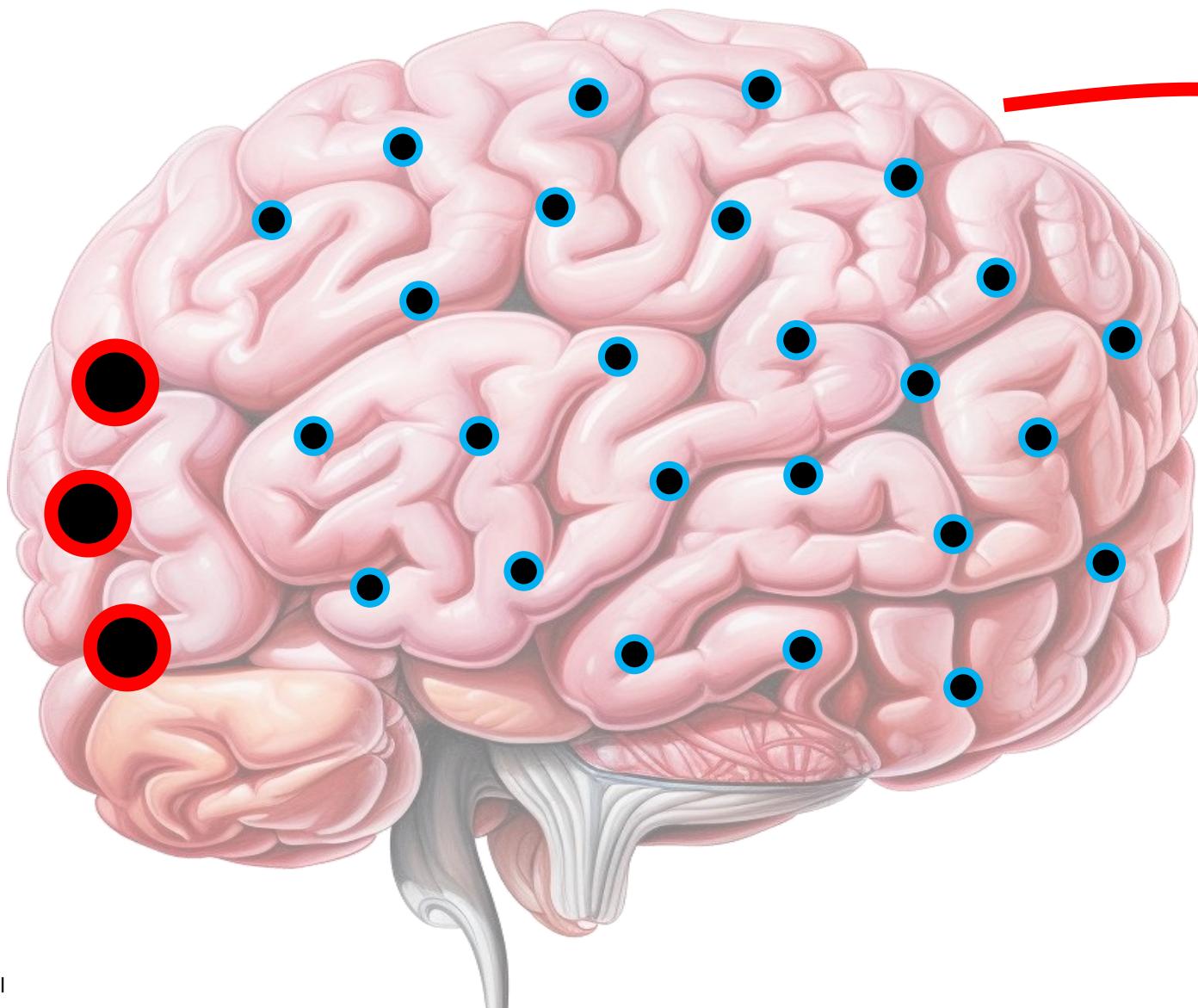
# Dictionary search



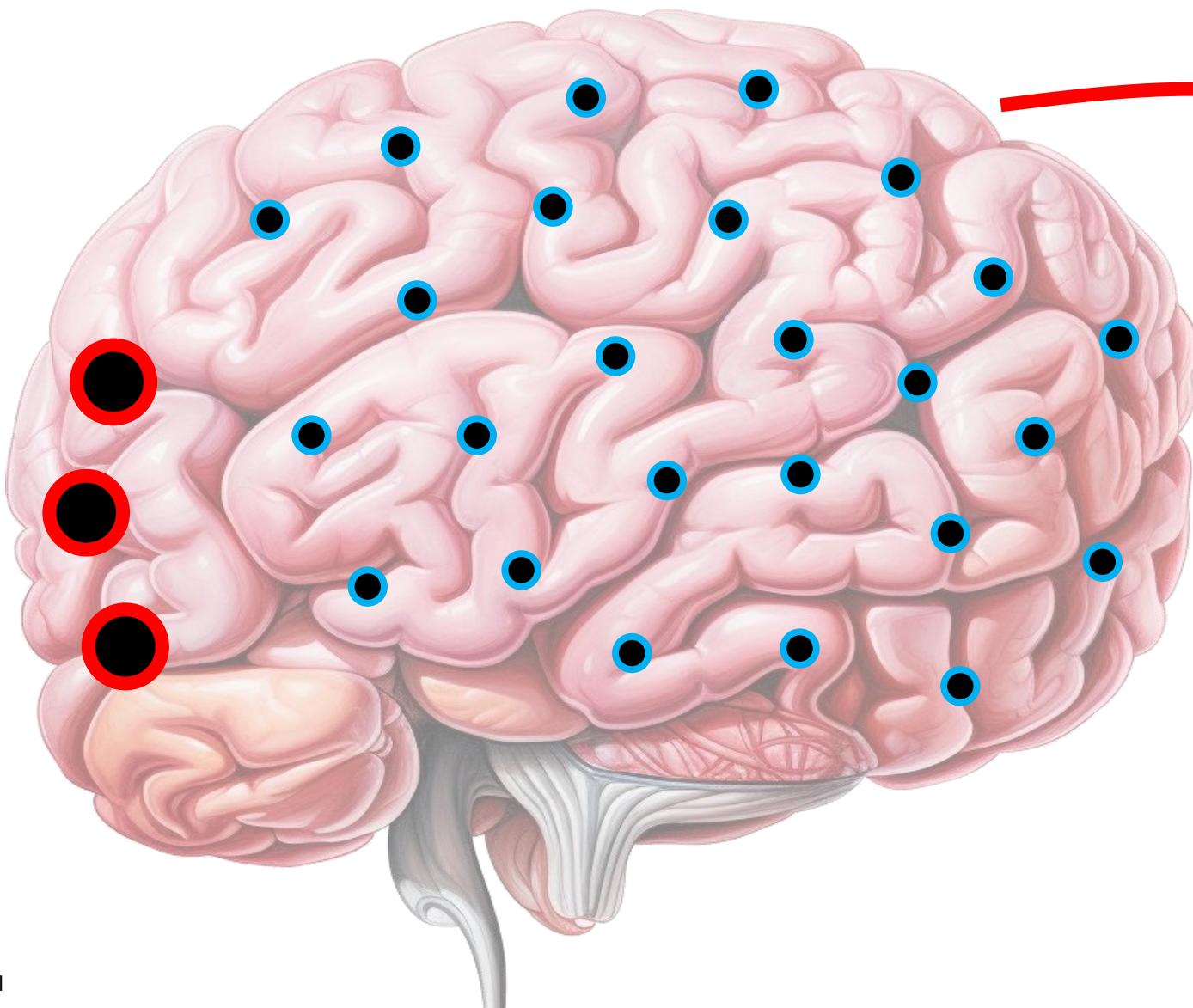


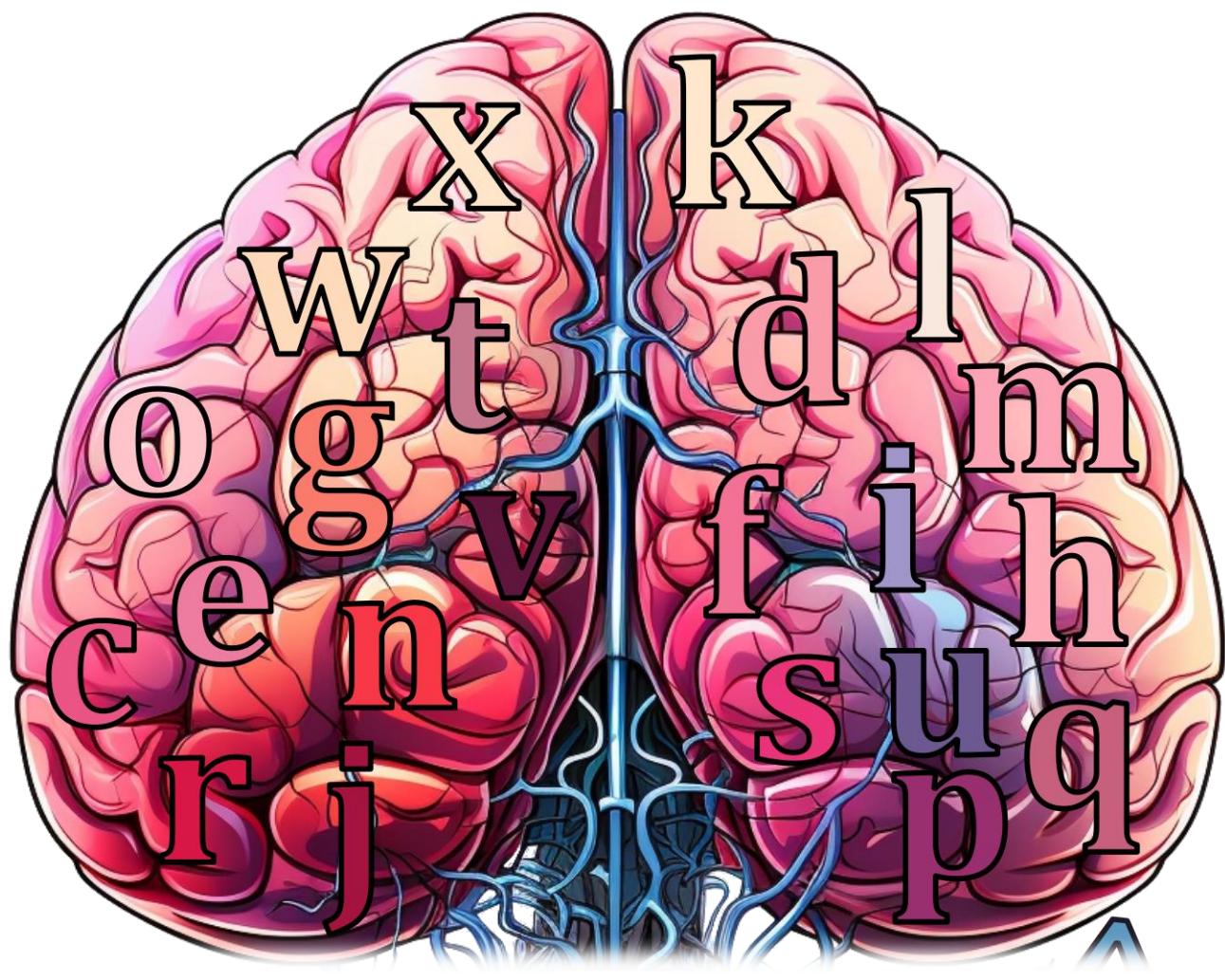
How do babies learn to eat purée?

# The brain



# The brain



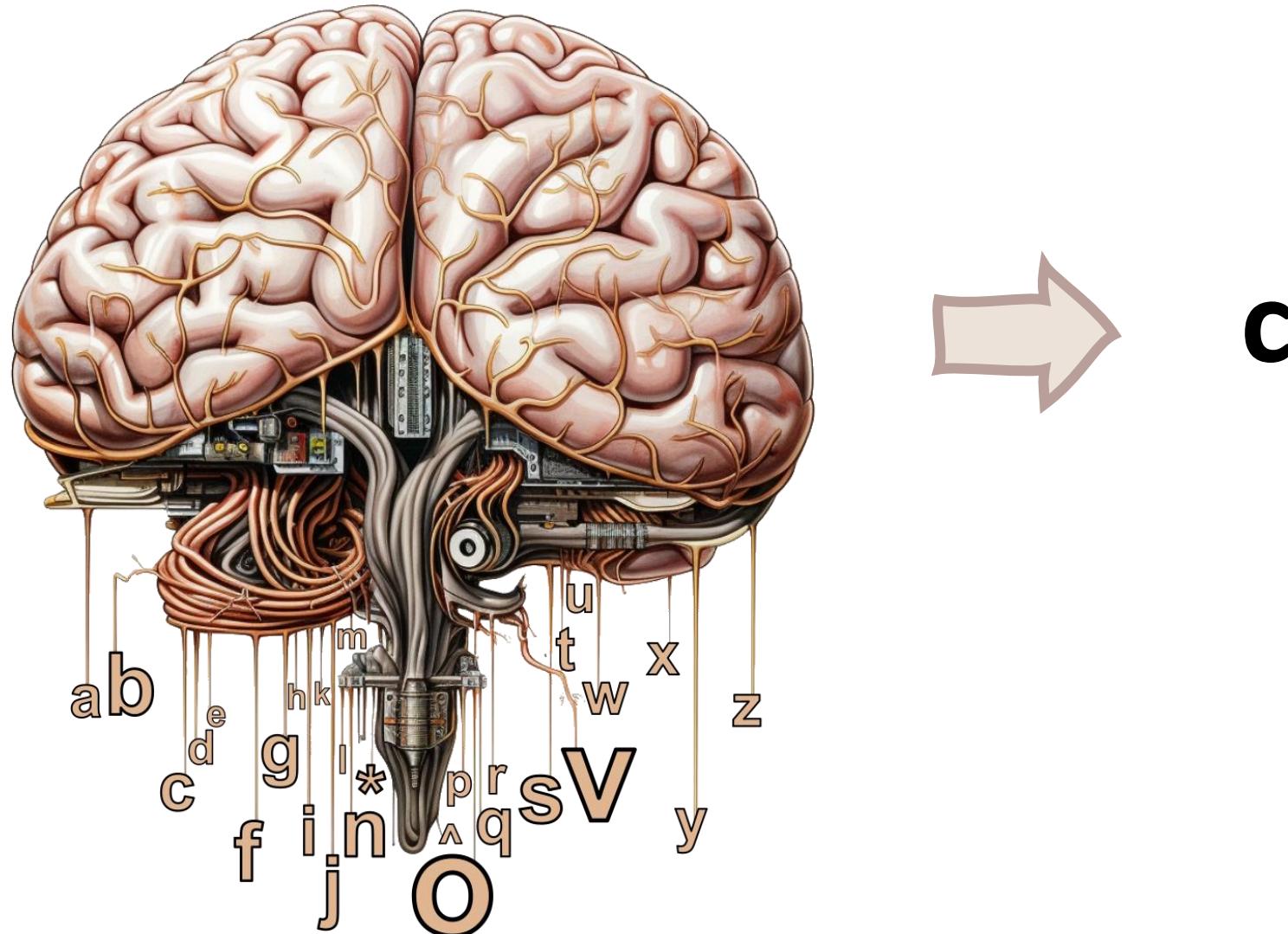


A brain to predict the next letter

b z a\*

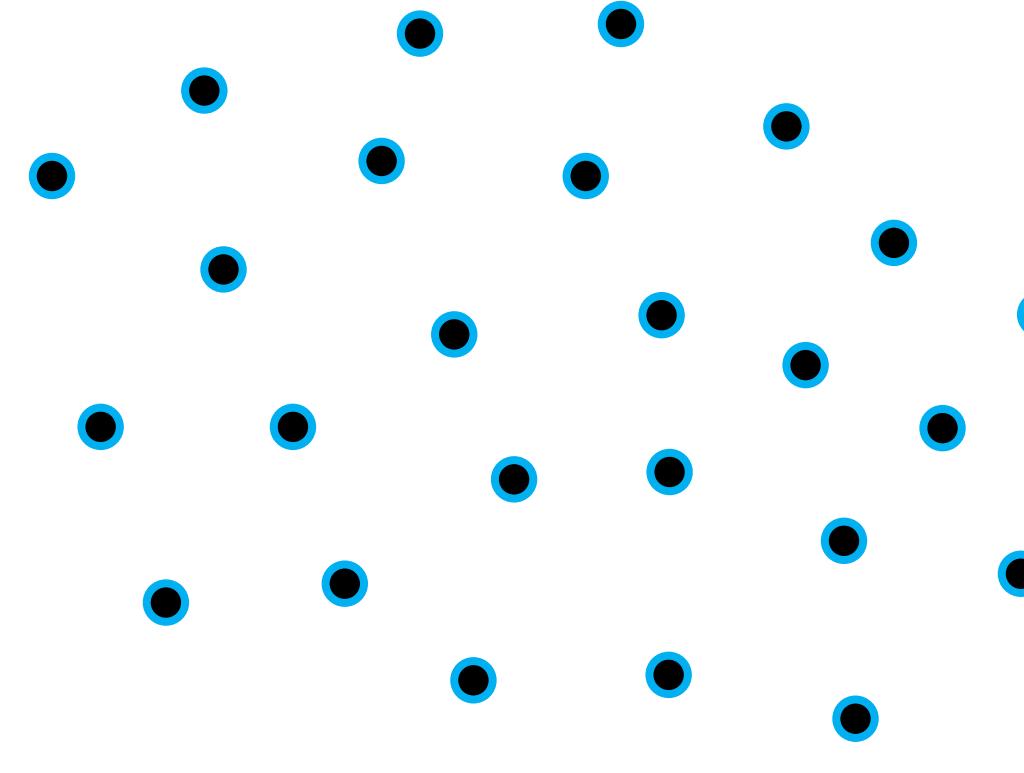
# Artificial Brain

$\wedge$ physi\_



# Artificial Brain

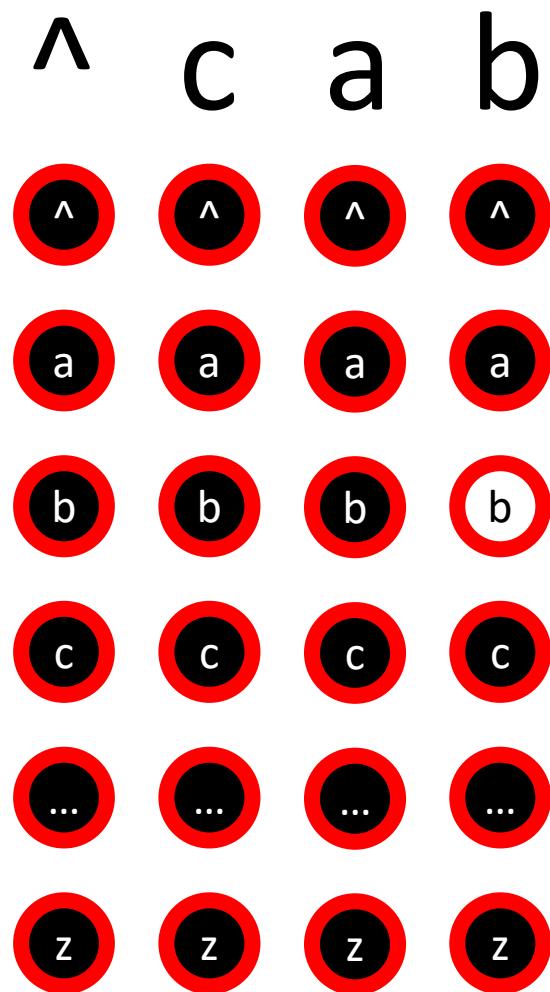
b



a



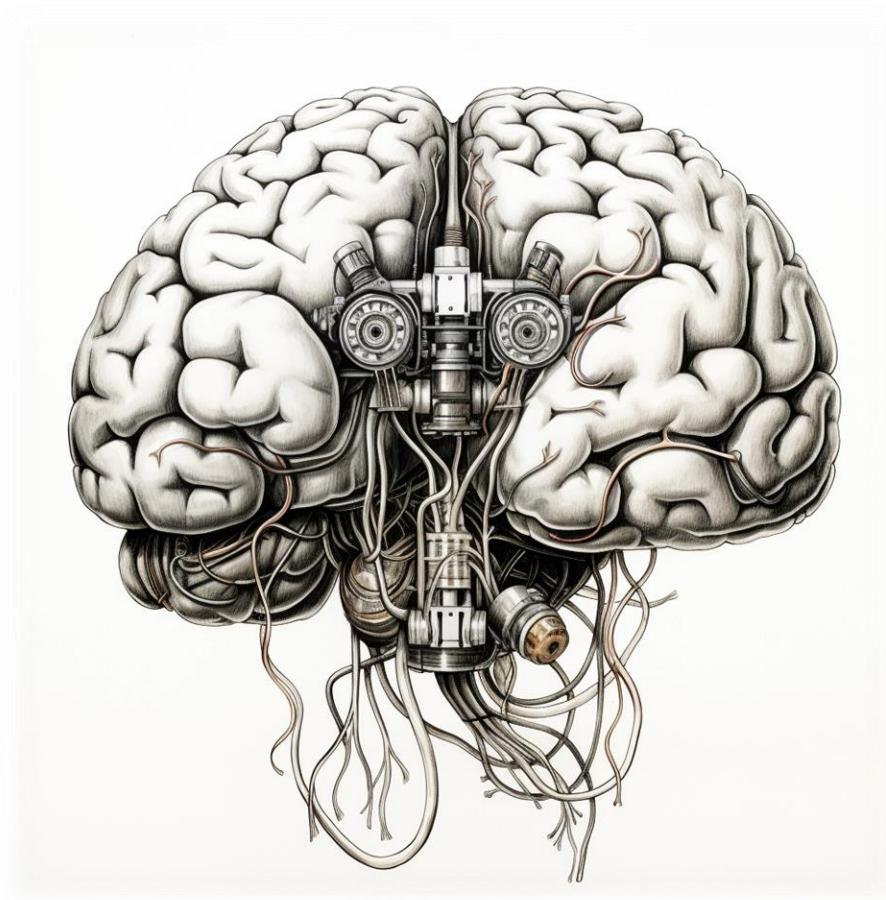
# Artificial Brain



# Predicting the next letter of the alphabet

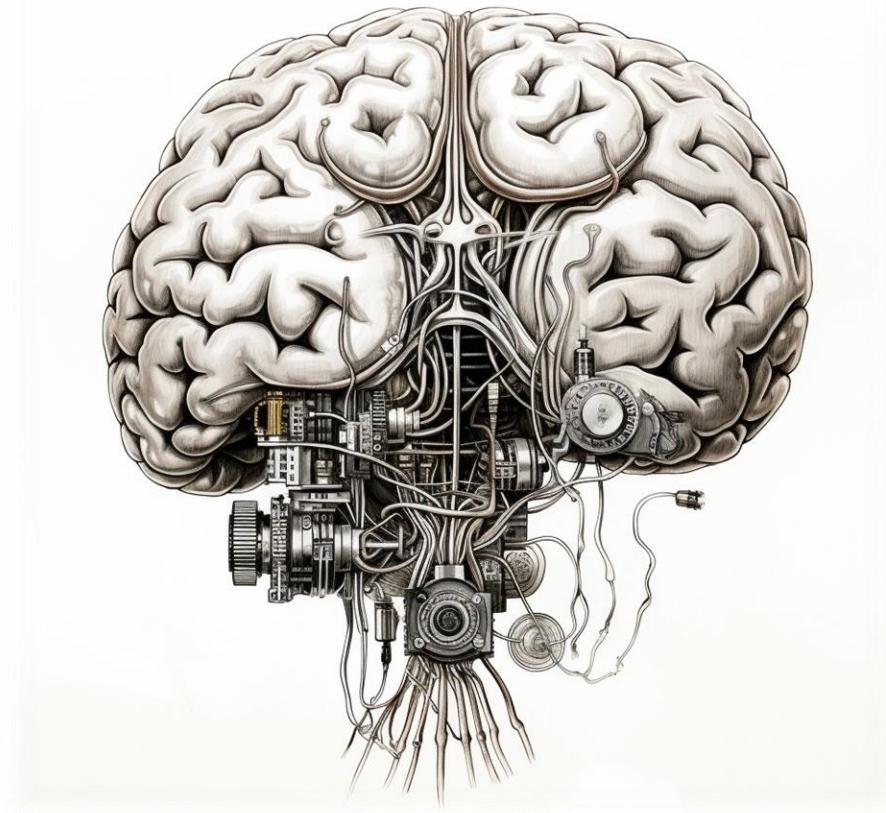
- a → b
- b → c
- c → d
- d → e
- e → f
- f → g
- g → h
- h → i
- i → j
- j → k
- k → l
- l → m
- m → n
- n → o
- o → p
- p → q
- q → r
- r → s
- s → t
- t → u
- u → v
- v → w
- w → x
- x → y
- y → z
- z → -
- - → \*

# Predicting the next letter of the alphabet



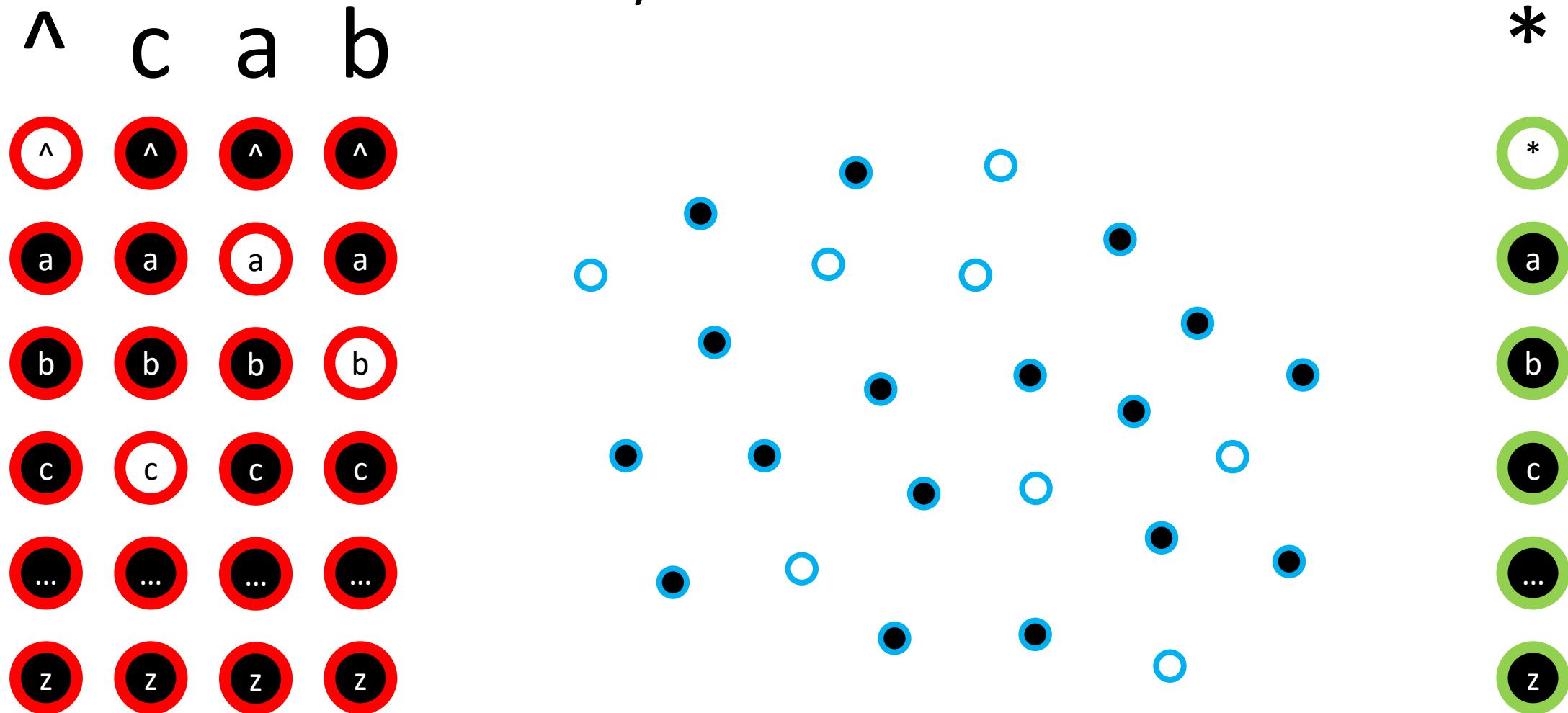
[https://pauldubois98.github.io/GenerativeAI/futur\\_letters.html?data=test](https://pauldubois98.github.io/GenerativeAI/futur_letters.html?data=test)

# Predicting the correct next letter

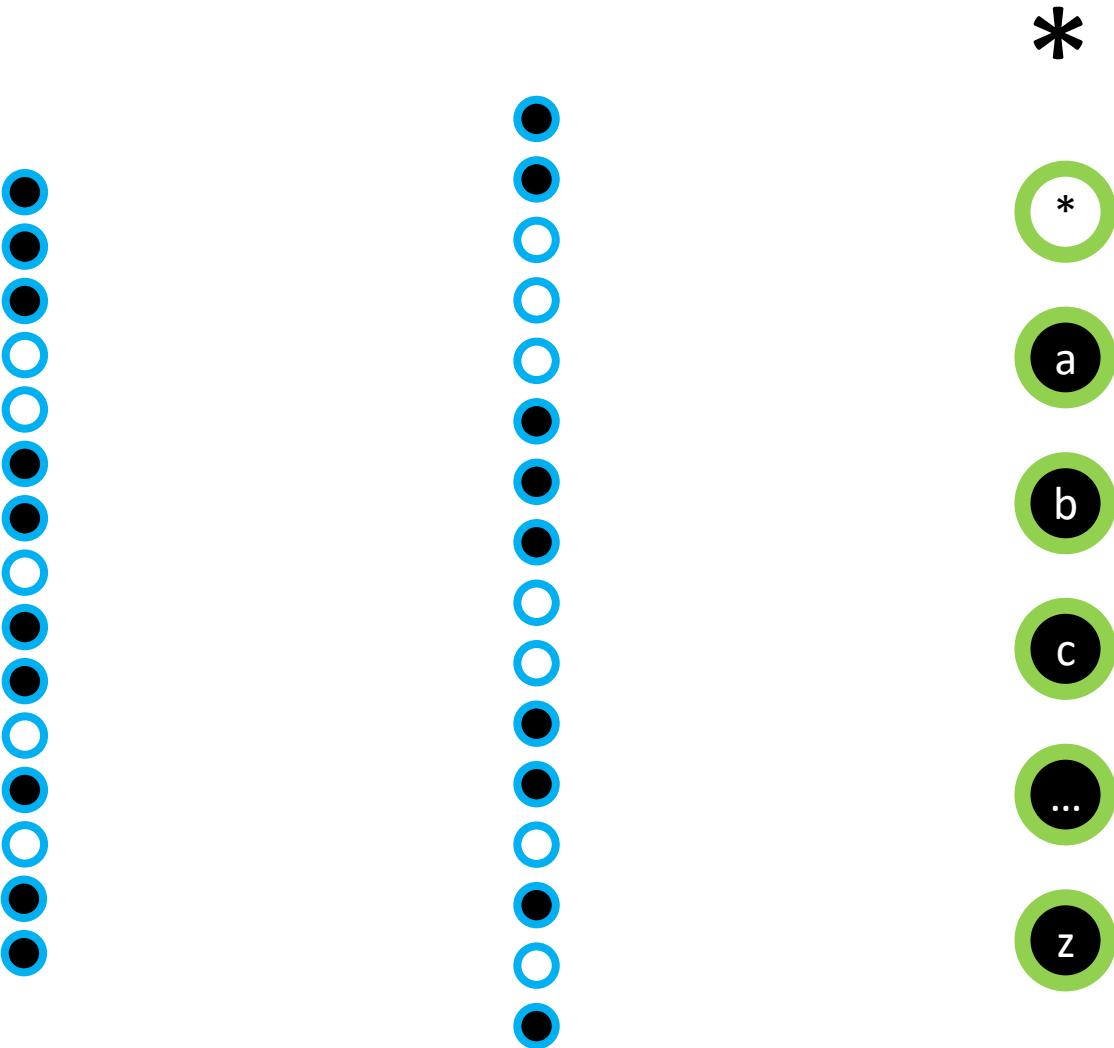
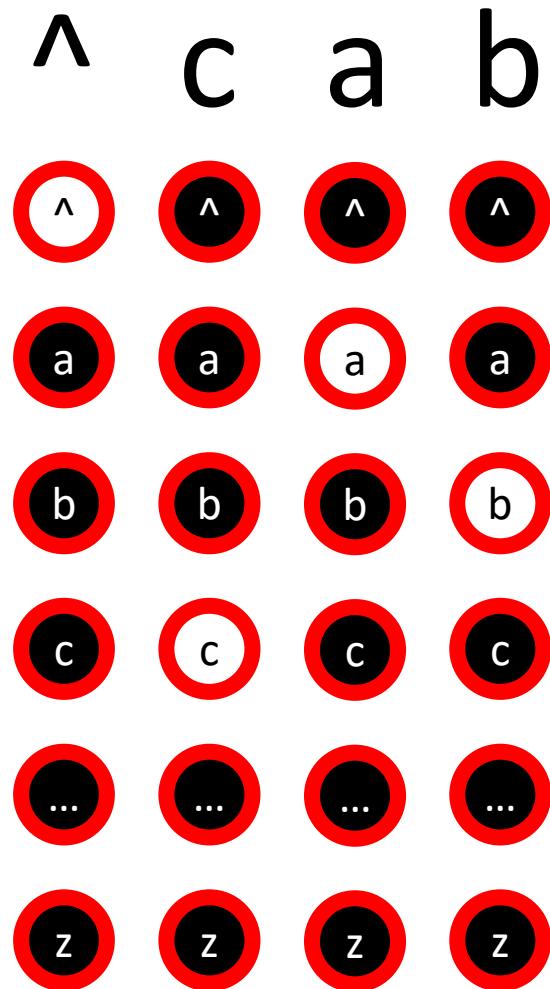


[https://pauldubois98.github.io/GenerativeAI/futur\\_letters.html](https://pauldubois98.github.io/GenerativeAI/futur_letters.html)

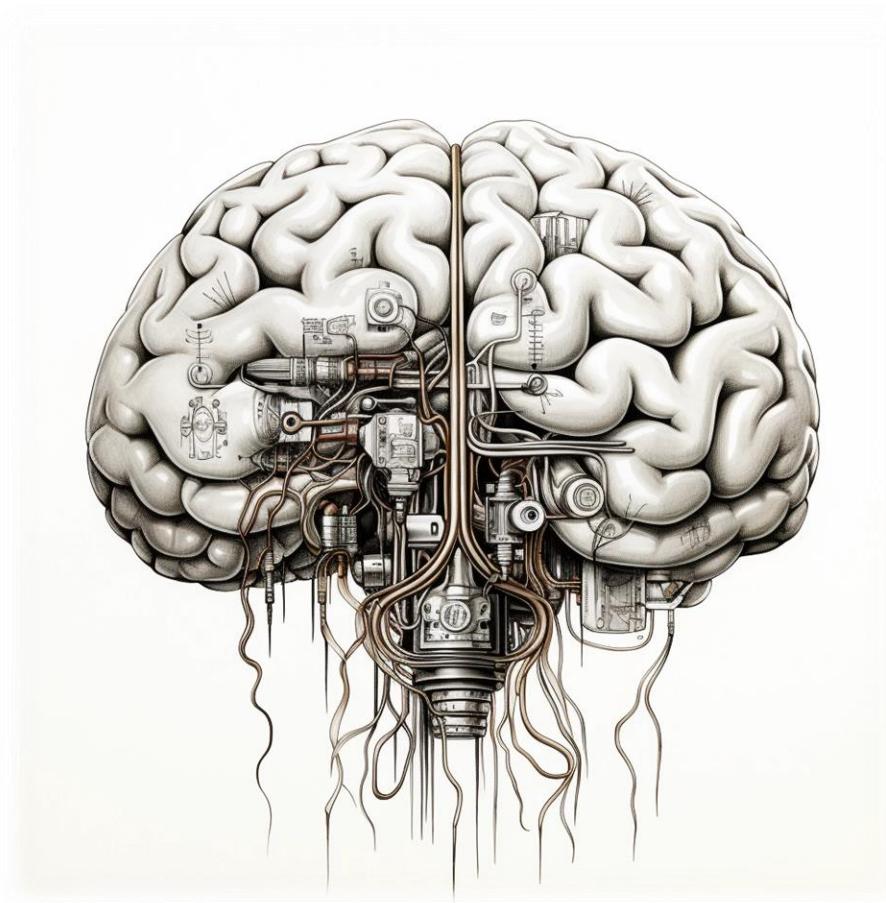
# Layers Architecture



# Layers Architecture



# Layers Architecture



[https://pauldubois98.github.io/GenerativeAI/ultimate\\_letters.html?data=test](https://pauldubois98.github.io/GenerativeAI/ultimate_letters.html?data=test)

# Training dataset

## Ours

Dictionary of  $\approx 10\ 000$  words

## ChatGPT

- FAQ forums
- Wikipedia
- Press articles
- Scientific articles
- School textbooks
- ...

# Training resources

**Ours**

< 10 minutes  
On 1 smartphone  
(or a laptop)

**ChatGPT**

“34 days”  
On 1023 supercomputer  
(A100 GPUs)

# Number of parameters

**Ours**

$$\begin{aligned} & 29 * N_{letters} * N_{middle} \\ & + N_{middle} * 29 \\ \approx & 30 * 10 * 100 + 100 * 30 \end{aligned}$$

$$\approx 3300$$

**ChatGPT**

$$\begin{aligned} \text{ChatGPT-3.5: } & \approx 175 * 10^9 \\ & \approx 175\,000\,000\,000 \end{aligned}$$

$$\begin{aligned} \text{ChatGPT-4: } & \approx 100 * 10^{12} \\ & \approx 100\,000\,000\,000\,000 \end{aligned}$$

# Using ChatGPT

“I buy a coffee and a bread for 5€.  
The coffee is 1€ more expensive  
that the bread.  
How much costs the bread?”

“The bread is 2€”

“I buy a coffee and a bread for 5€.  
The coffee is 2€ more expensive  
that the bread.  
How much costs the bread?”  
“The bread is 3€”

# Using ChatGPT with good prompt

“I buy a coffee and a bread for 5€.

The coffee is 1€ more expensive  
that the bread.

How much costs the bread?

Explain the reasoning.”

“ $B+C = 5 ; C = B+1$

so  $2B+1 = 5$  i.e.,  $B = 2$ .

The bread is 2€”

“I buy a coffee and a bread for 5€.

The coffee is 2€ more expensive  
that the bread.

How much costs the bread?

Explain the reasoning.”

“ $B+C = 5 ; C = B+2$

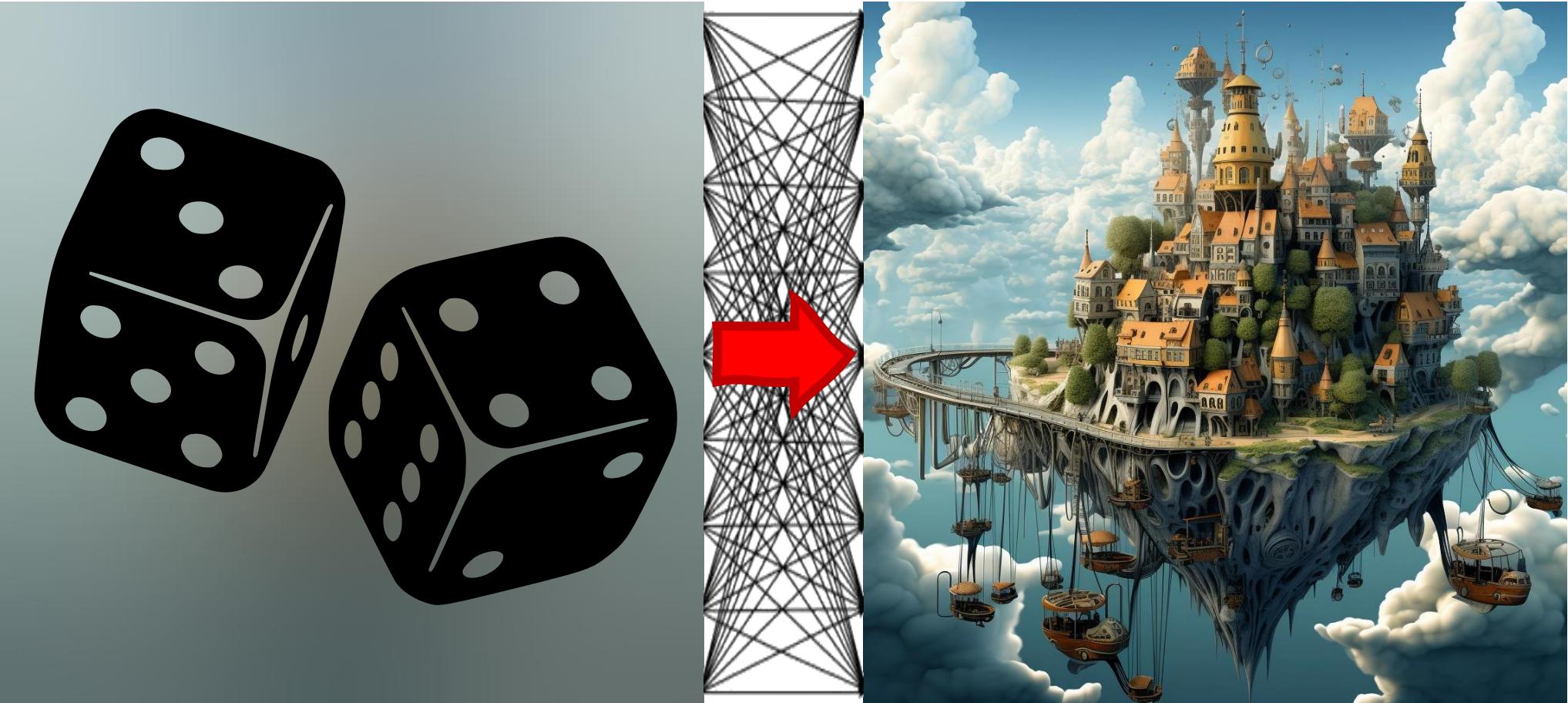
so  $2B+2 = 5$  i.e.,  $B = 1.5$ .

The bread is 1.5€”

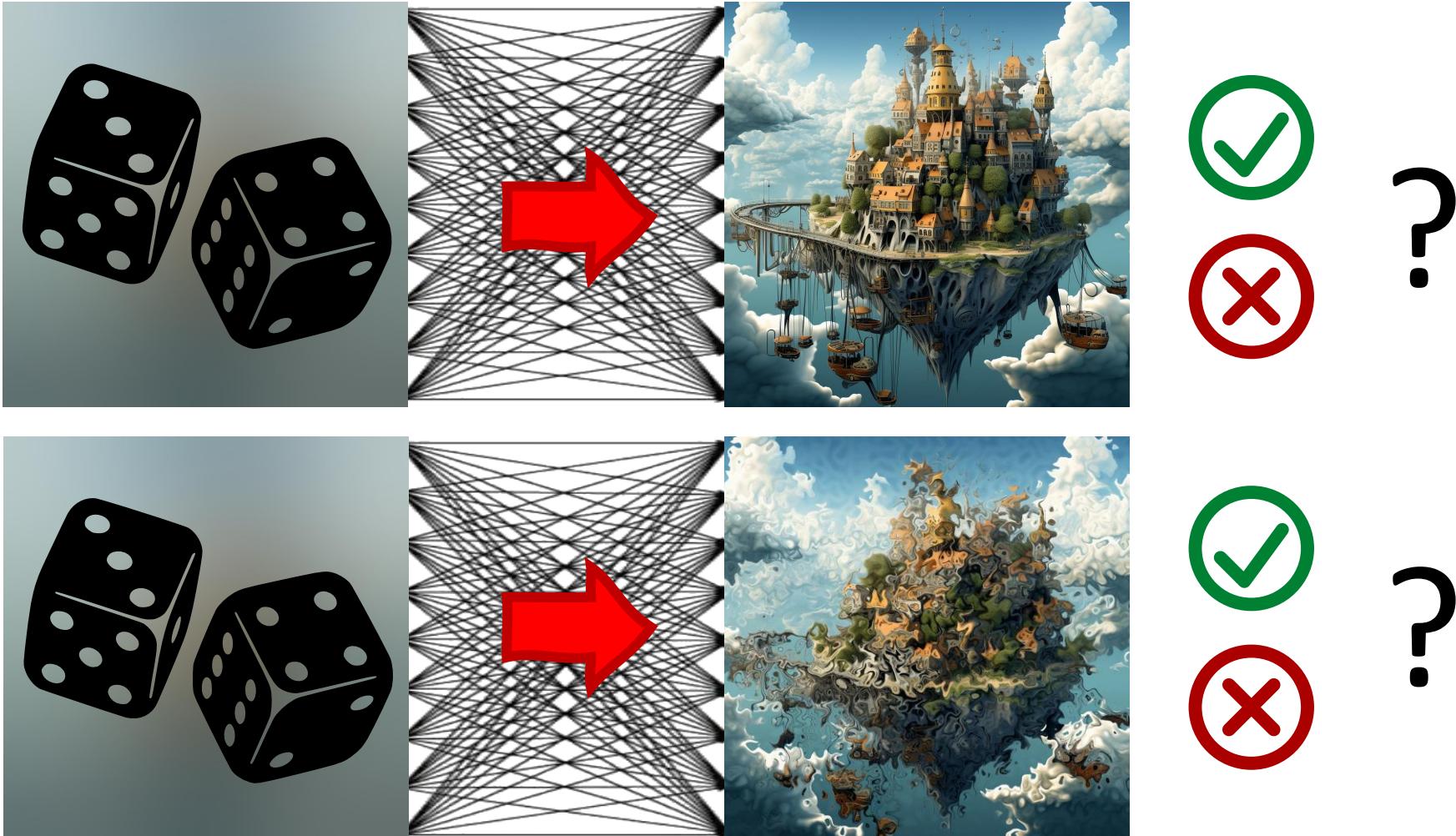
# Does this person exist?



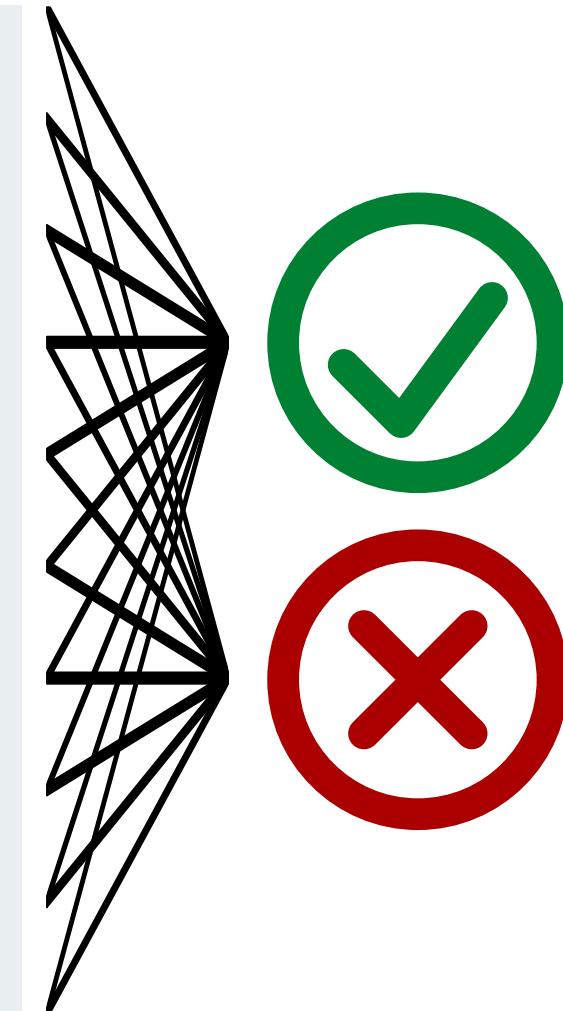
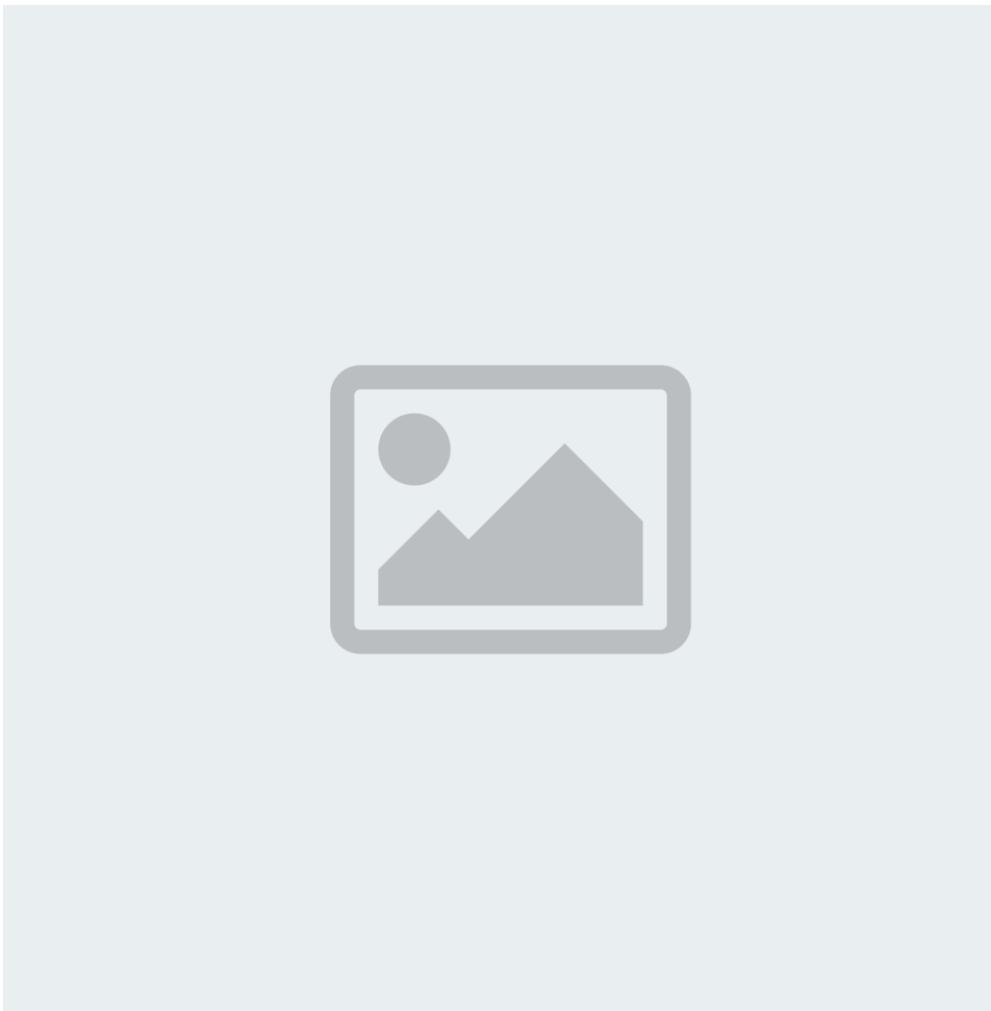
# Generating images



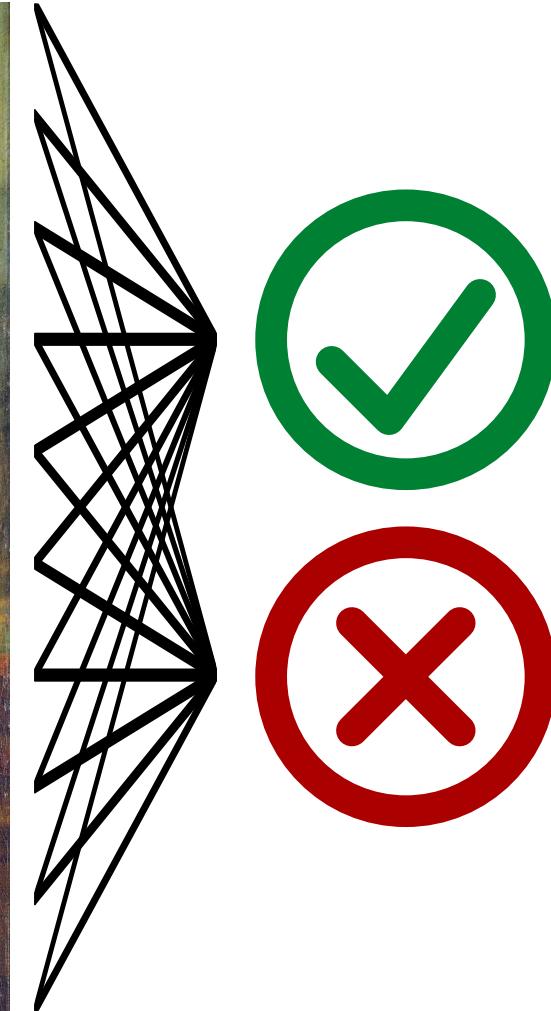
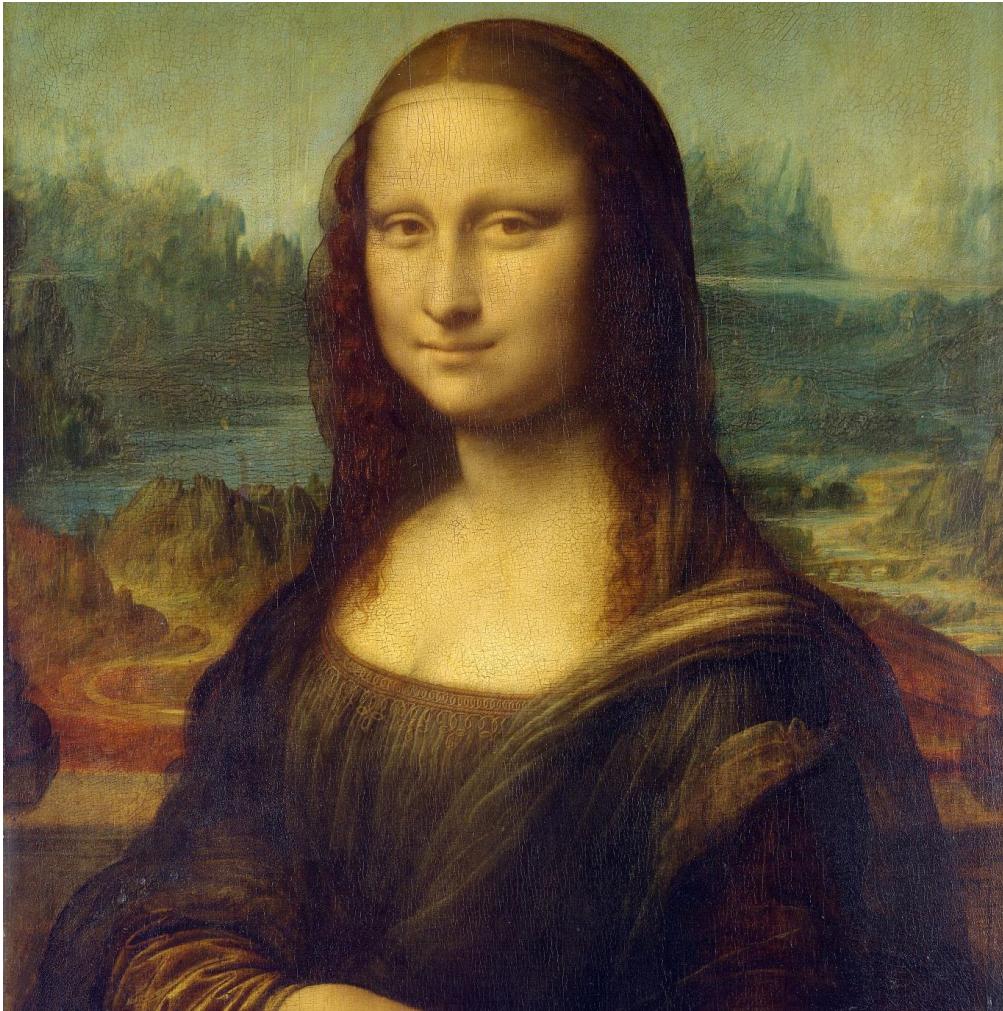
# What is a correctly generated image?



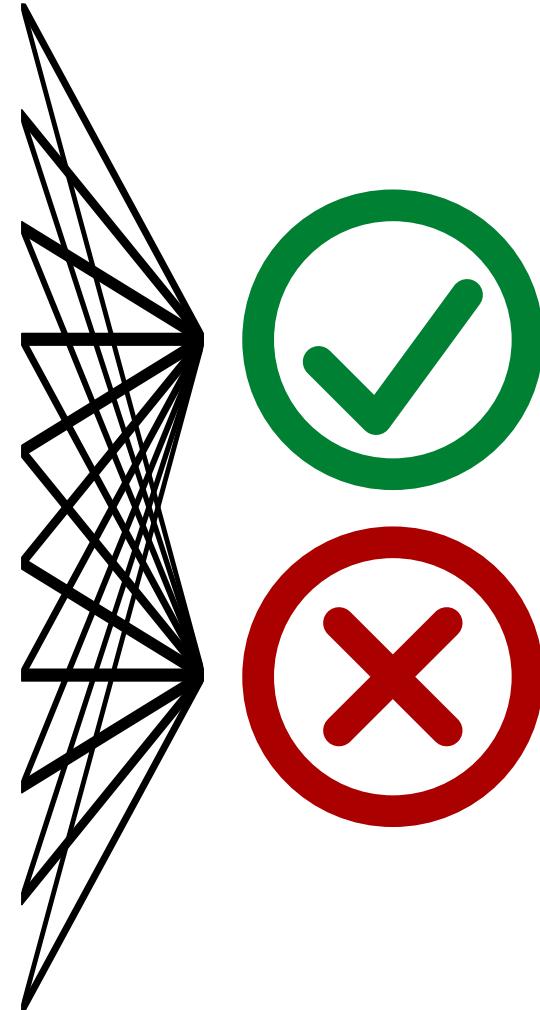
# Use another AI!



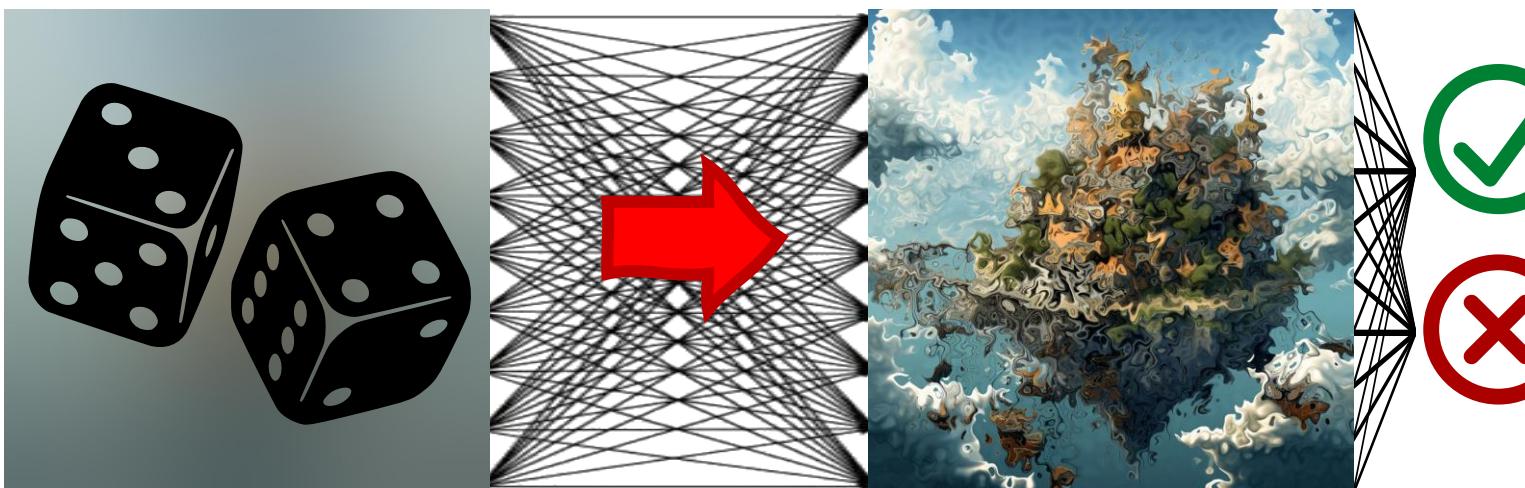
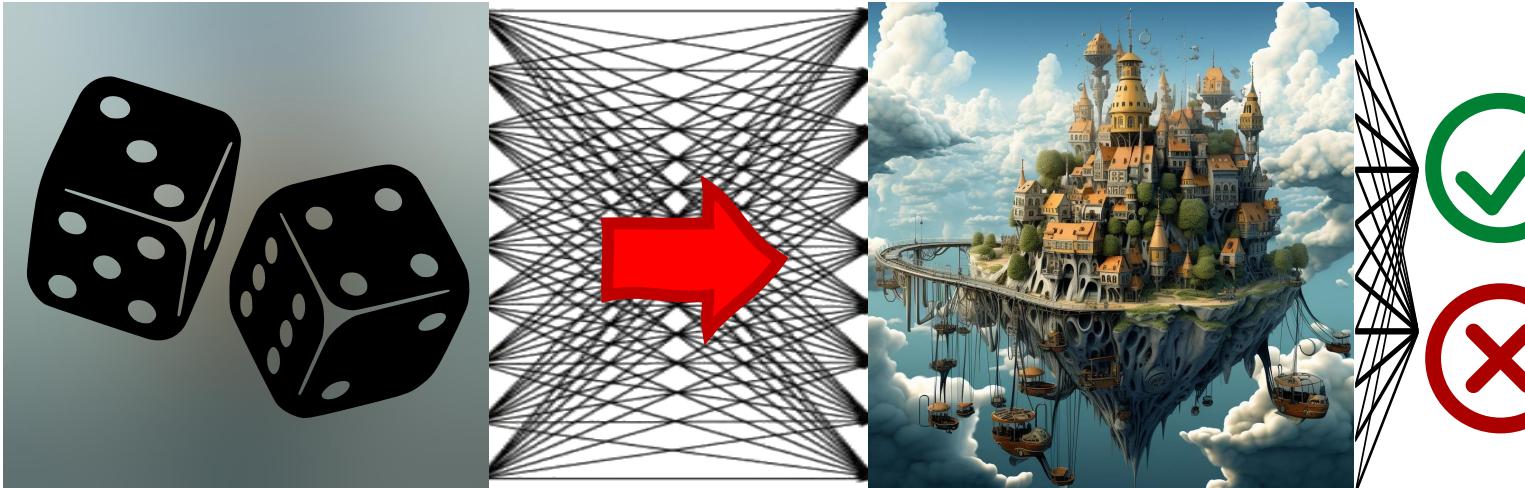
# Use another AI!



# Use another AI!



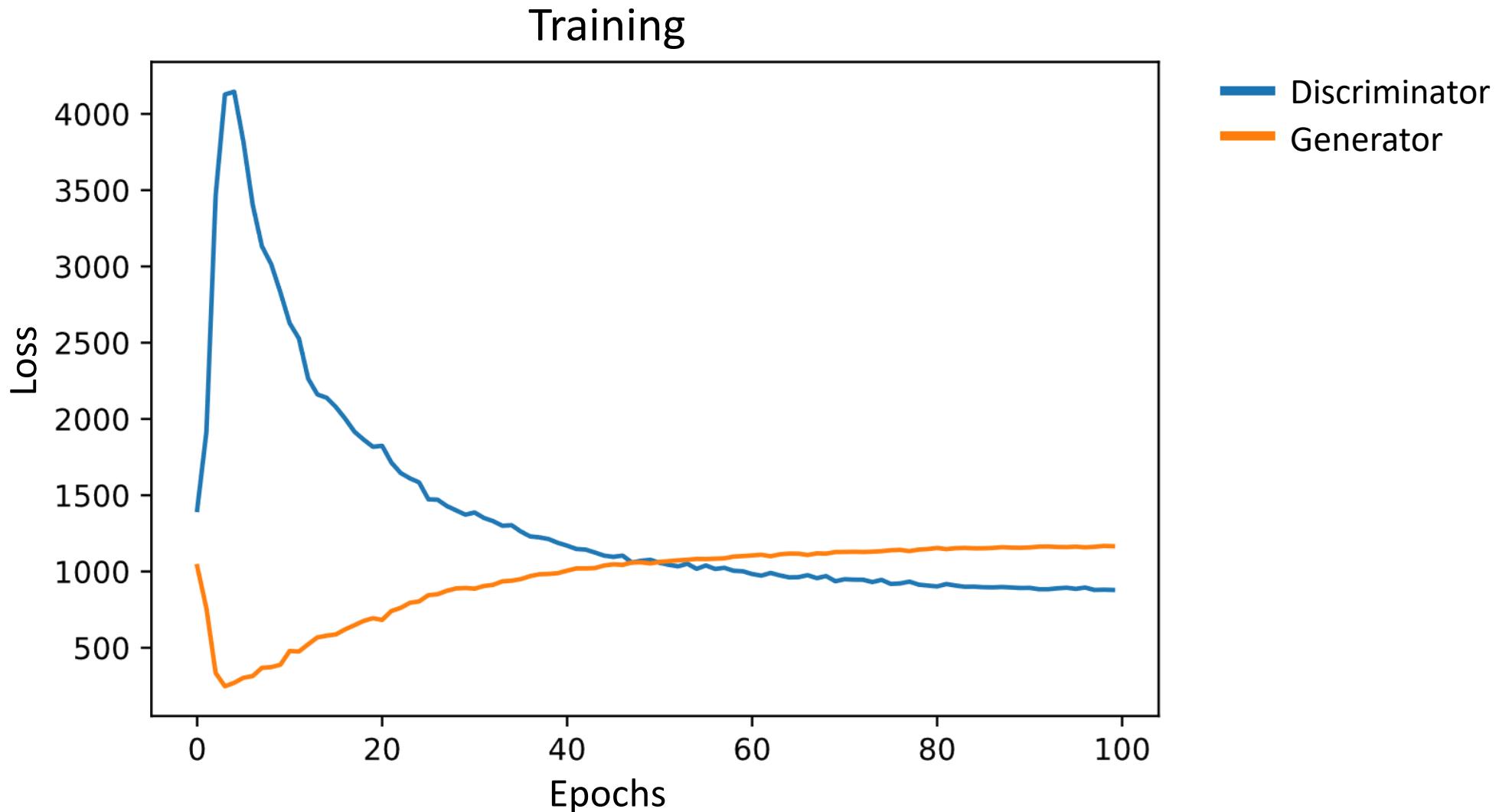
# Generating images training



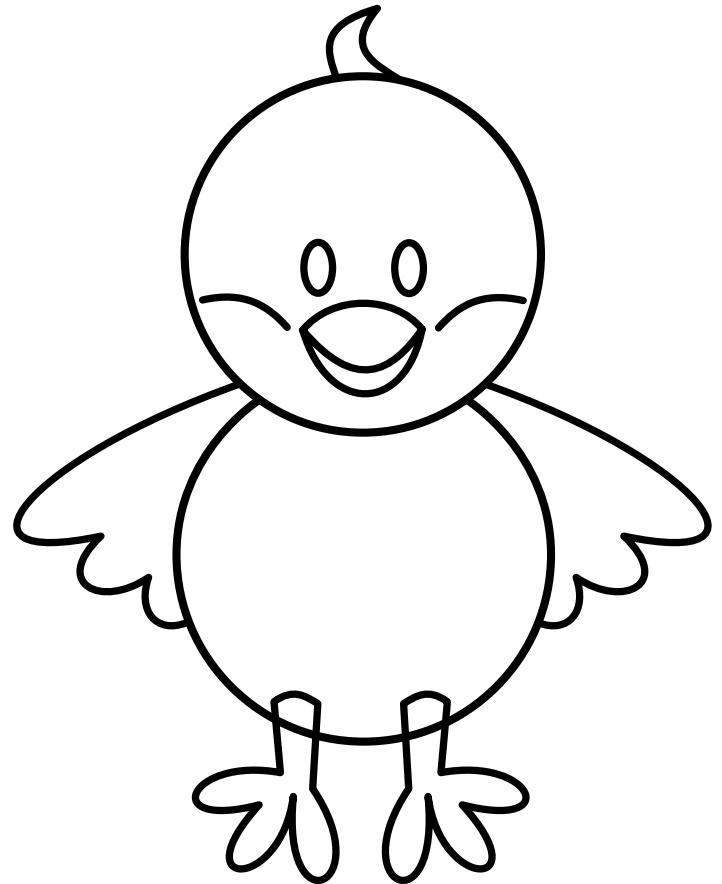
# Generator vs Discriminator



# Generator vs discriminator

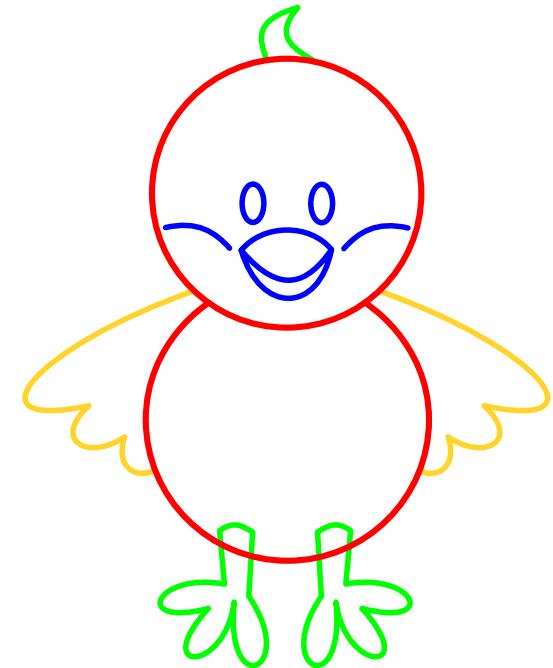
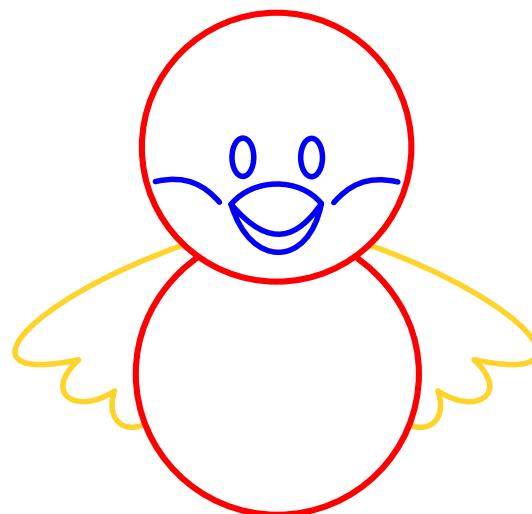
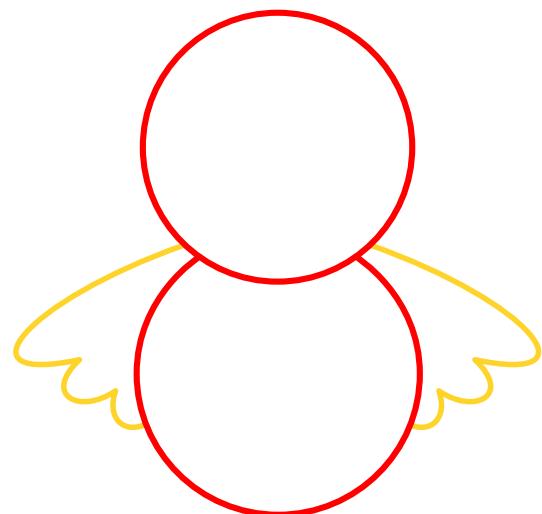
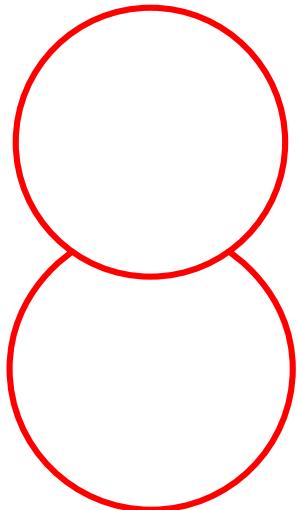


# Draw a chick



[https://pauldubois98.github.io/GenerativeAI/drawing\\_sandbox.html](https://pauldubois98.github.io/GenerativeAI/drawing_sandbox.html)

# Draw a chick... with steps!



# Denoising

