

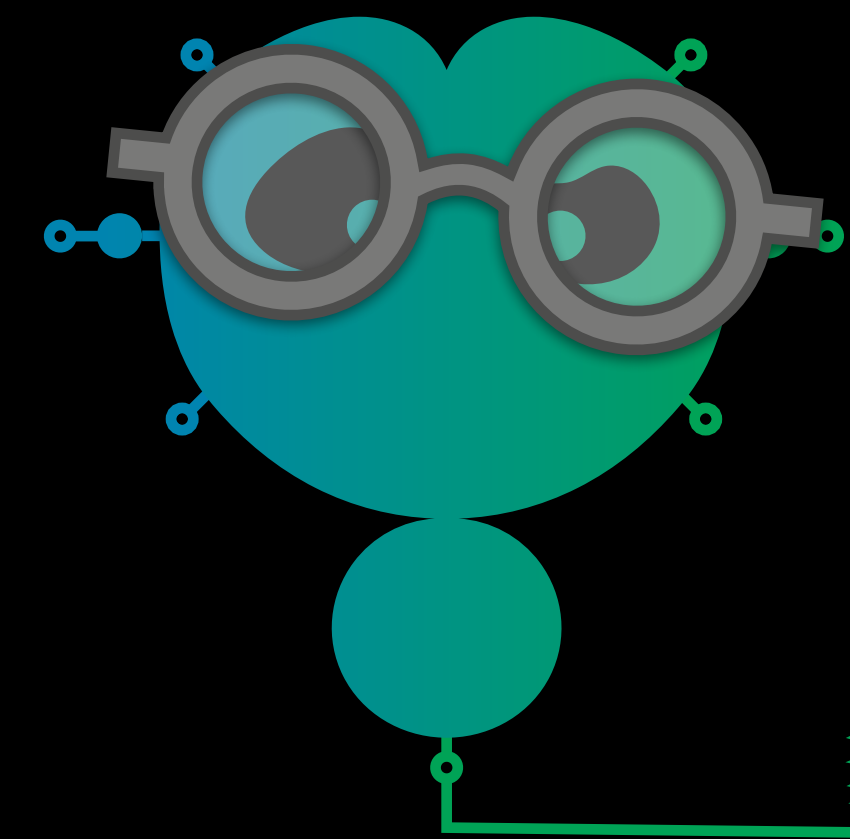
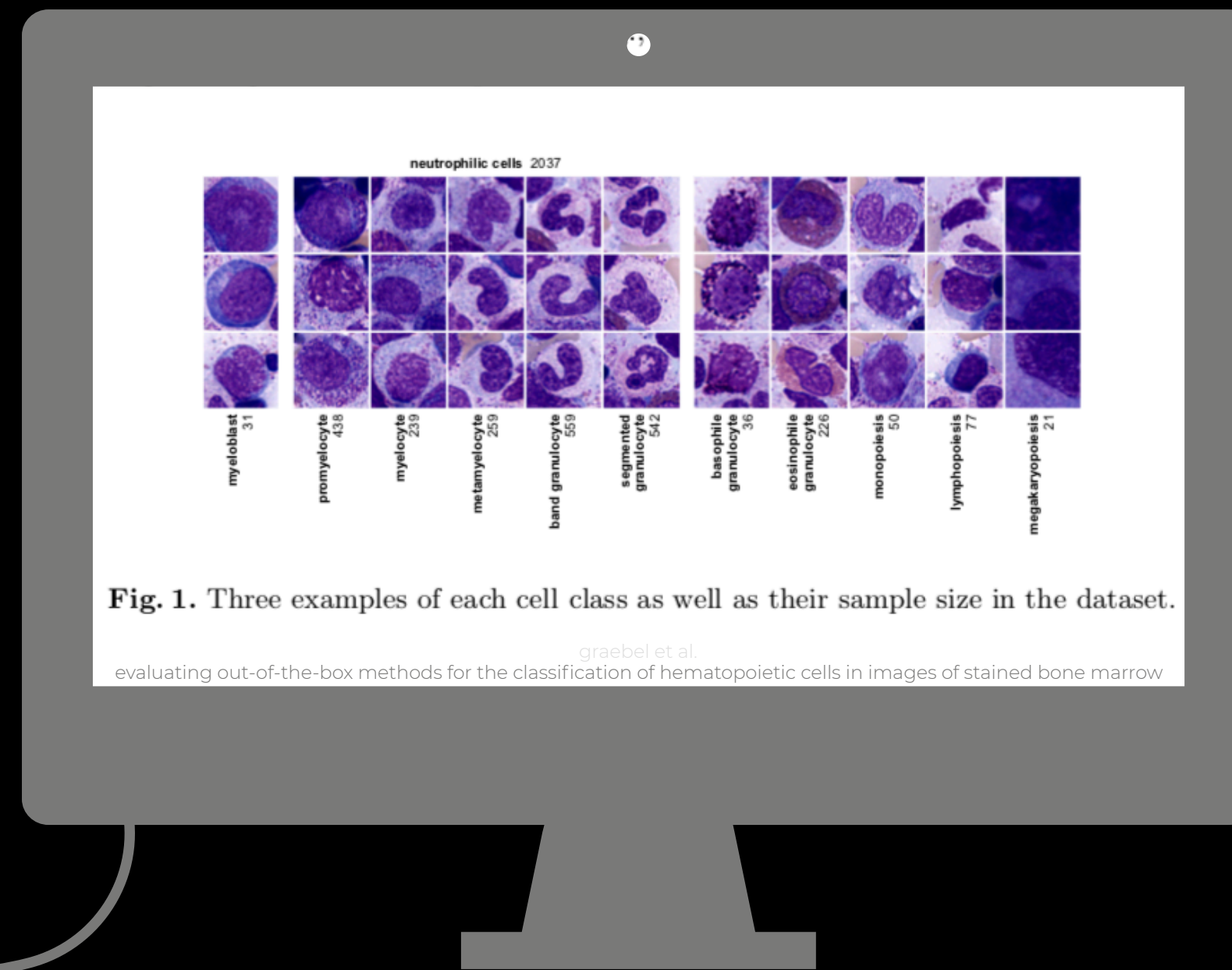
introduction to

# DEEP LEARNING

# WHO IS TEUBI?



# WHO IS TEUBI?



# ALGORITHMS THEN & NOW

some input



```
> do this  
> do that  
> if this  
    > then that  
> else  
    > this
```

algorithm

some output



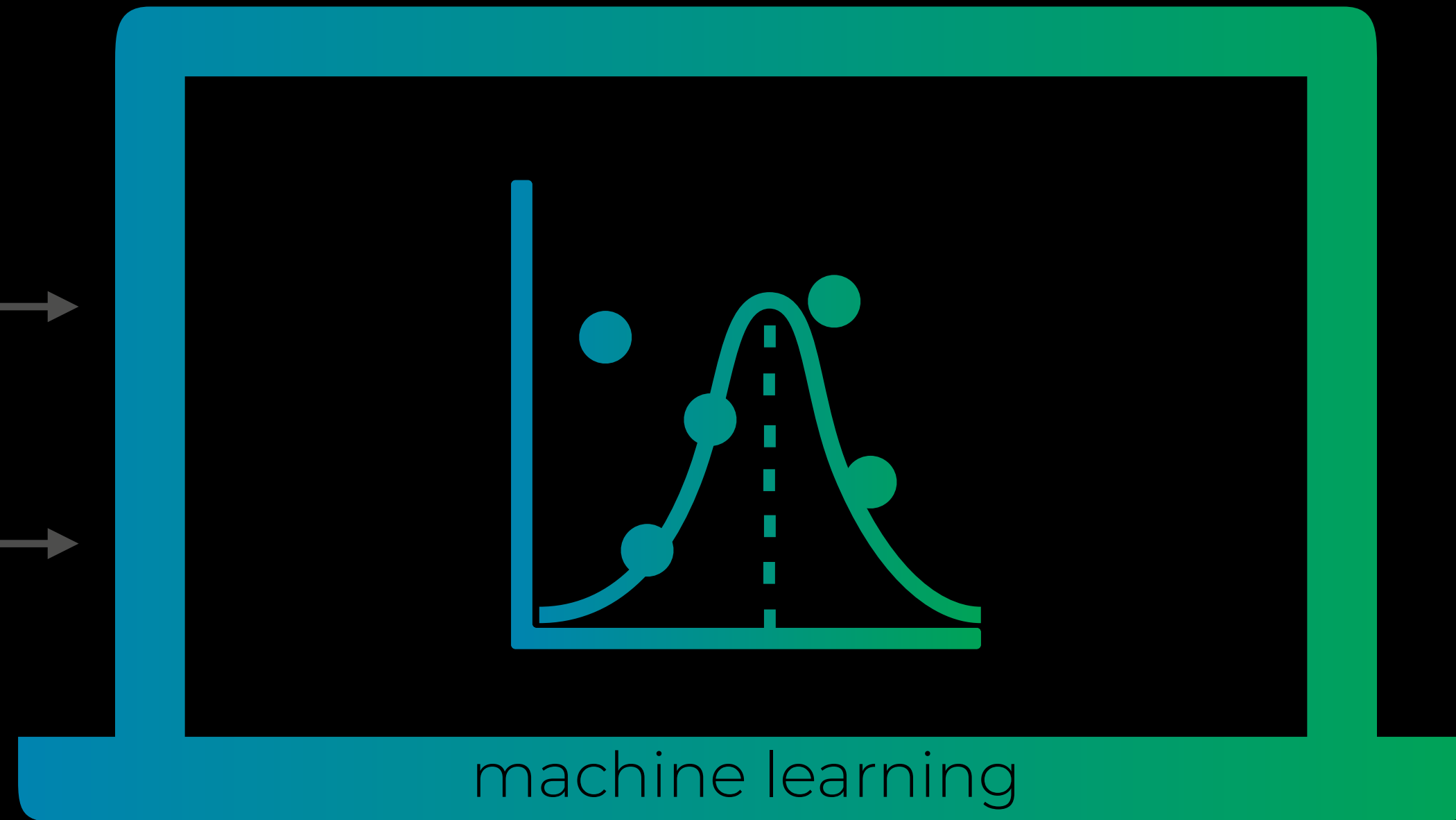


# ALGORITHMS THEN & NOW

some input



some output



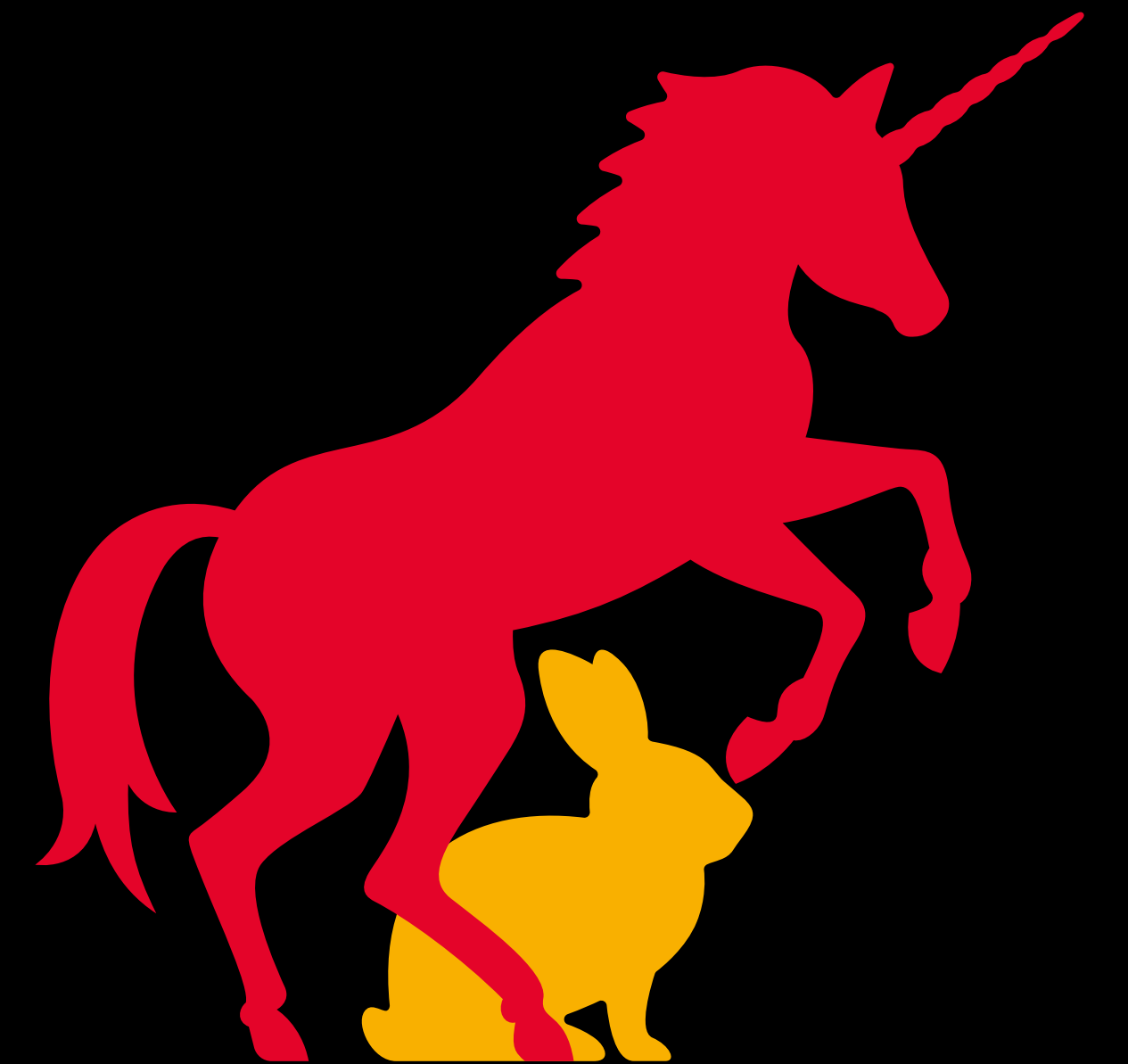
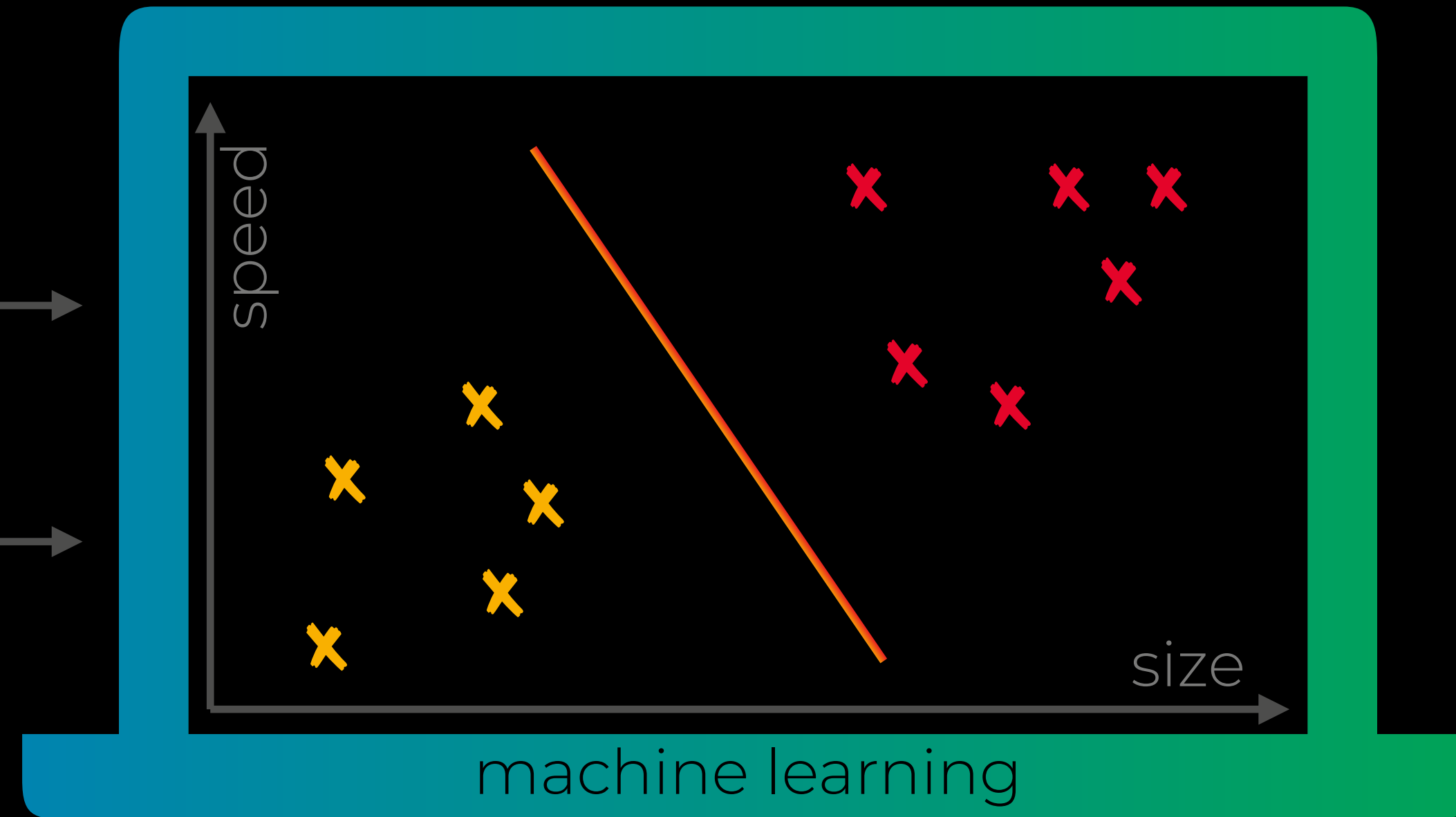
# ALGORITHMS THEN & NOW



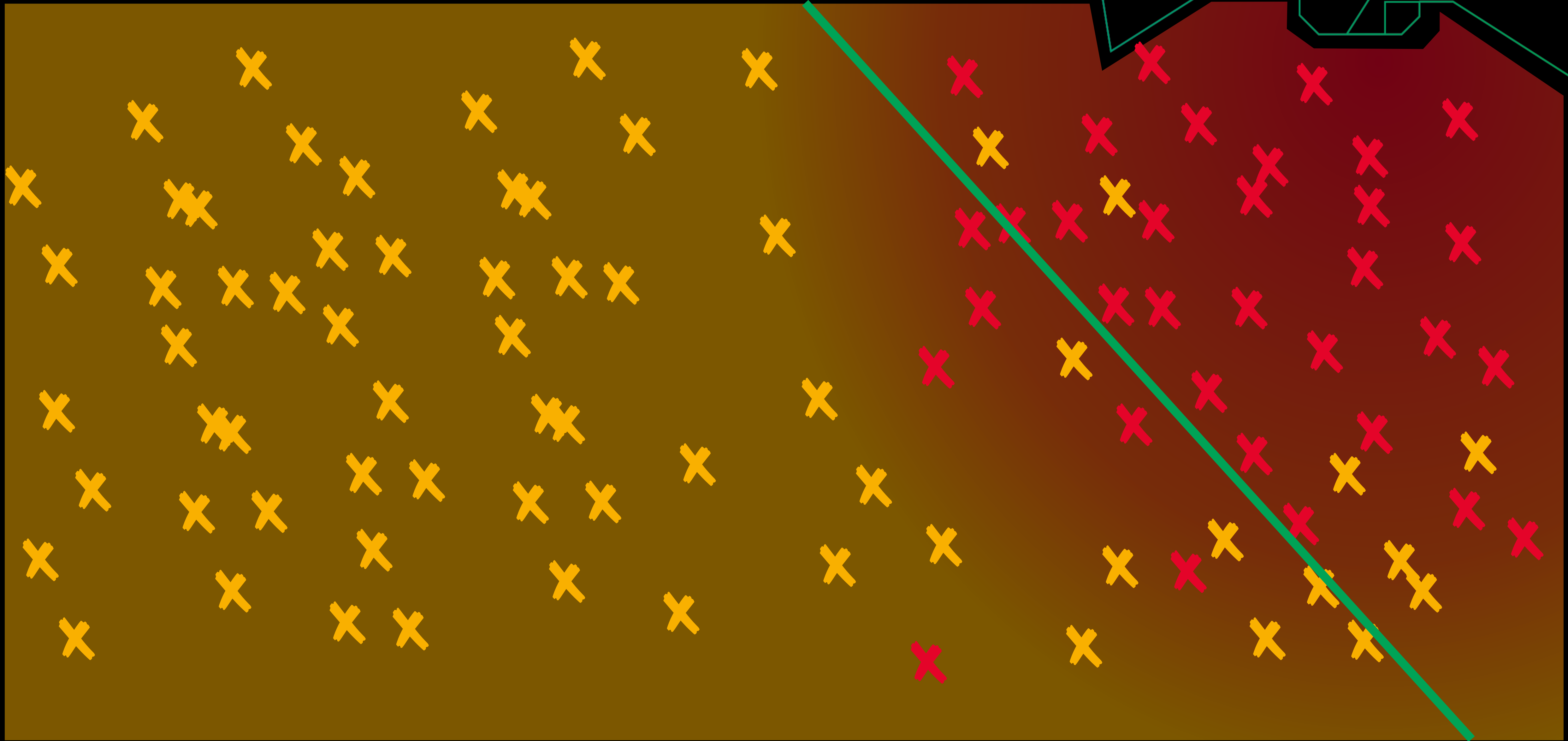
some input



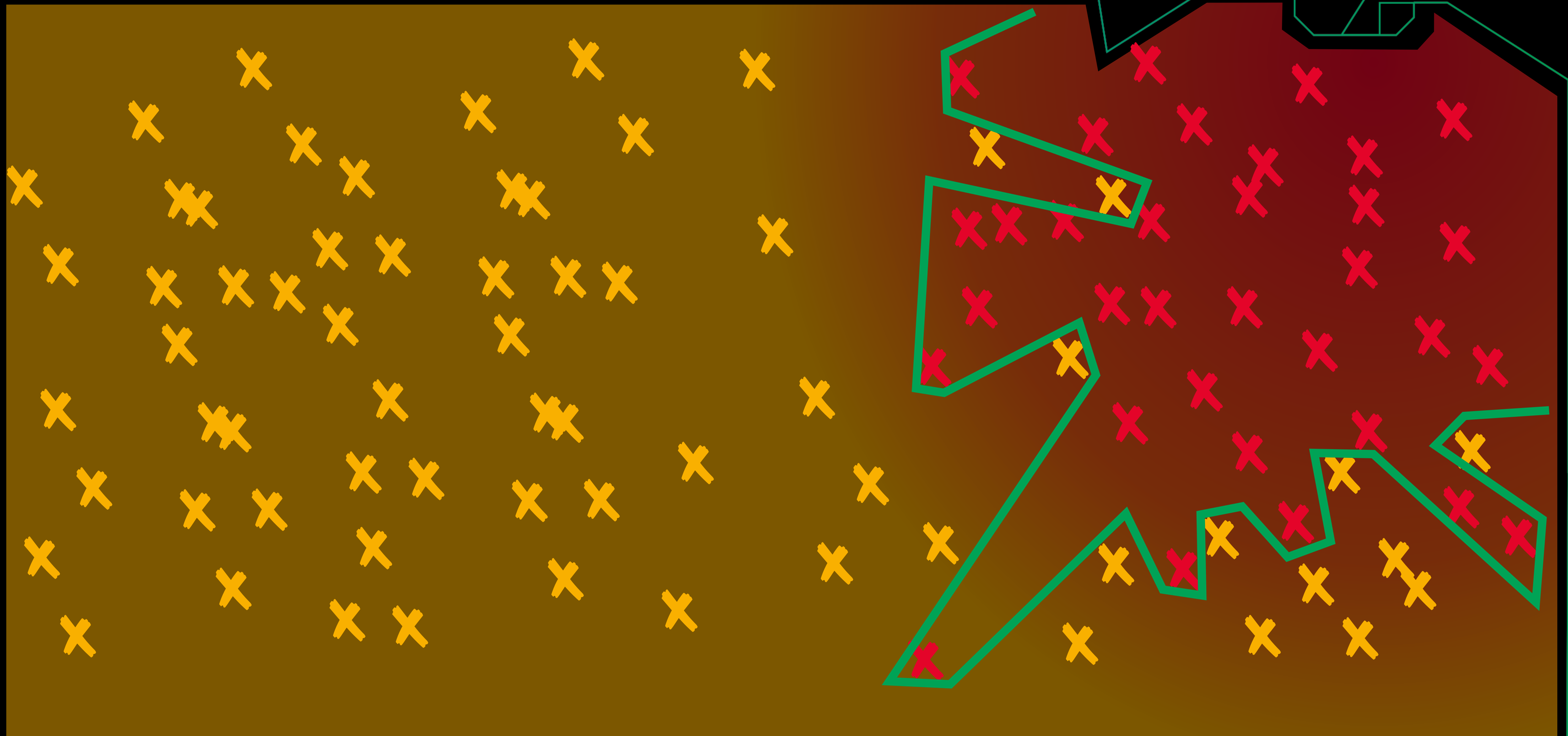
some output



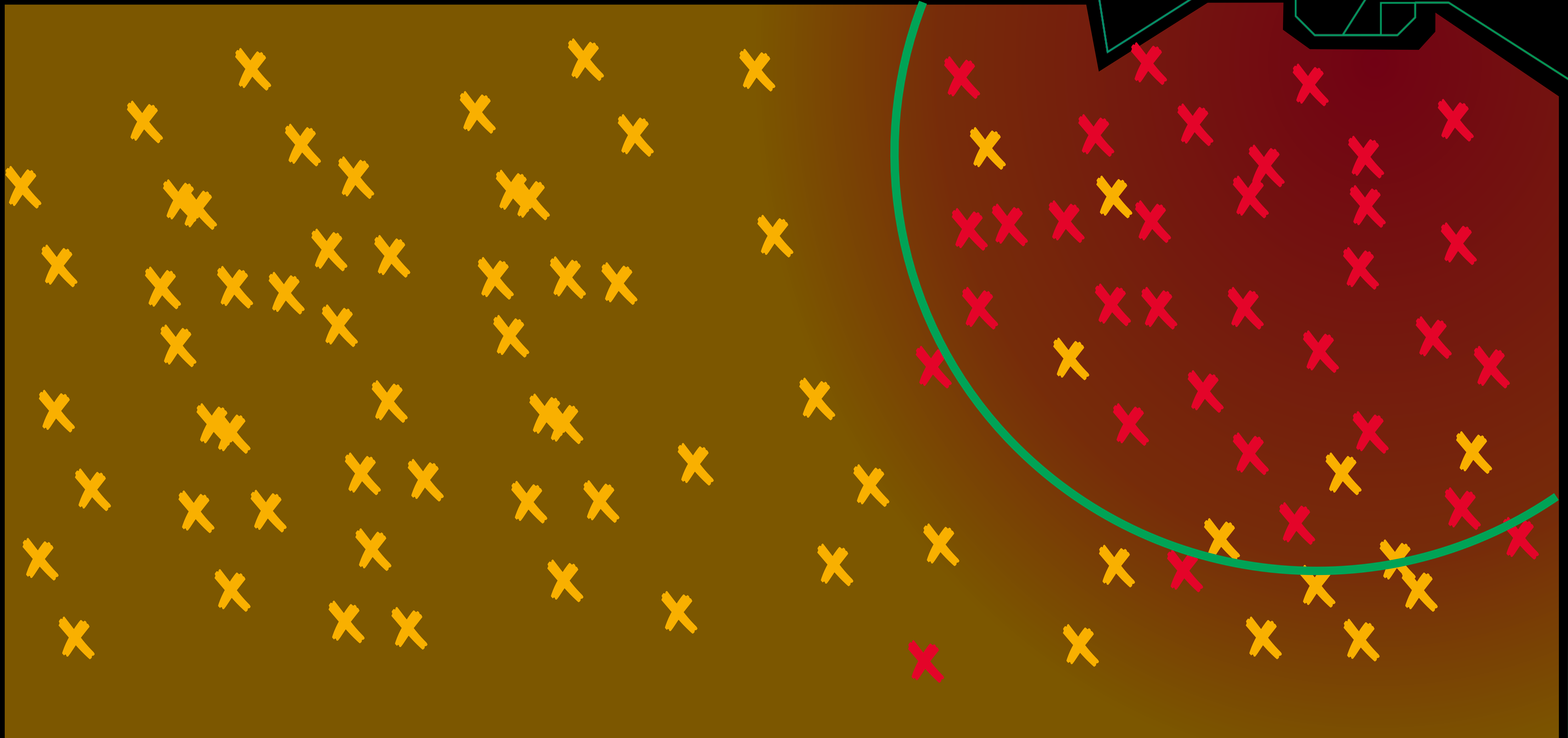
# OVERFITTING UNDERFITTING



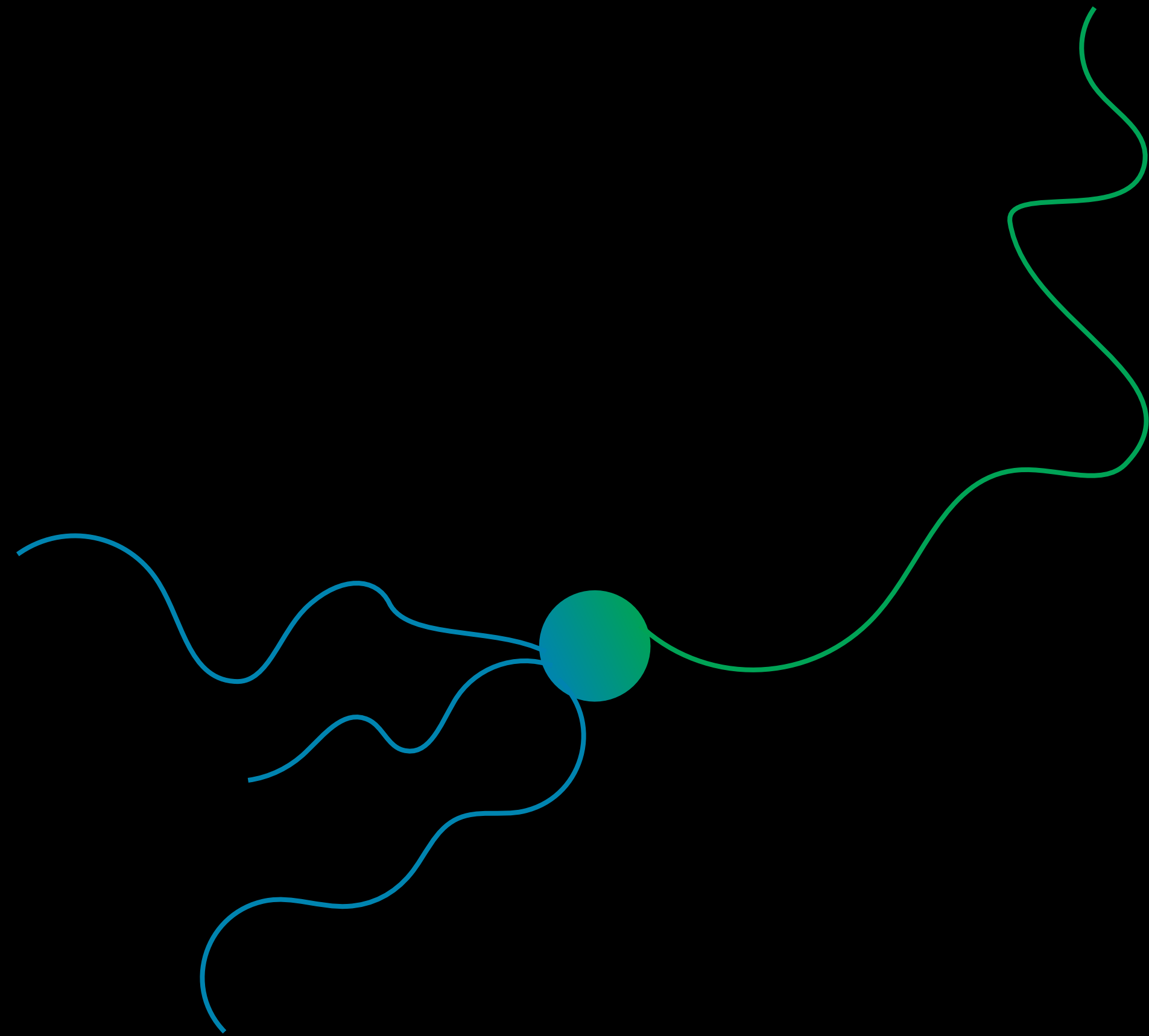
# OVERFITTING UNDERFITTING



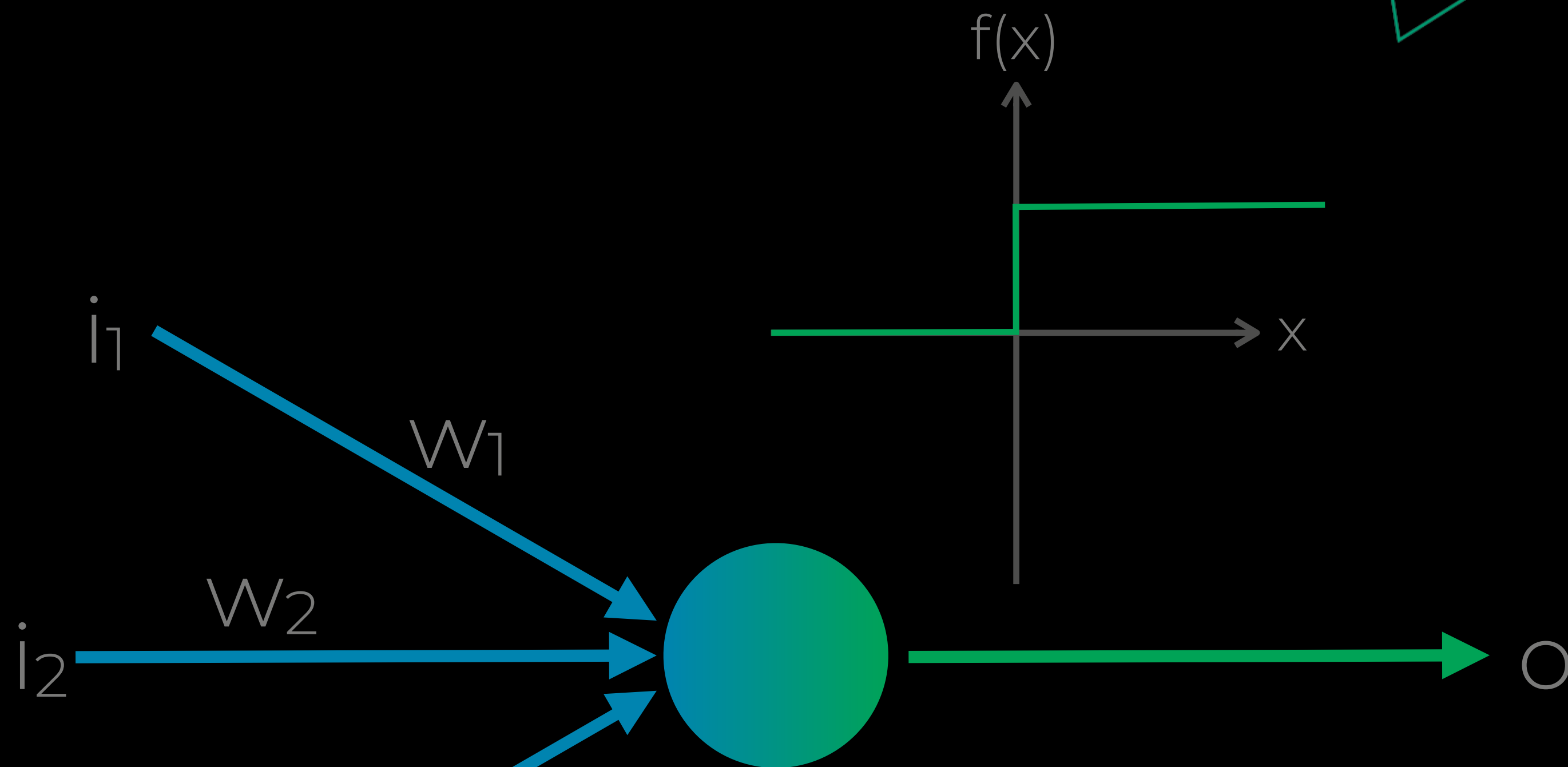
# OVERFITTING UNDERFITTING



# NEURAL NETWORKS

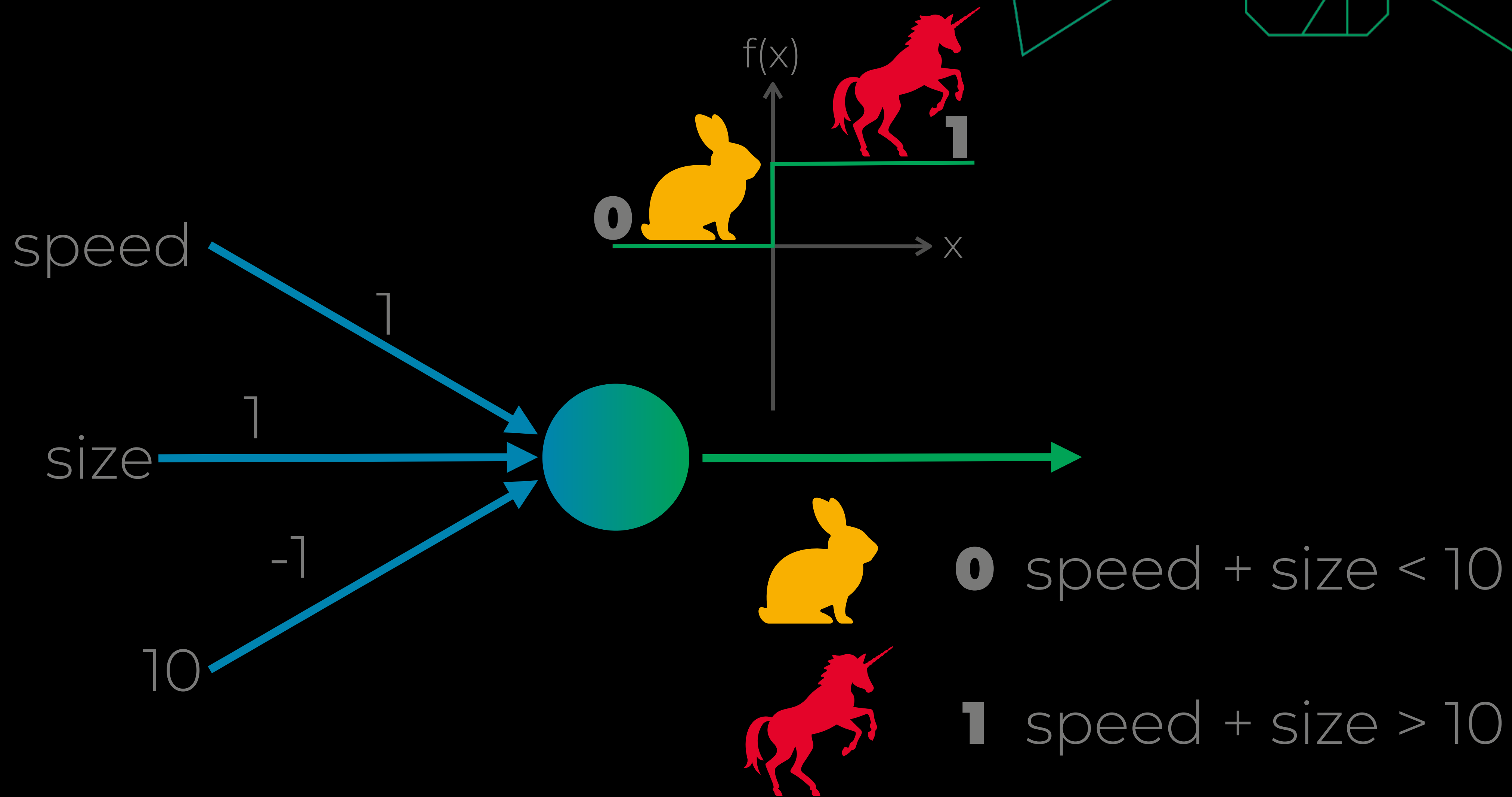


# NEURAL NETWORKS



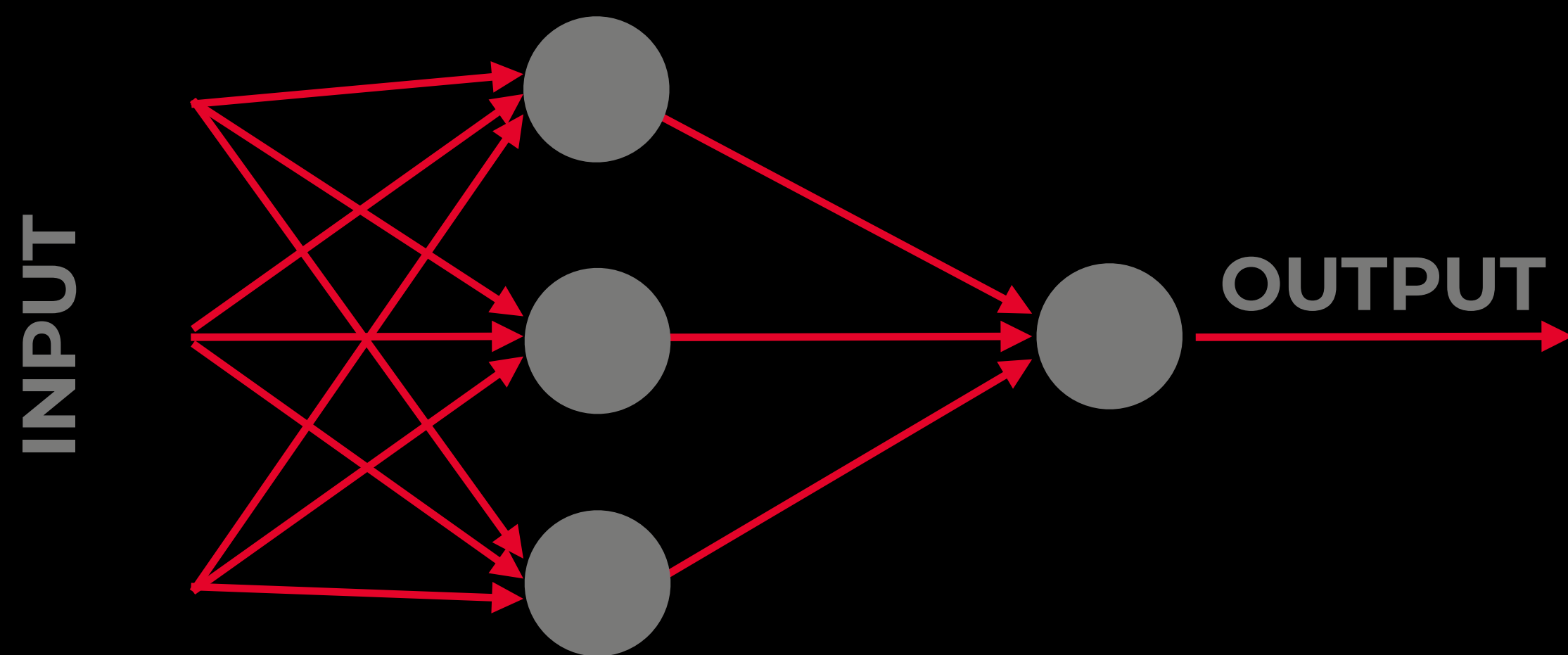
$$o = f(\sum iw)$$

# NEURAL NETWORKS





# NEURAL NETWORKS



computed  
**OUTPUT**

expected  
**OUTPUT**

0



0

0



*raise weights!*

1

1



*lower weights!*

0

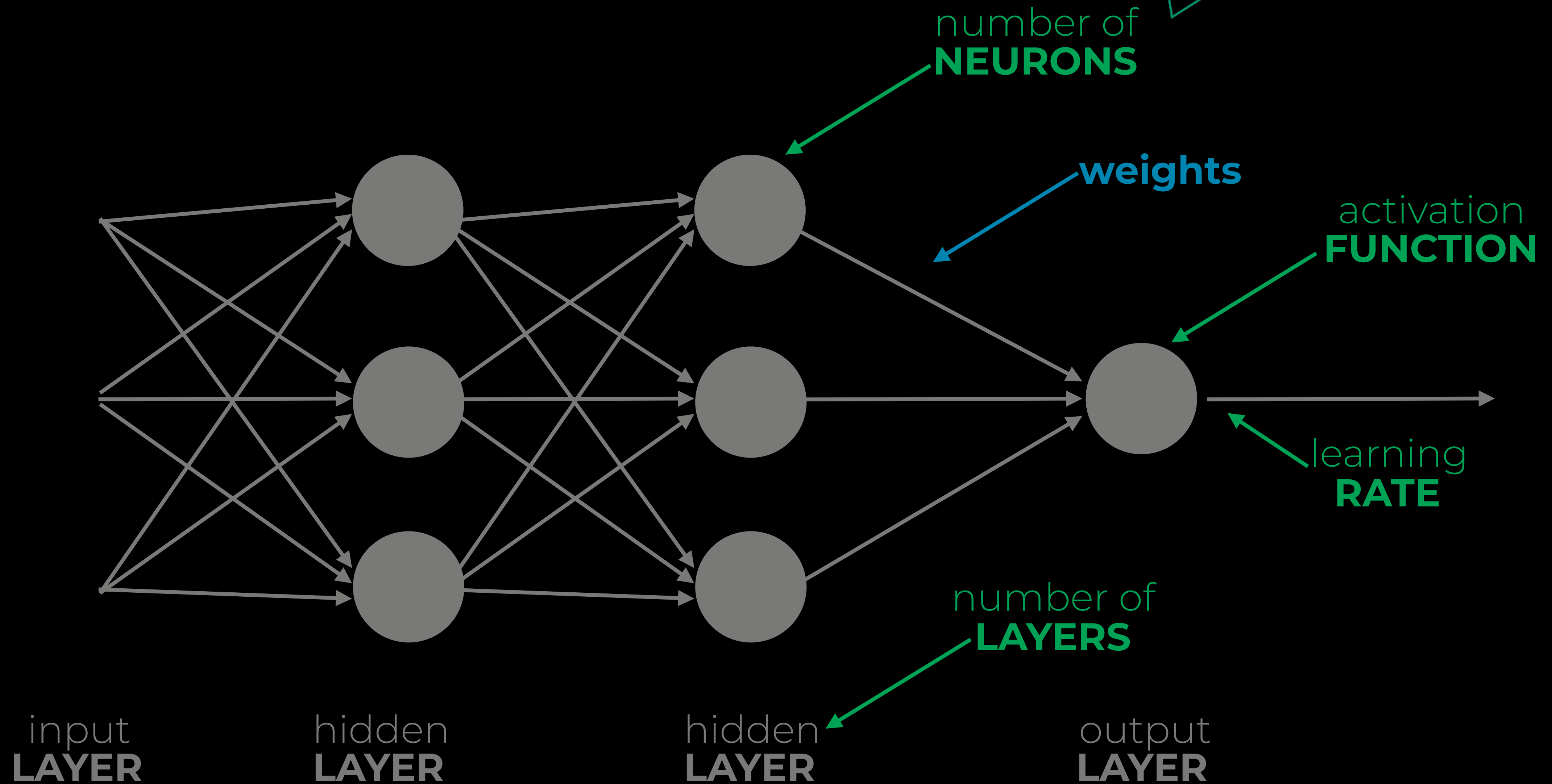
1



1

$$\lambda, || O_{\text{computed}} - O_{\text{expected}} ||$$

# NEURAL NETWORKS



# NEURAL NETWORKS

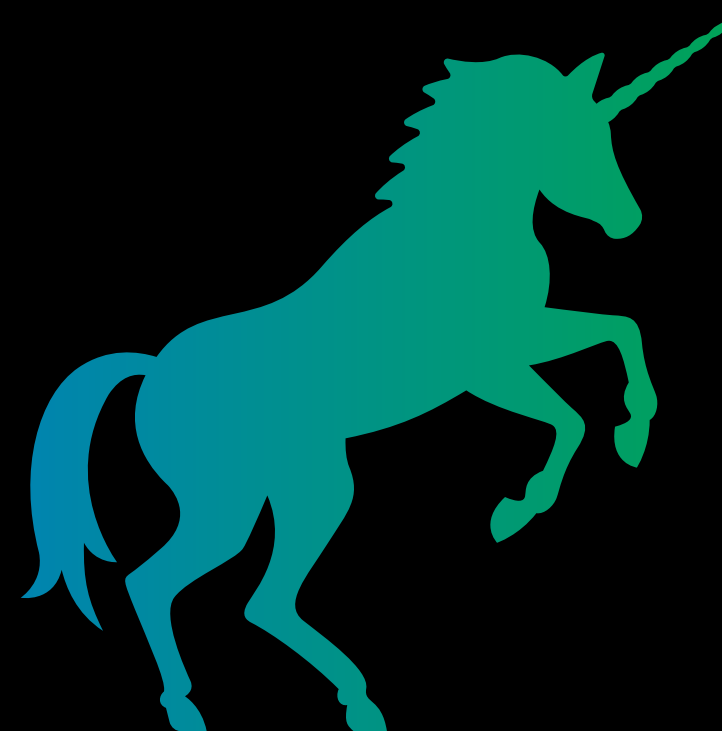
- **CLASSIFICATION TASKS**

- **ANIMAL** rabbit | unicorn

size

speed

colour



- **TEXT** spam | not spam

- **PATIENT** healthy | ill

- **IMAGE** cat | dog



# NEURAL NETWORKS

- **CLASSIFICATION TASKS**

- **ANIMAL** rabbit | unicorn

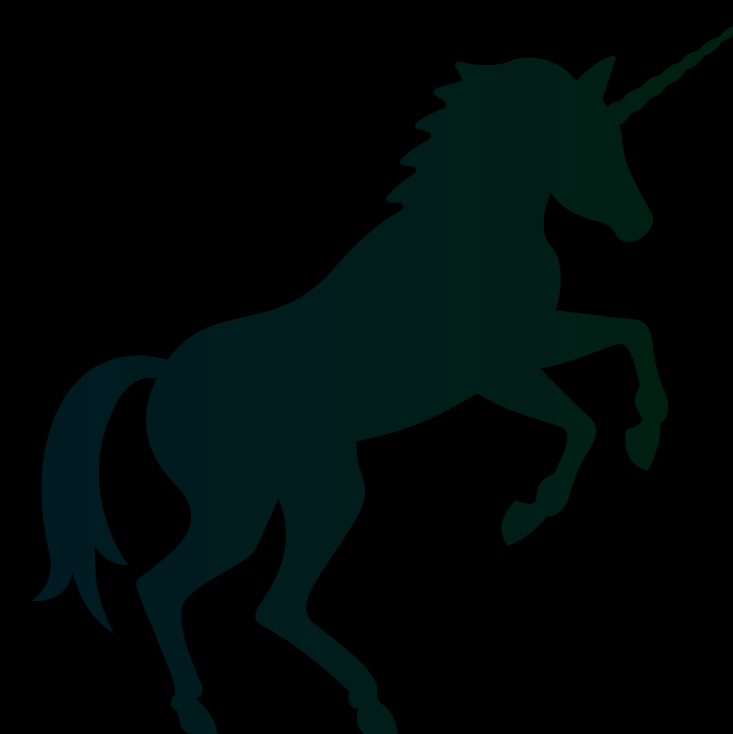
- **TEXT** spam | not spam

- sender

- recipient

- hyperlinks?

- certain words?



- **PATIENT** healthy | ill

- **IMAGE** cat | dog

# NEURAL NETWORKS

- **CLASSIFICATION TASKS**

- **ANIMAL** rabbit | unicorn

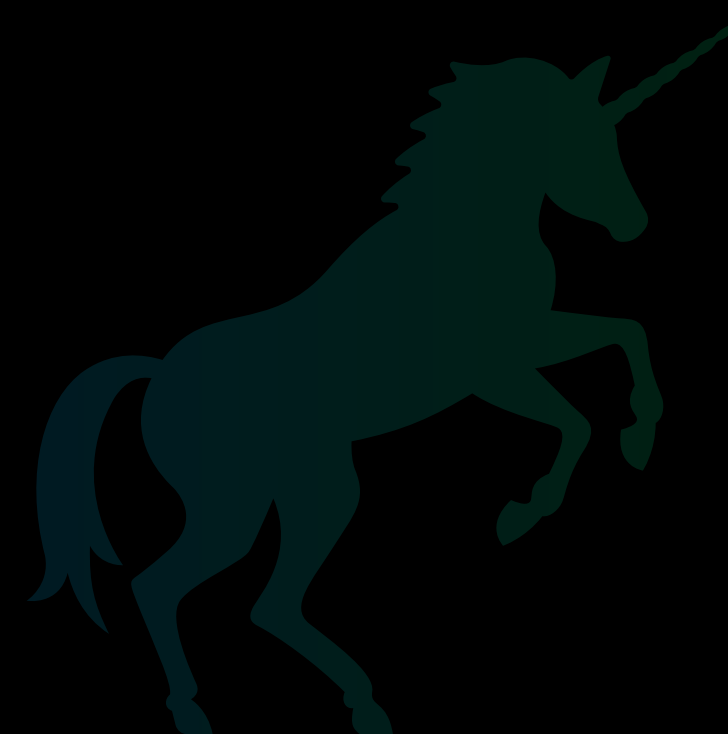
- **TEXT** spam | not spam

- **PATIENT** healthy | ill

medical history

temperature

certain symptoms



- **IMAGE** cat | dog

# NEURAL NETWORKS

- **CLASSIFICATION TASKS**

- **ANIMAL** rabbit | unicorn

- **TEXT** spam | not spam

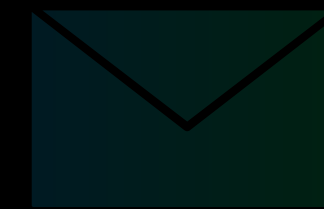
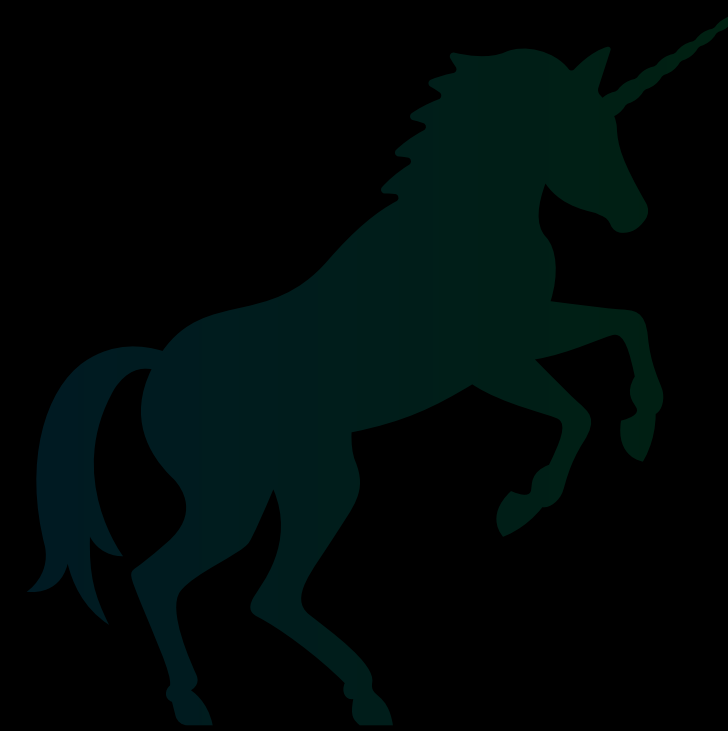
- **PATIENT** healthy | ill

- **IMAGE** cat | dog

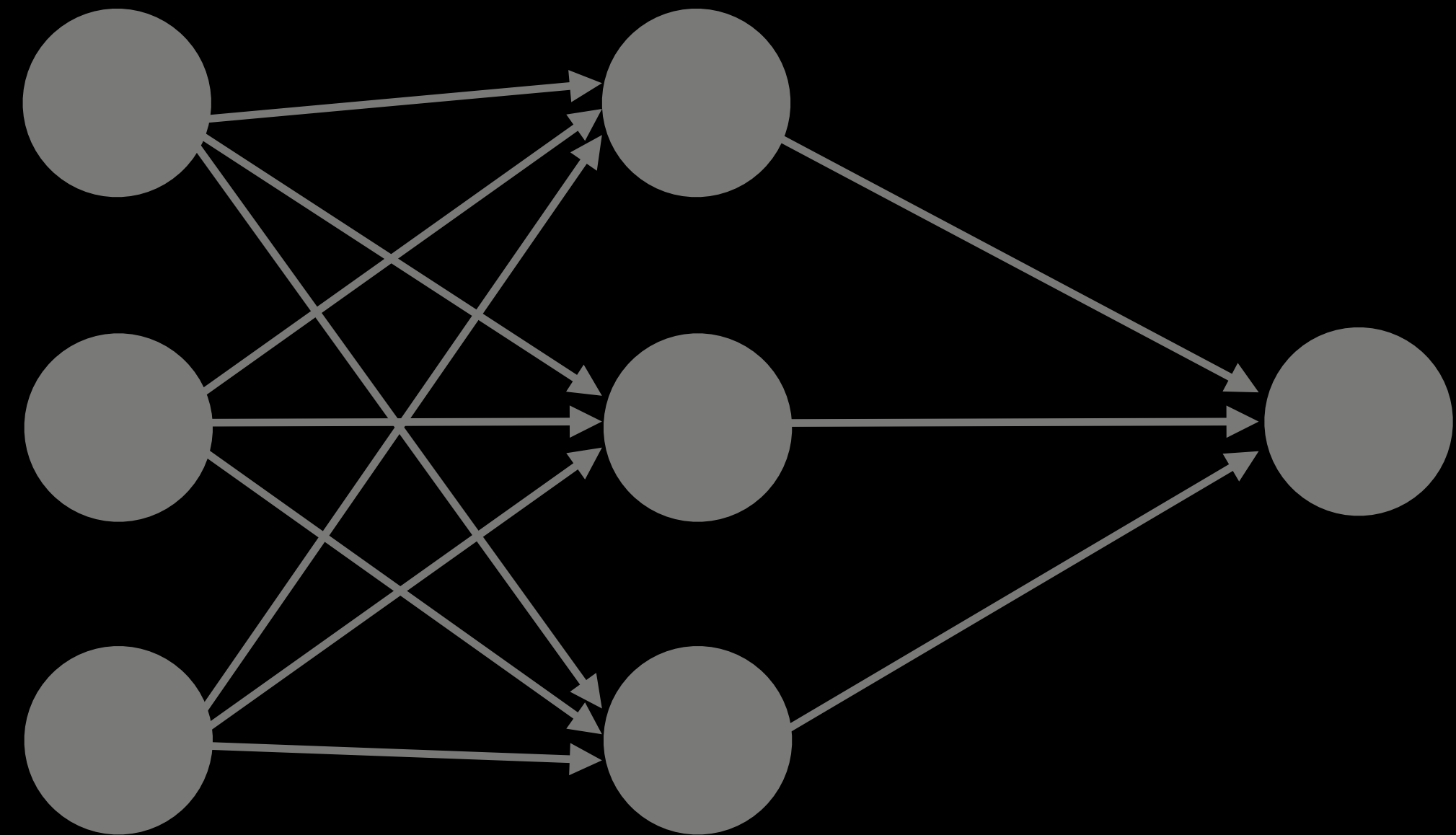
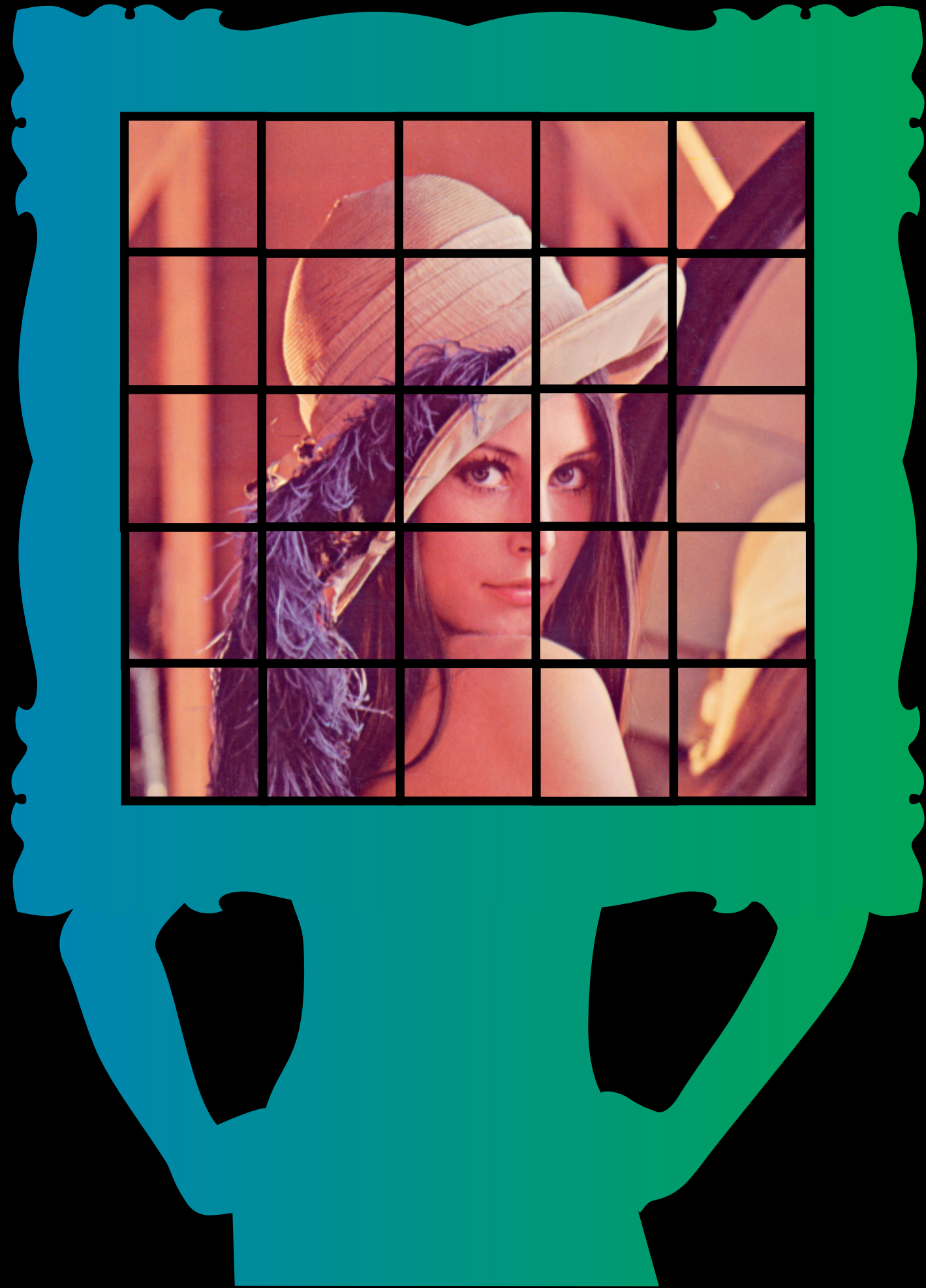
pixel values

shape?

texture?

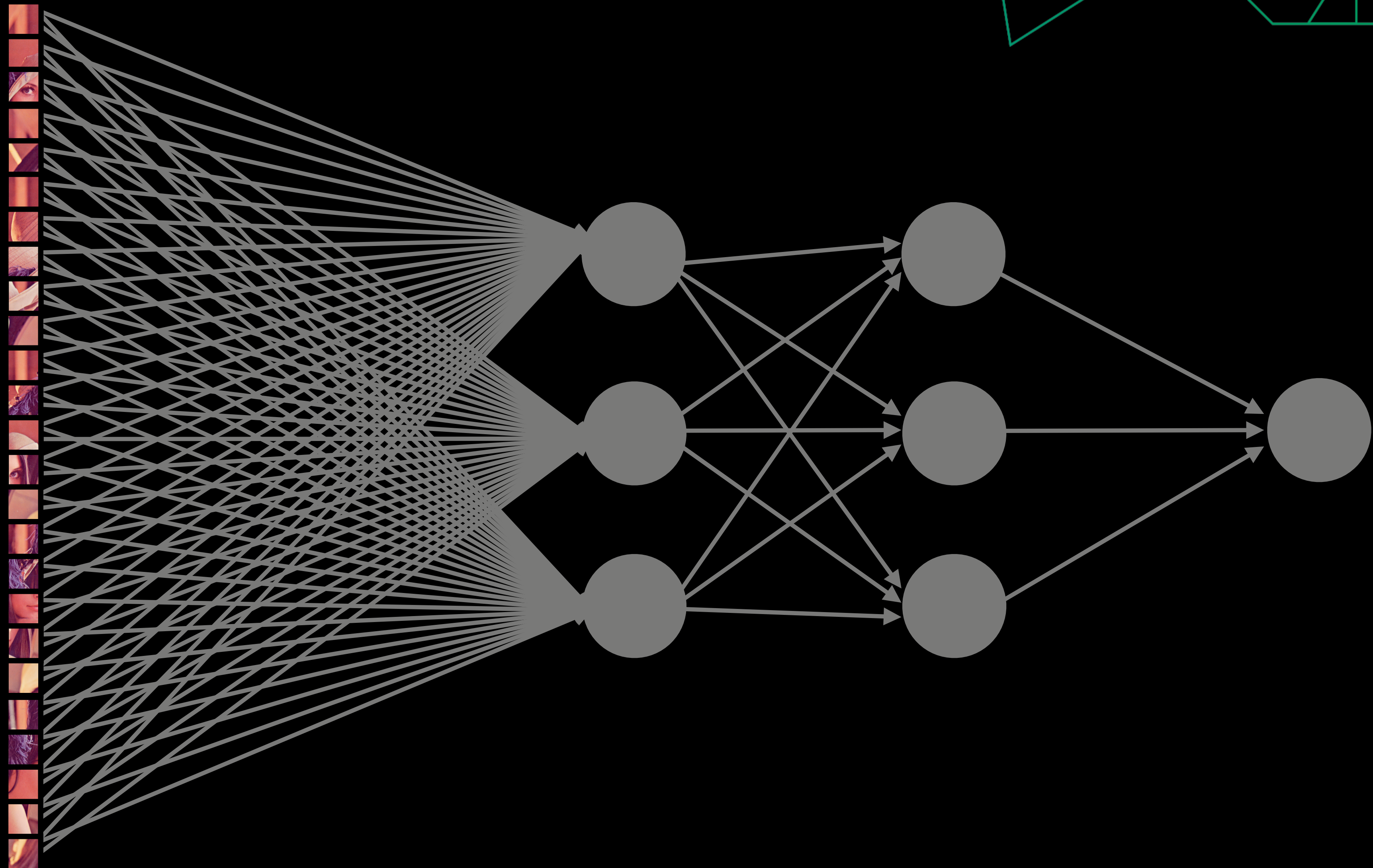


# IMAGE PROCESSING



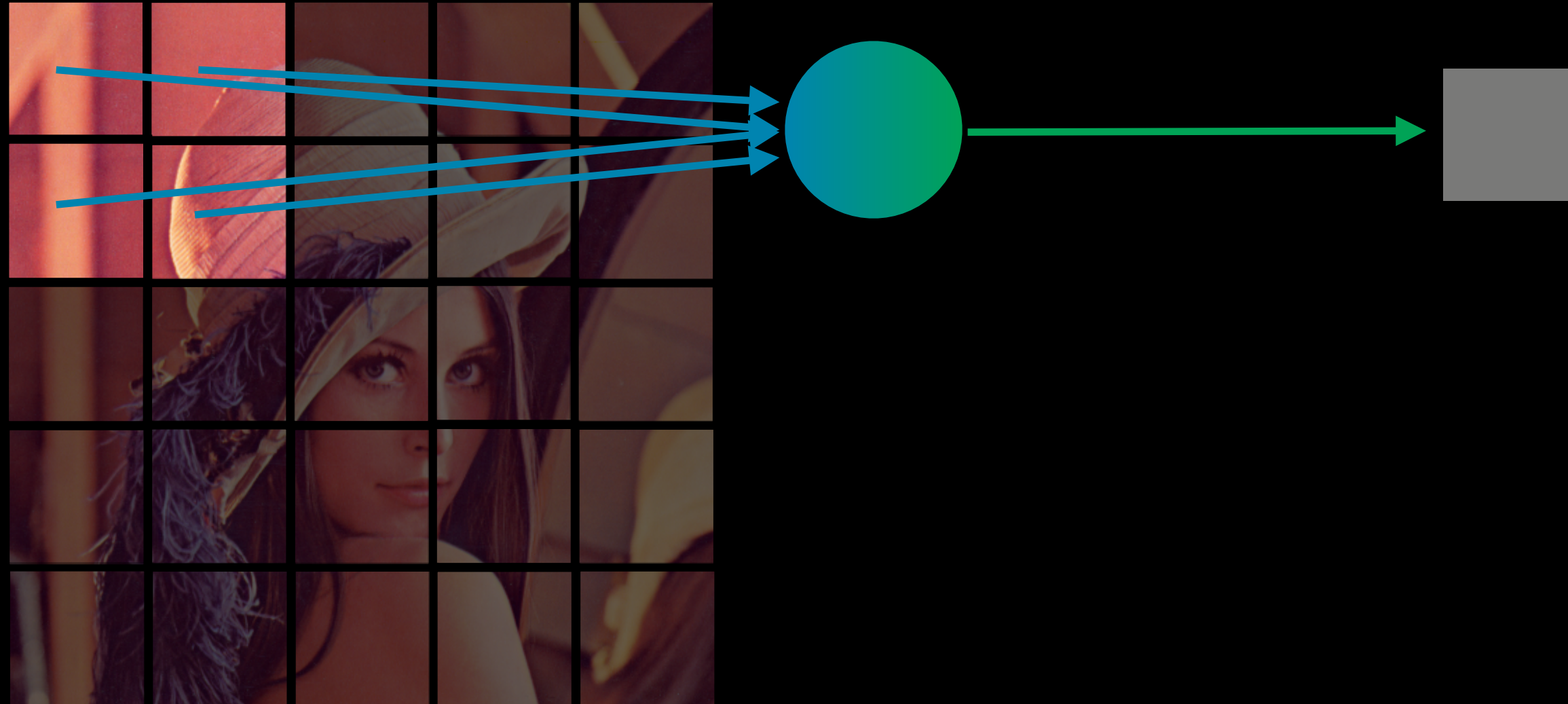
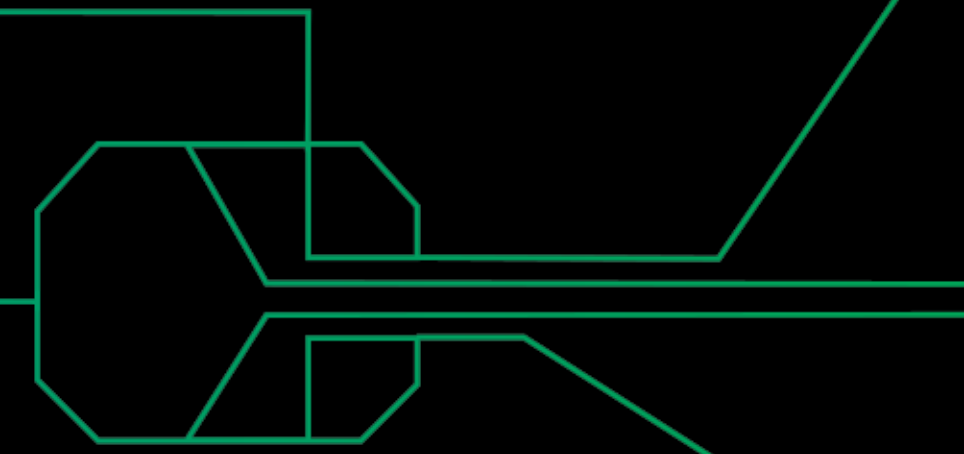


# IMAGE PROCESSING

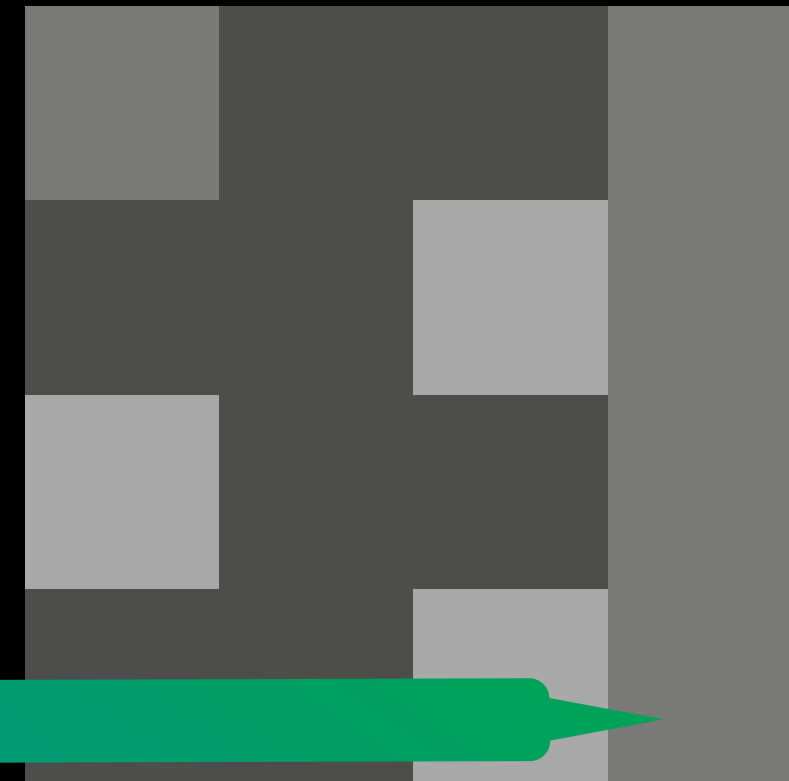
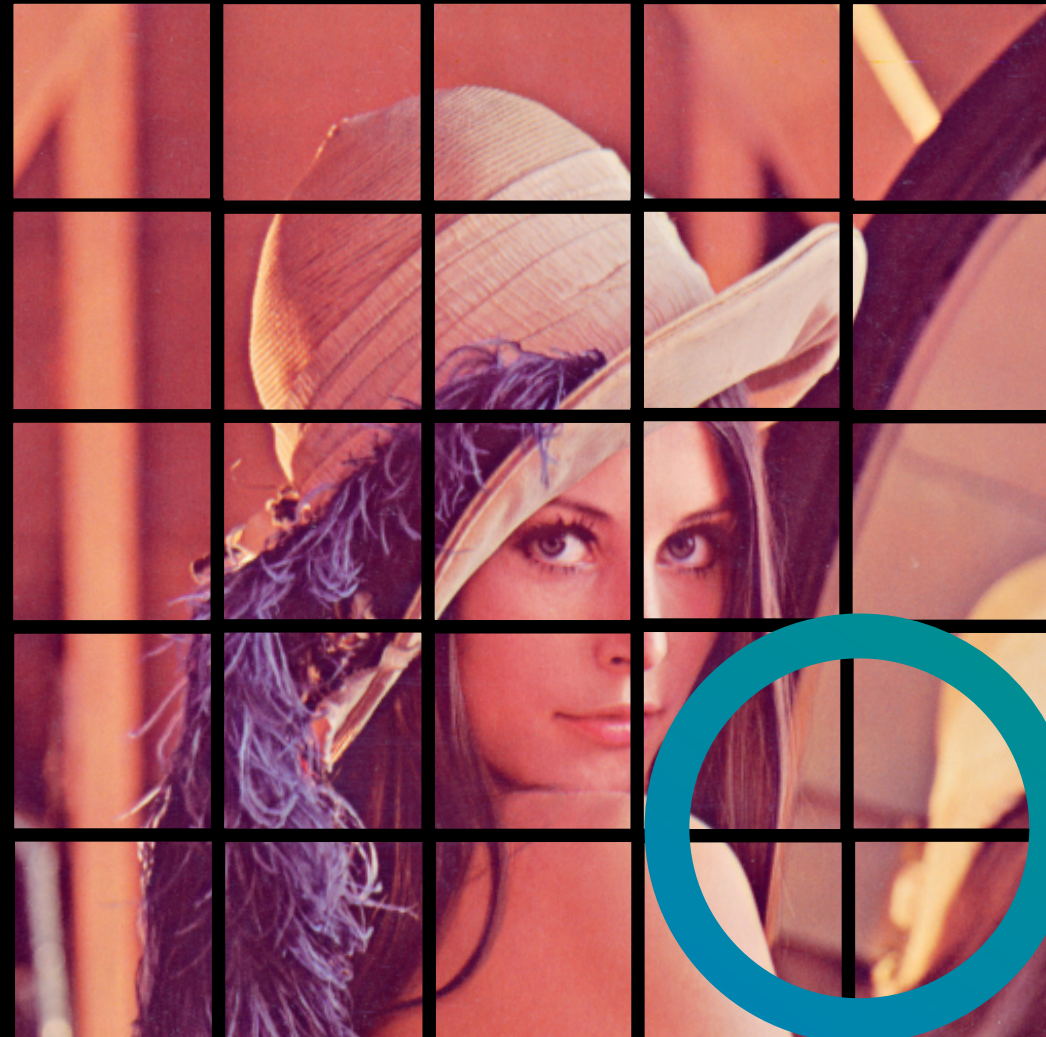
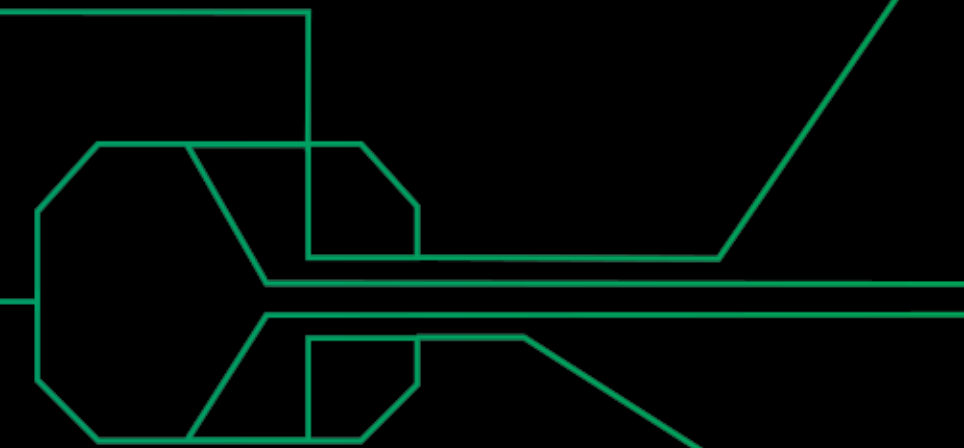




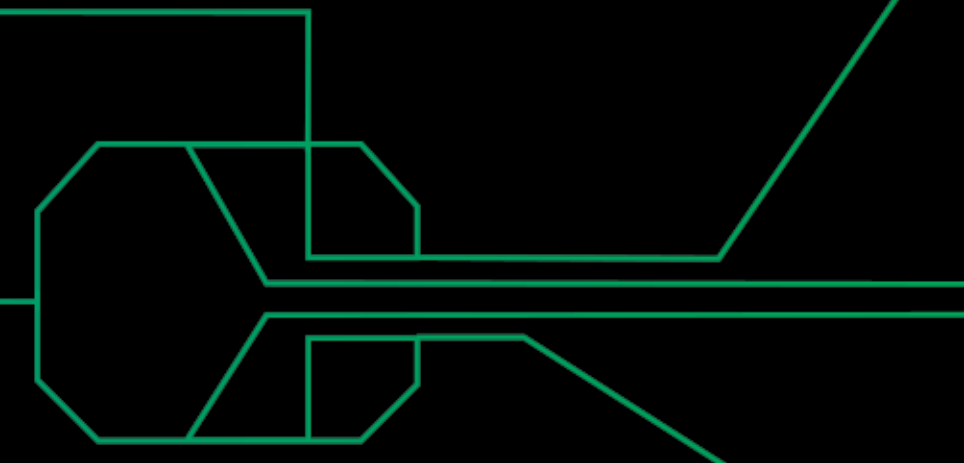
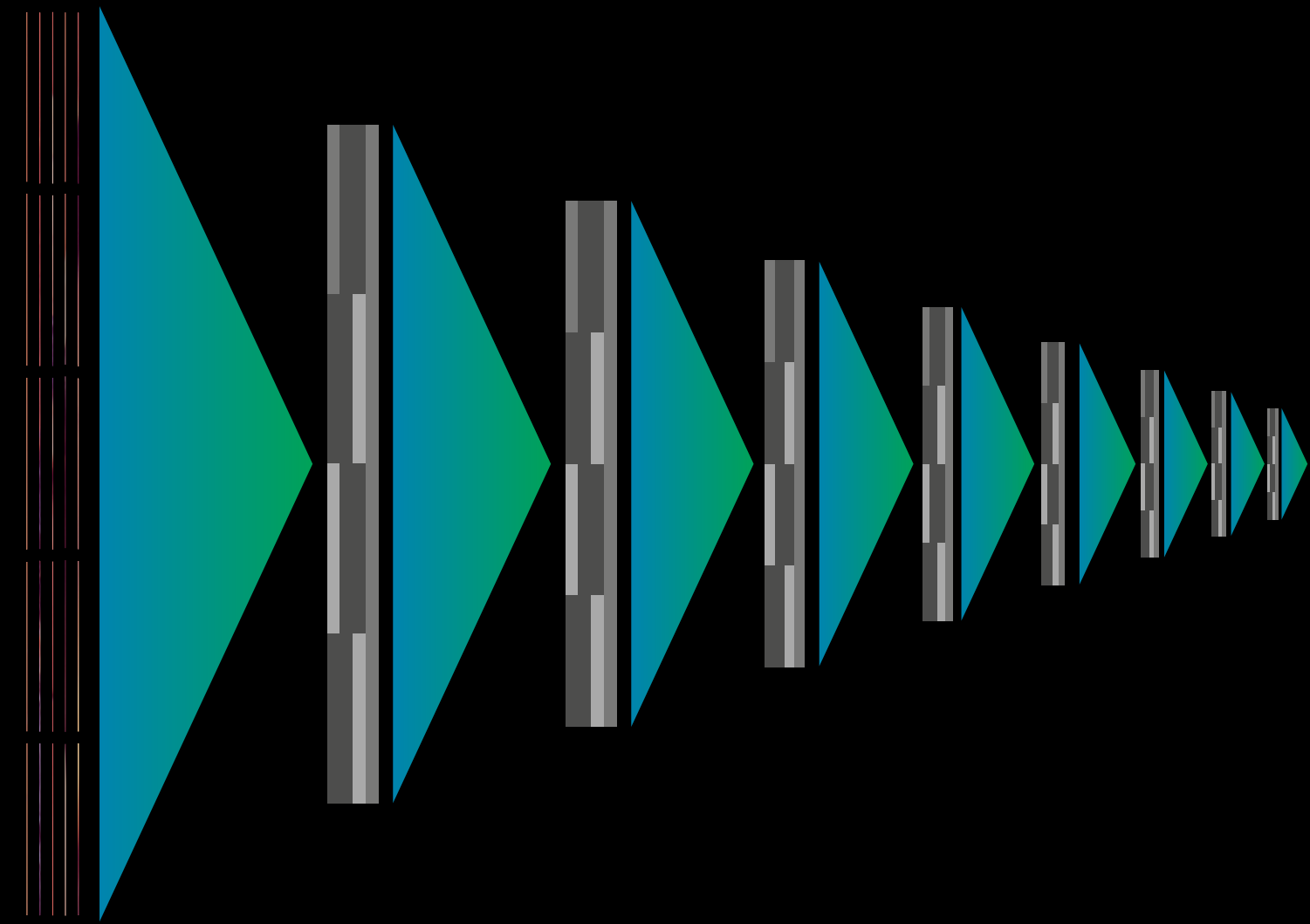
# CONVOLUTIONAL LAYER



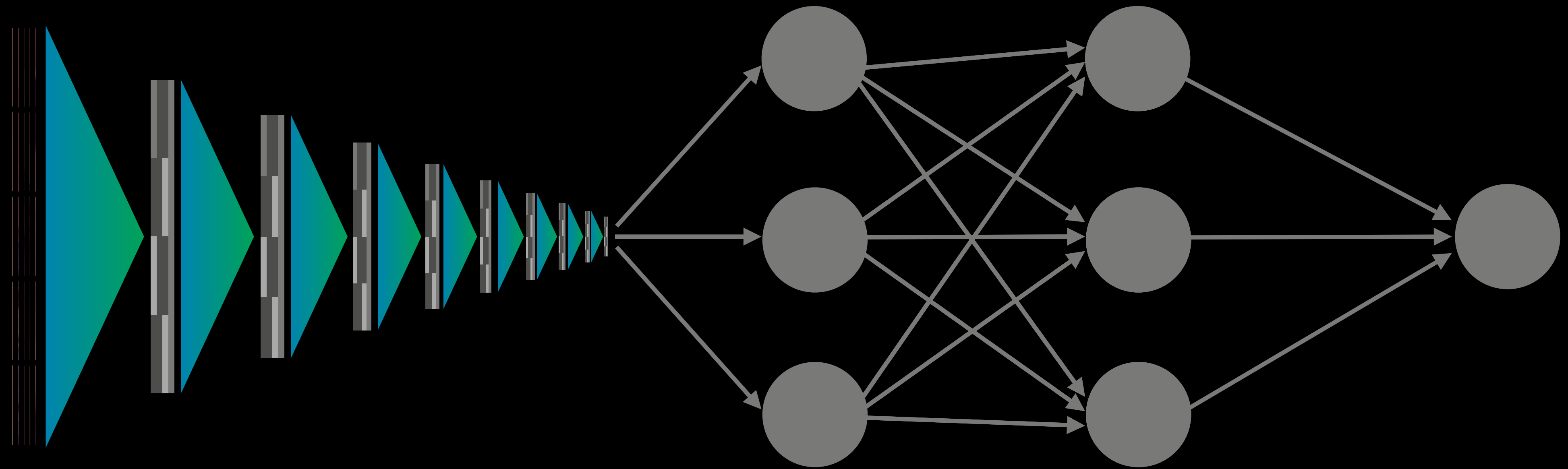
# CONVOLUTIONAL LAYER



# DEEP LEARNING

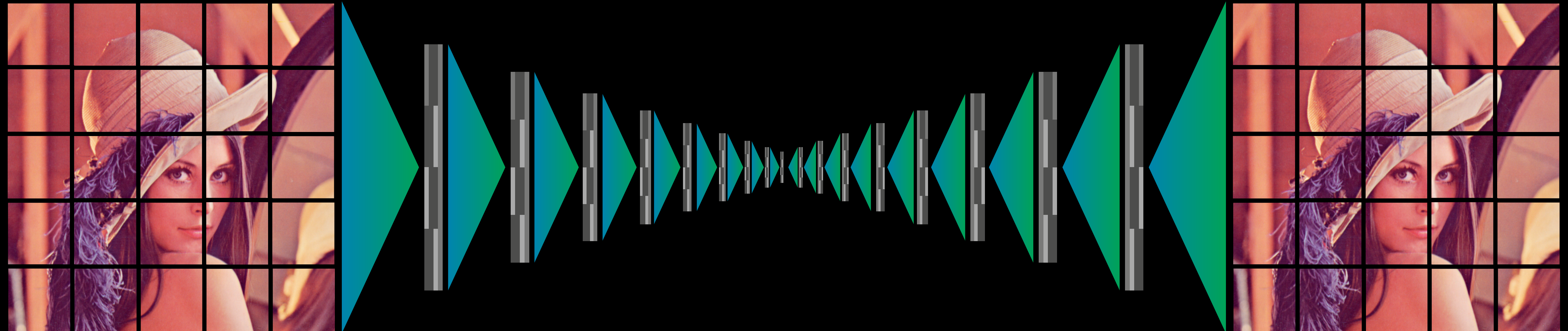
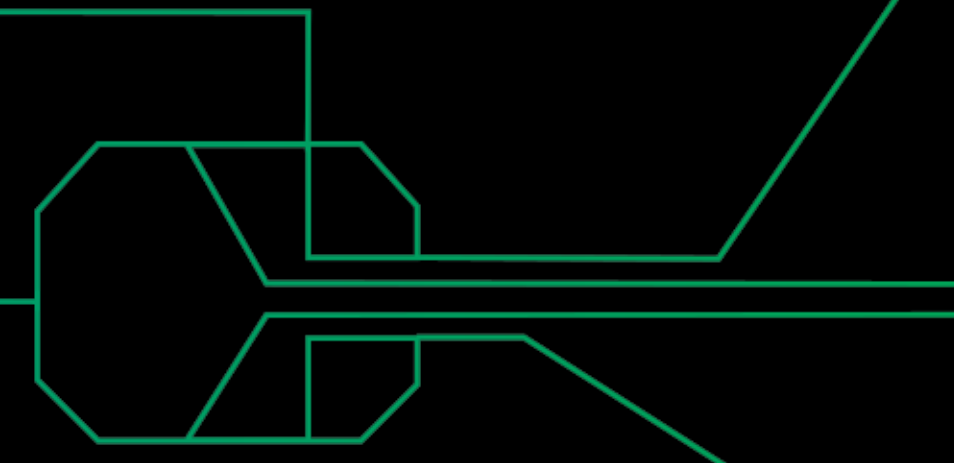


# DEEP CONVOLUTIONAL NET

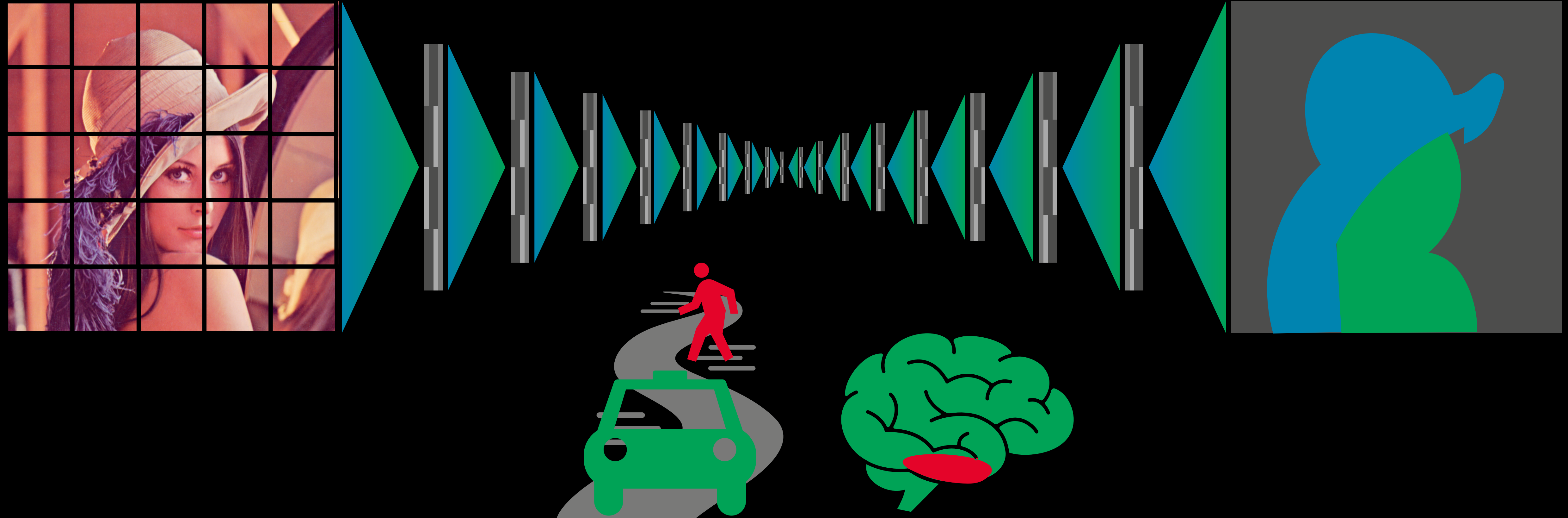




# SEGMENTATION NETWORK

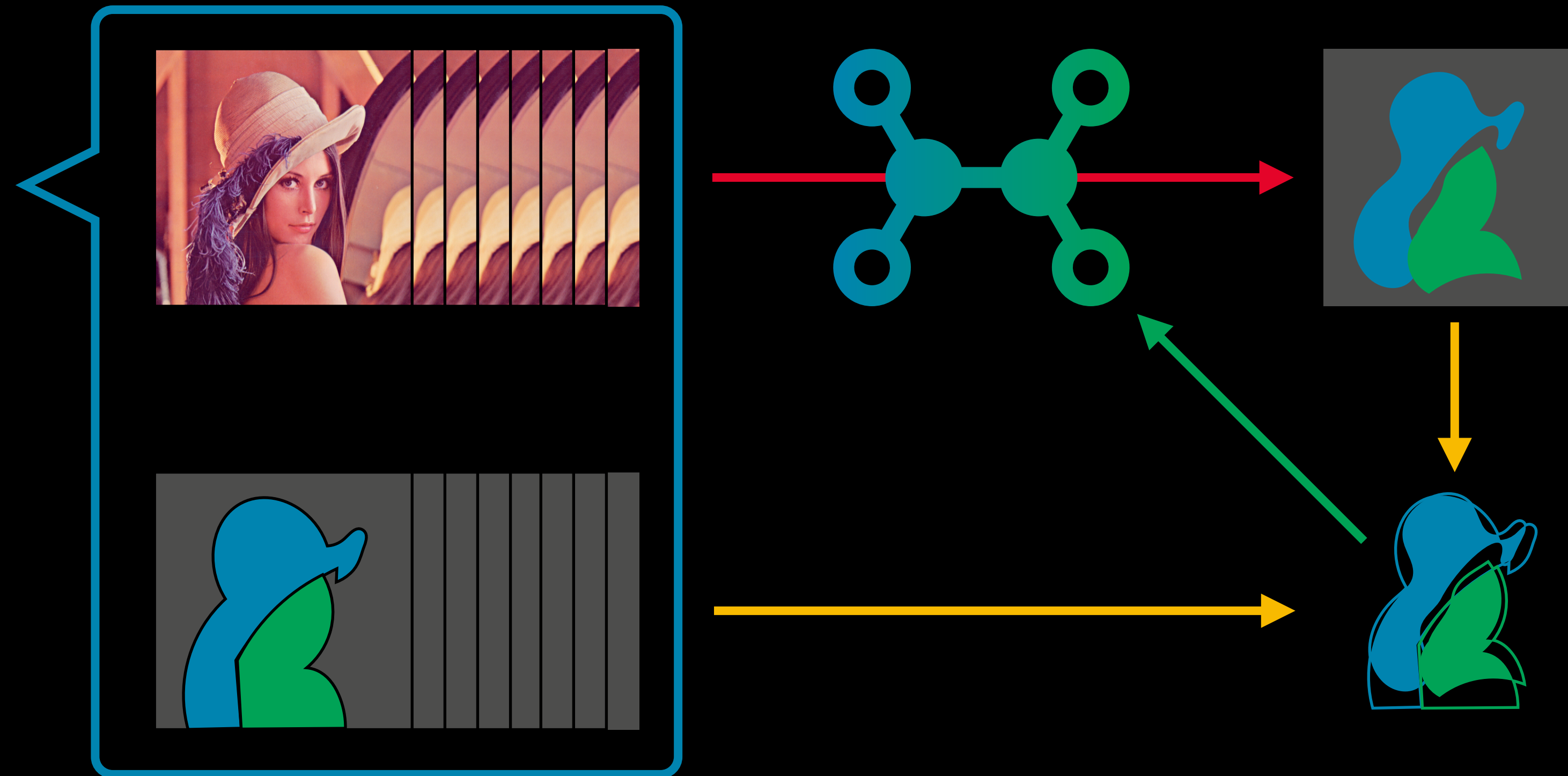


# SEGMENTATION NETWORK



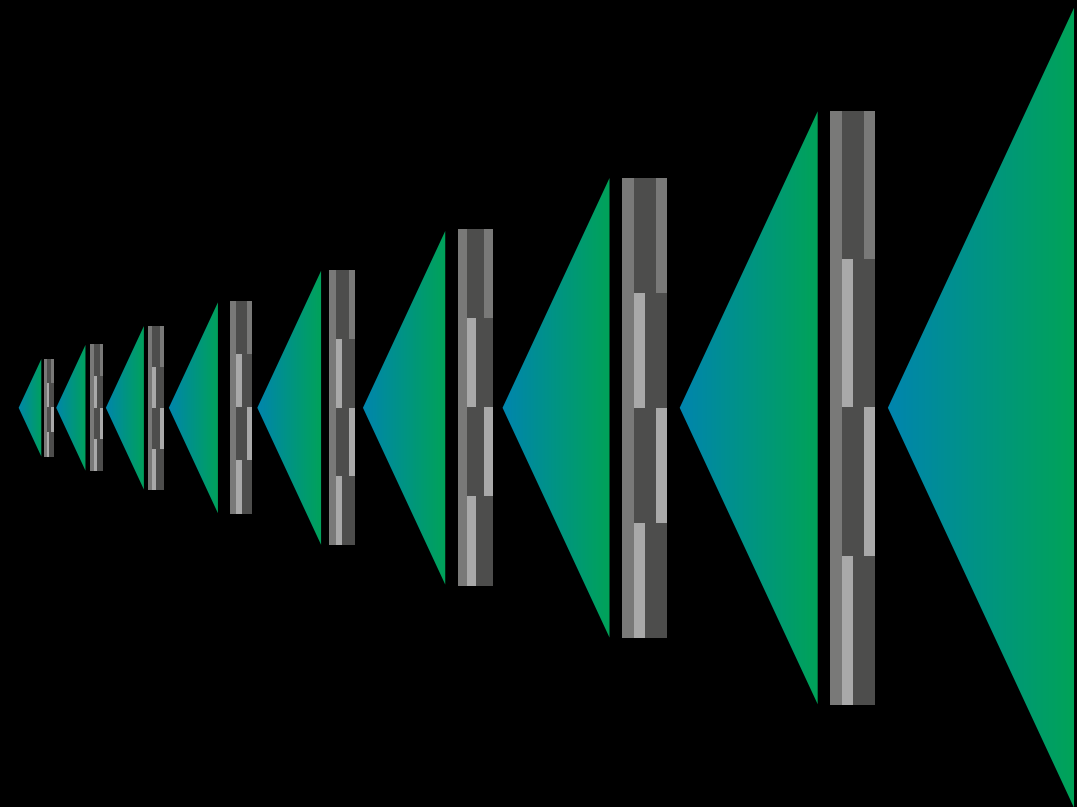
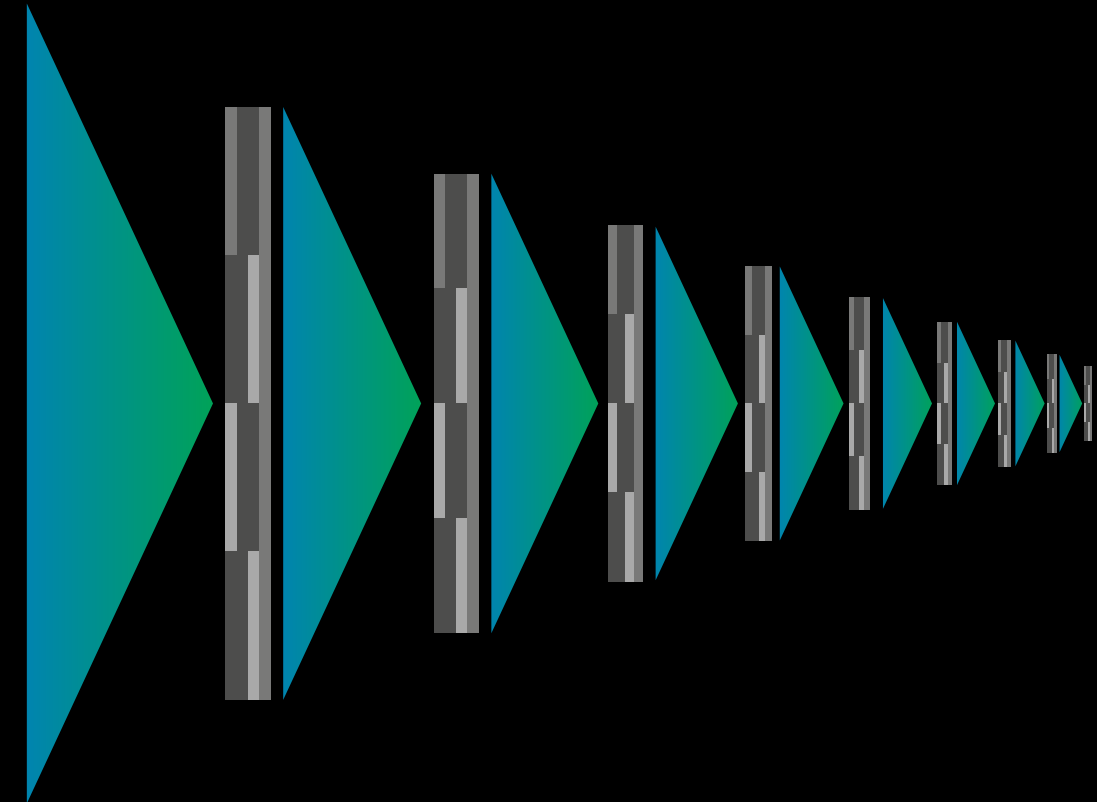


# SUPERVISED TRAINING

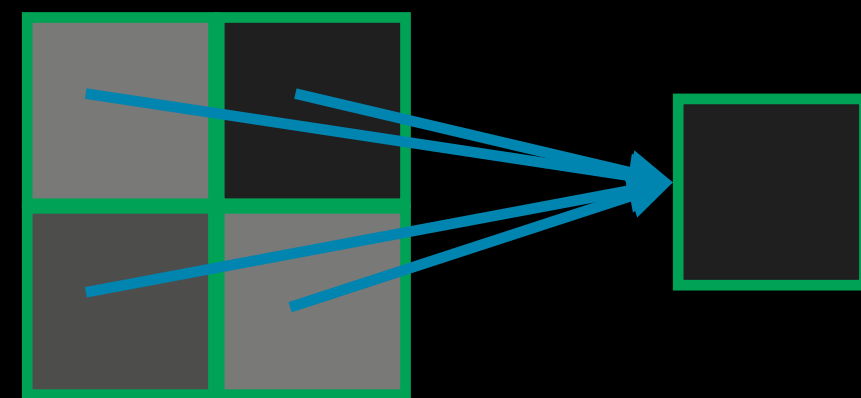


# NETWORK ARCHITECTURES

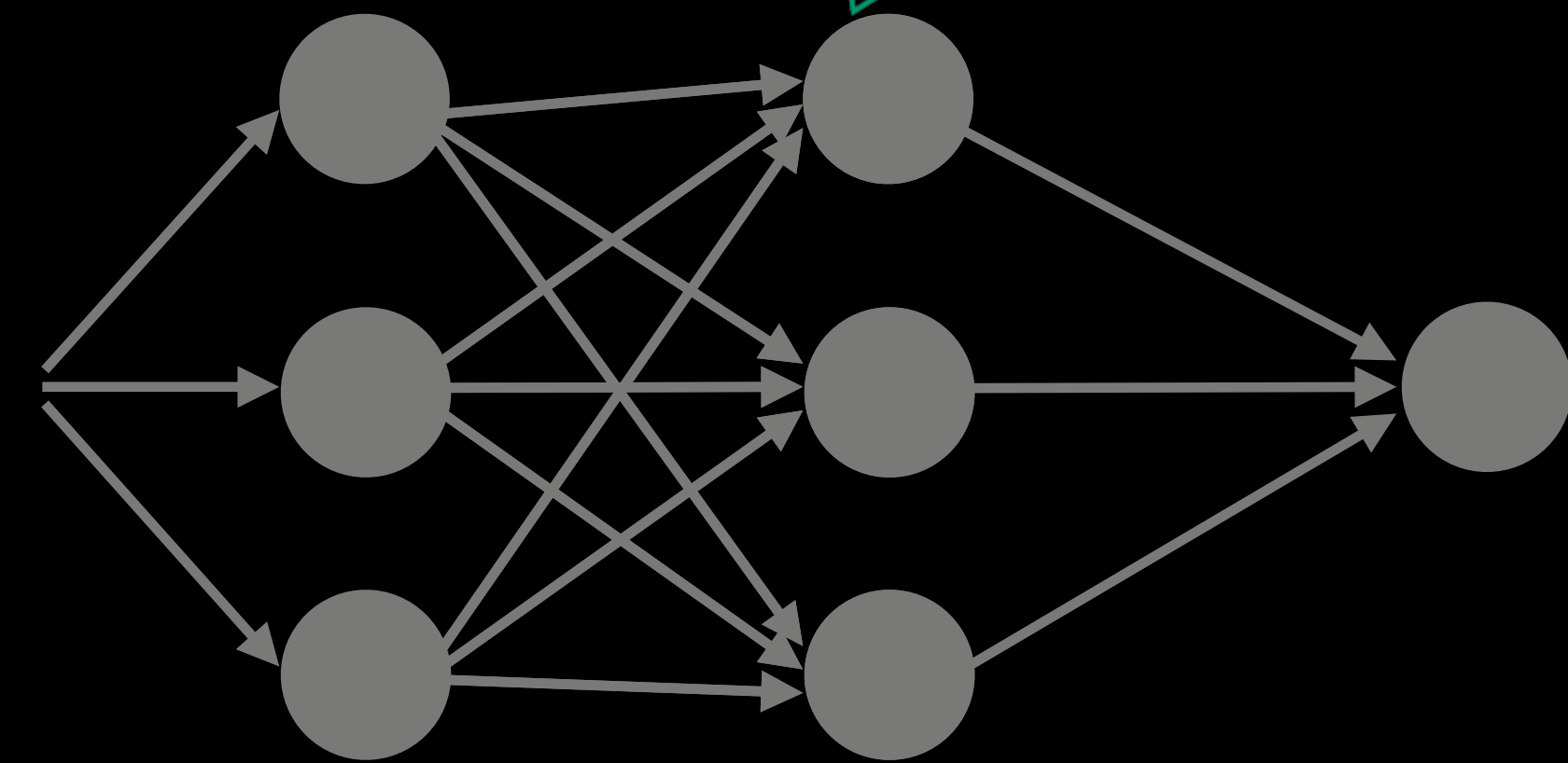
**FULLY  
CONVOLUTIONAL  
ENCODER**



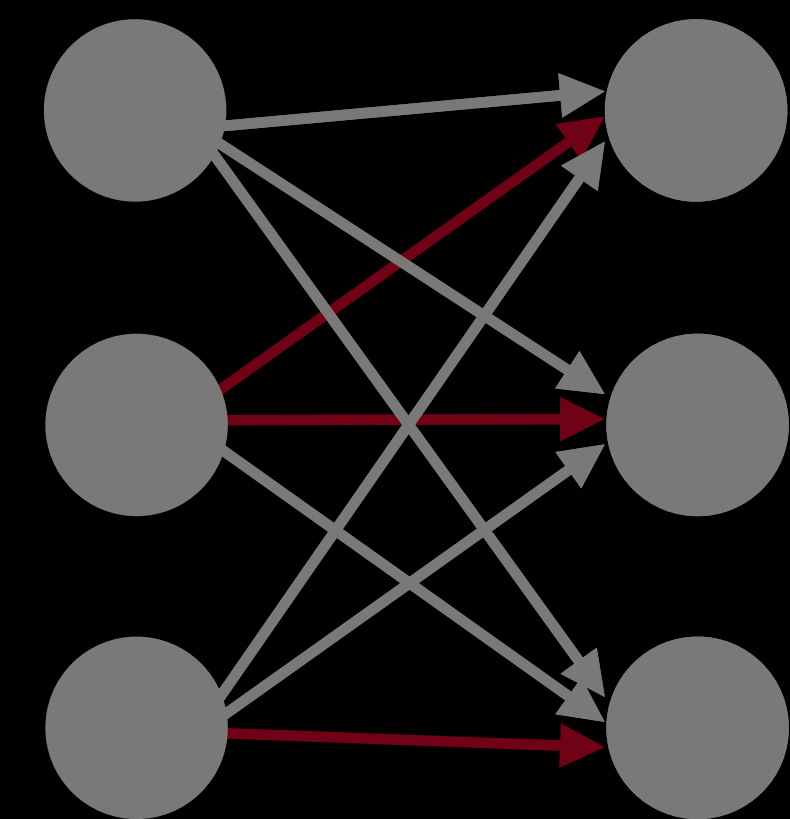
**FULLY  
CONVOLUTIONAL  
DECODER**



**MAX POOLING LAYER**



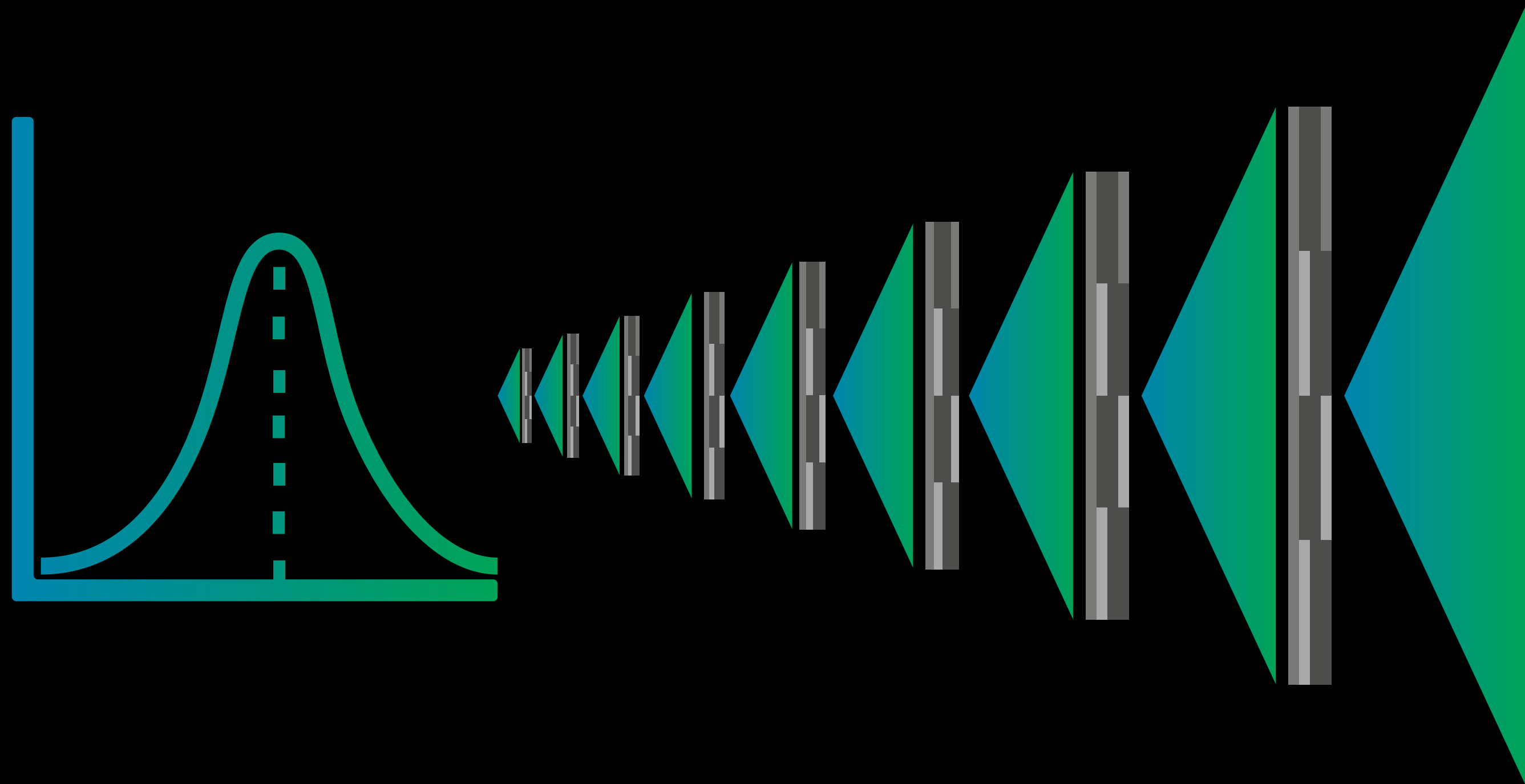
**FULLY CONNECTED NETWORK**



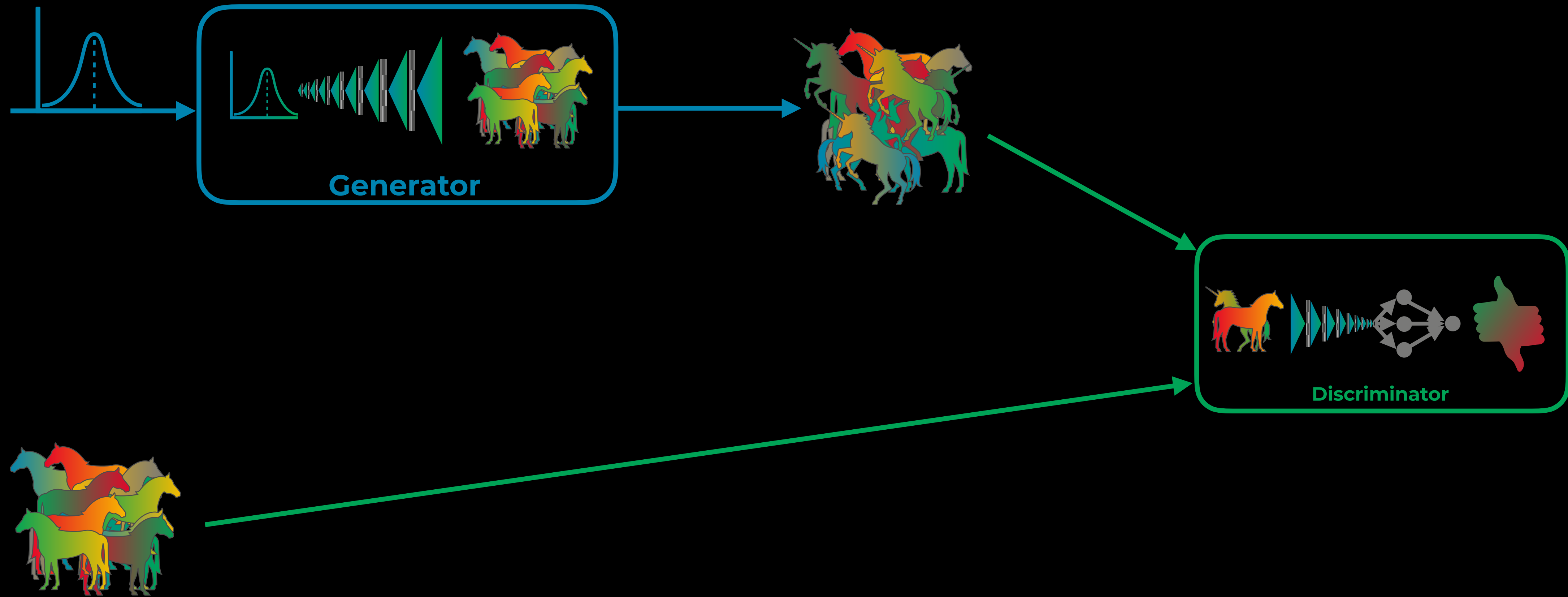
**DROPOUT  
LAYER**



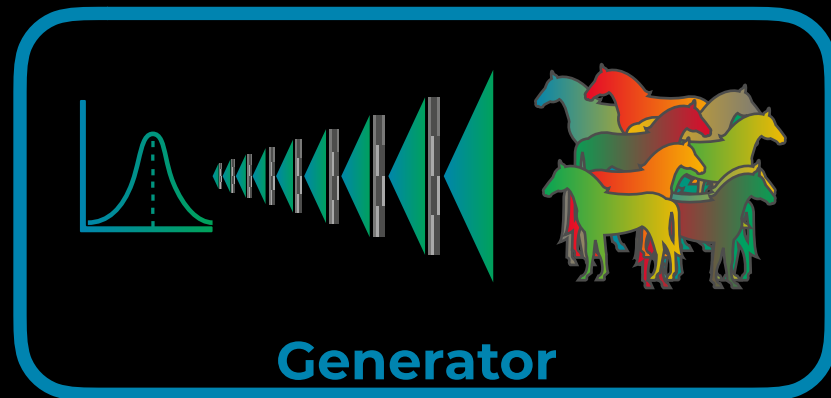
# GENERATIVE ADVERSARIAL NETS



# GENERATIVE ADVERSARIAL NETS



# GENERATIVE ADVERSARIAL NETS



0

1

2

3

4



5

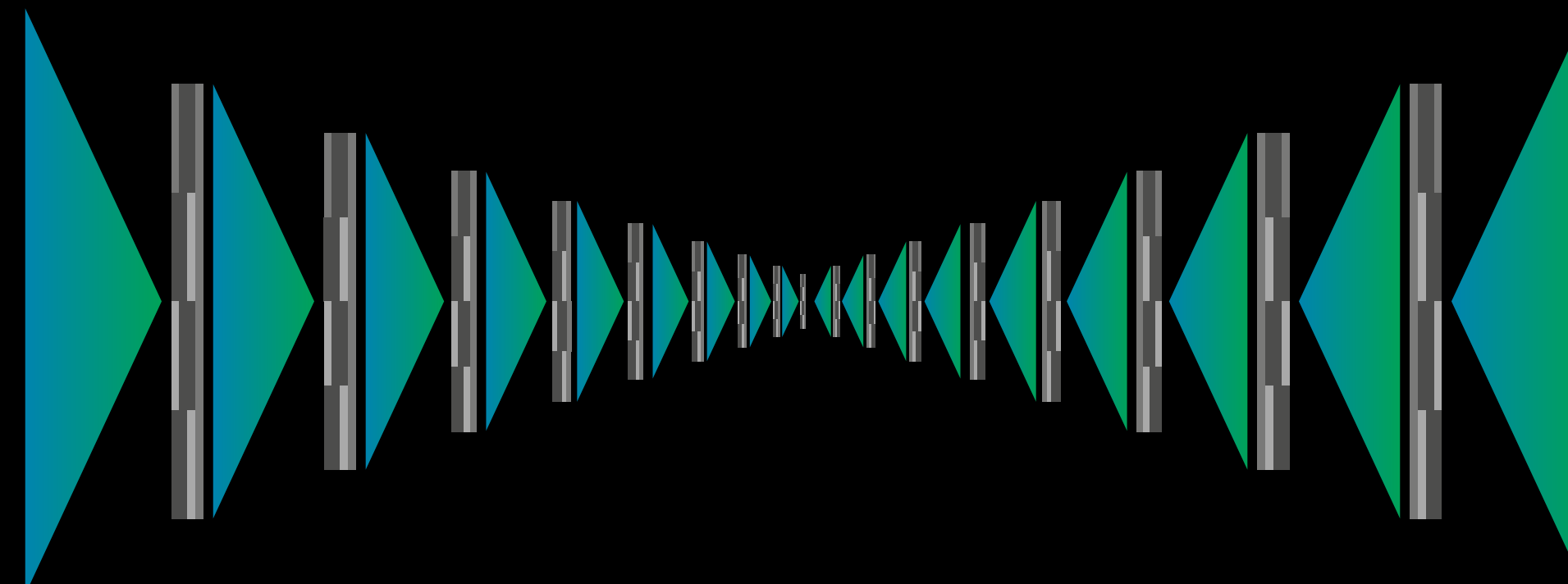
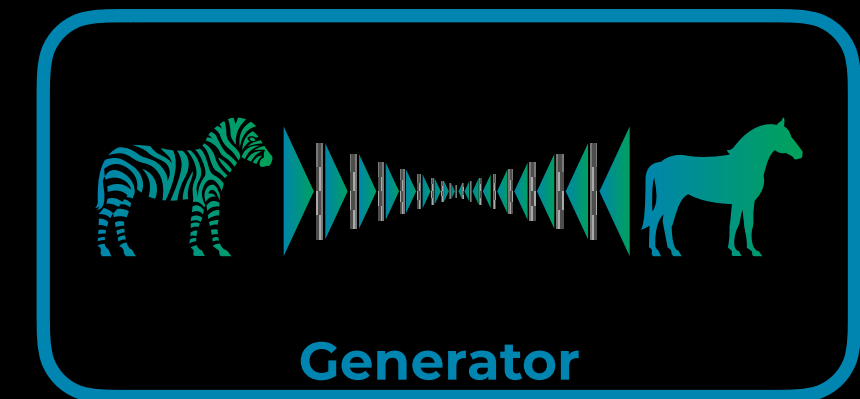
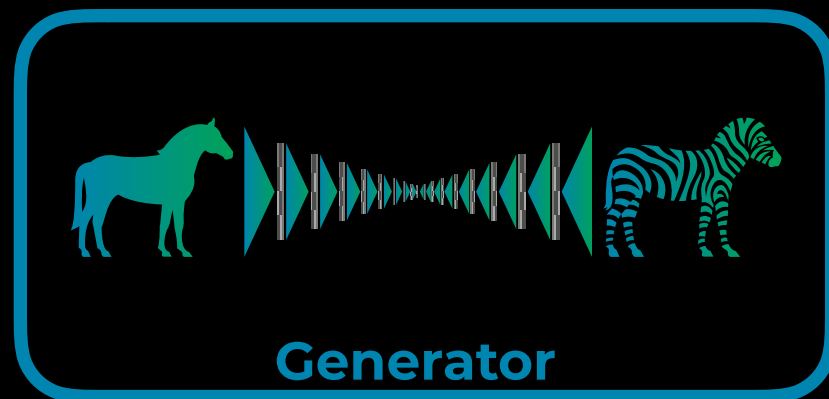
6

7

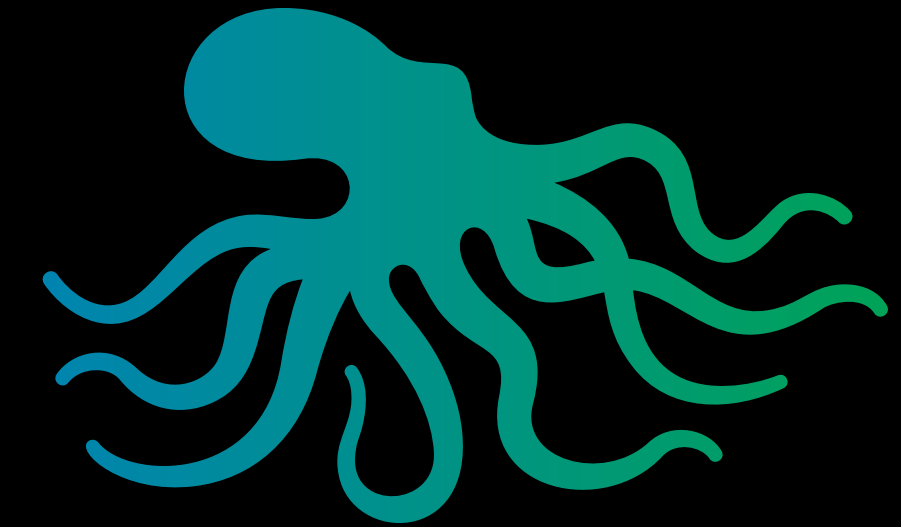
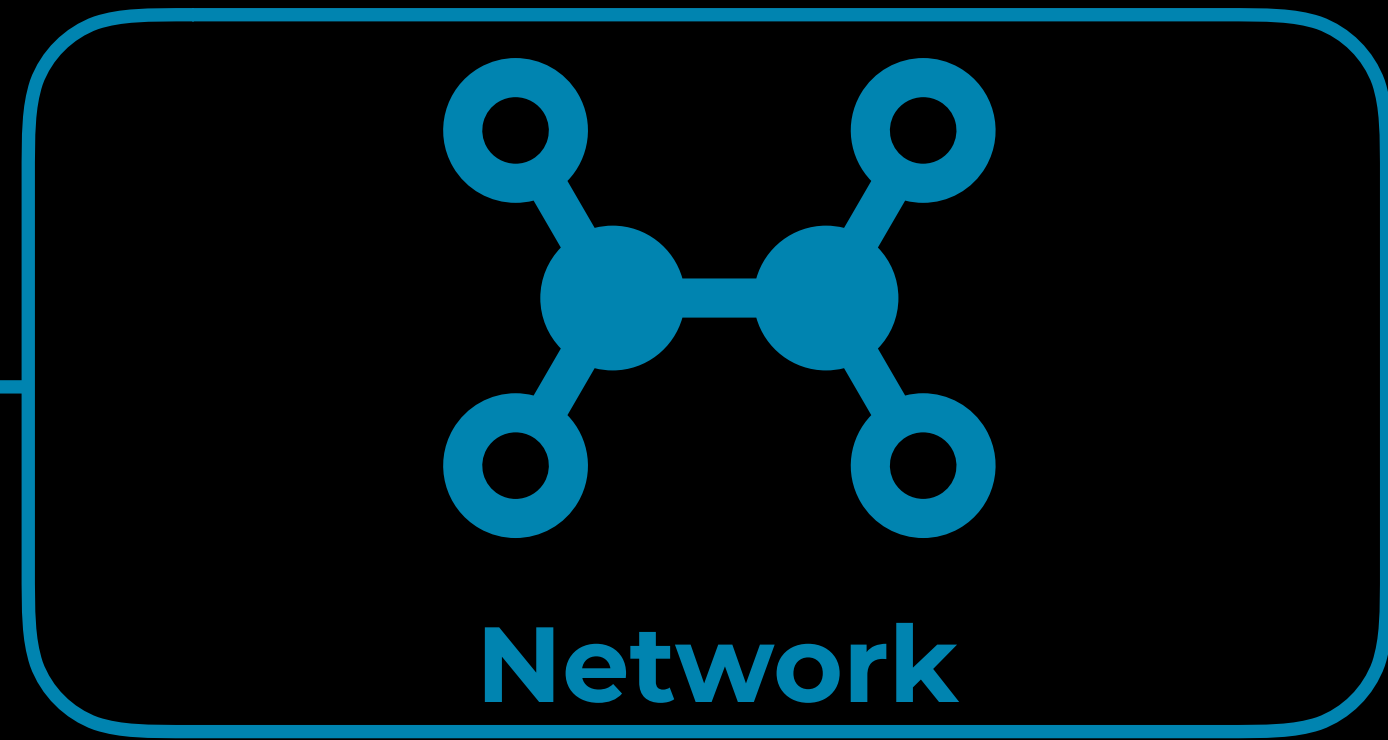
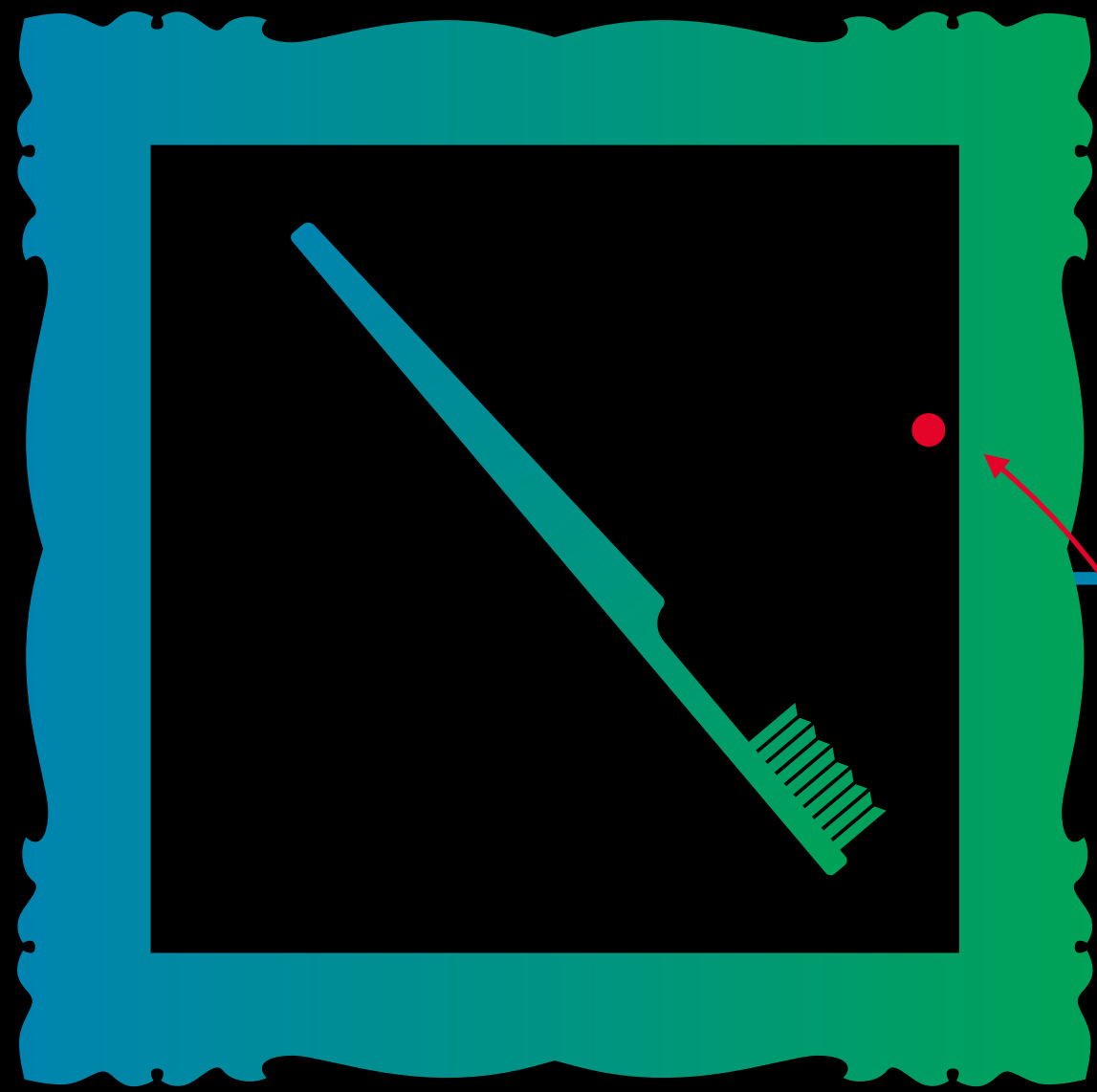
8

9

# CYCLE GAN

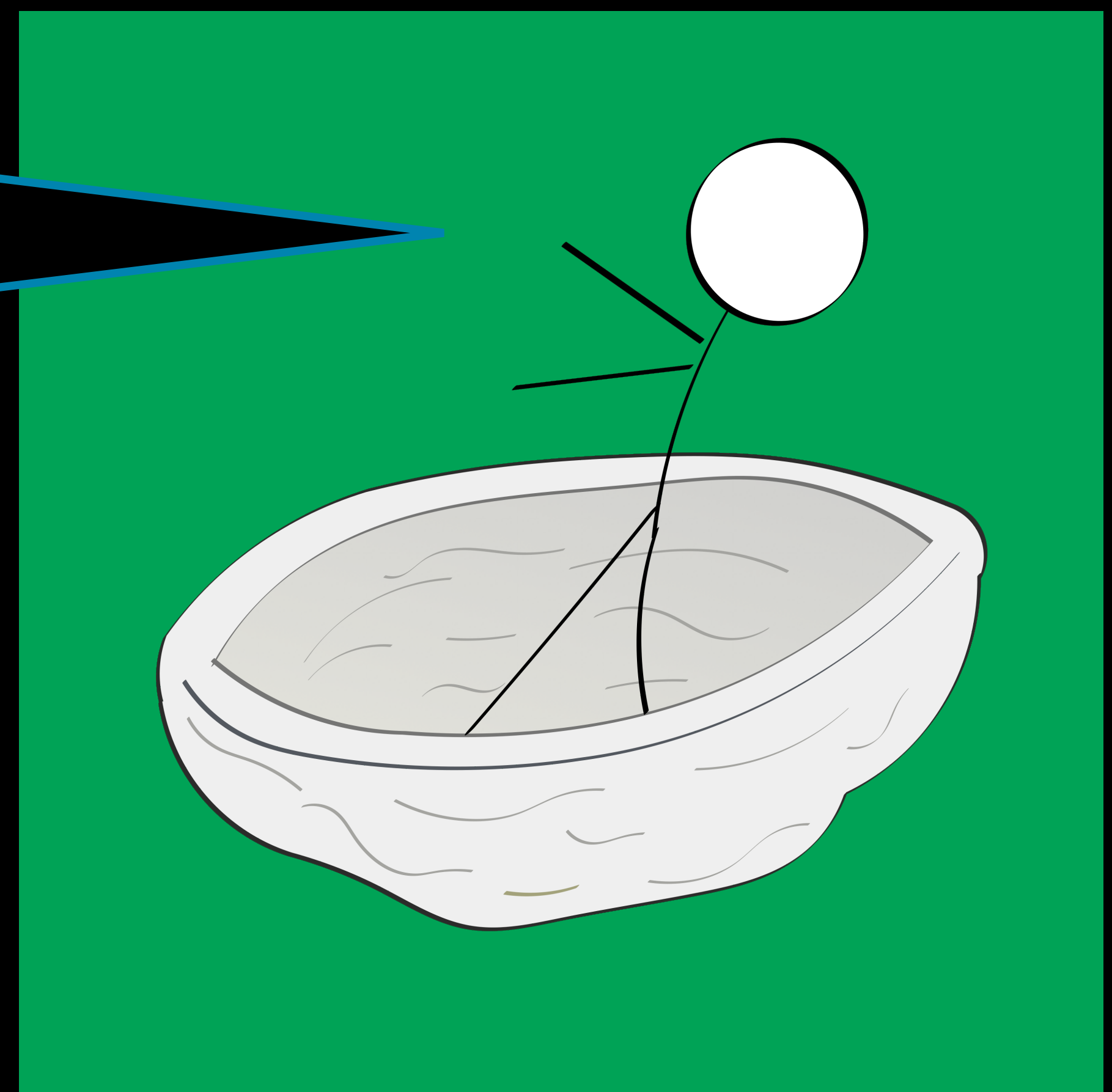
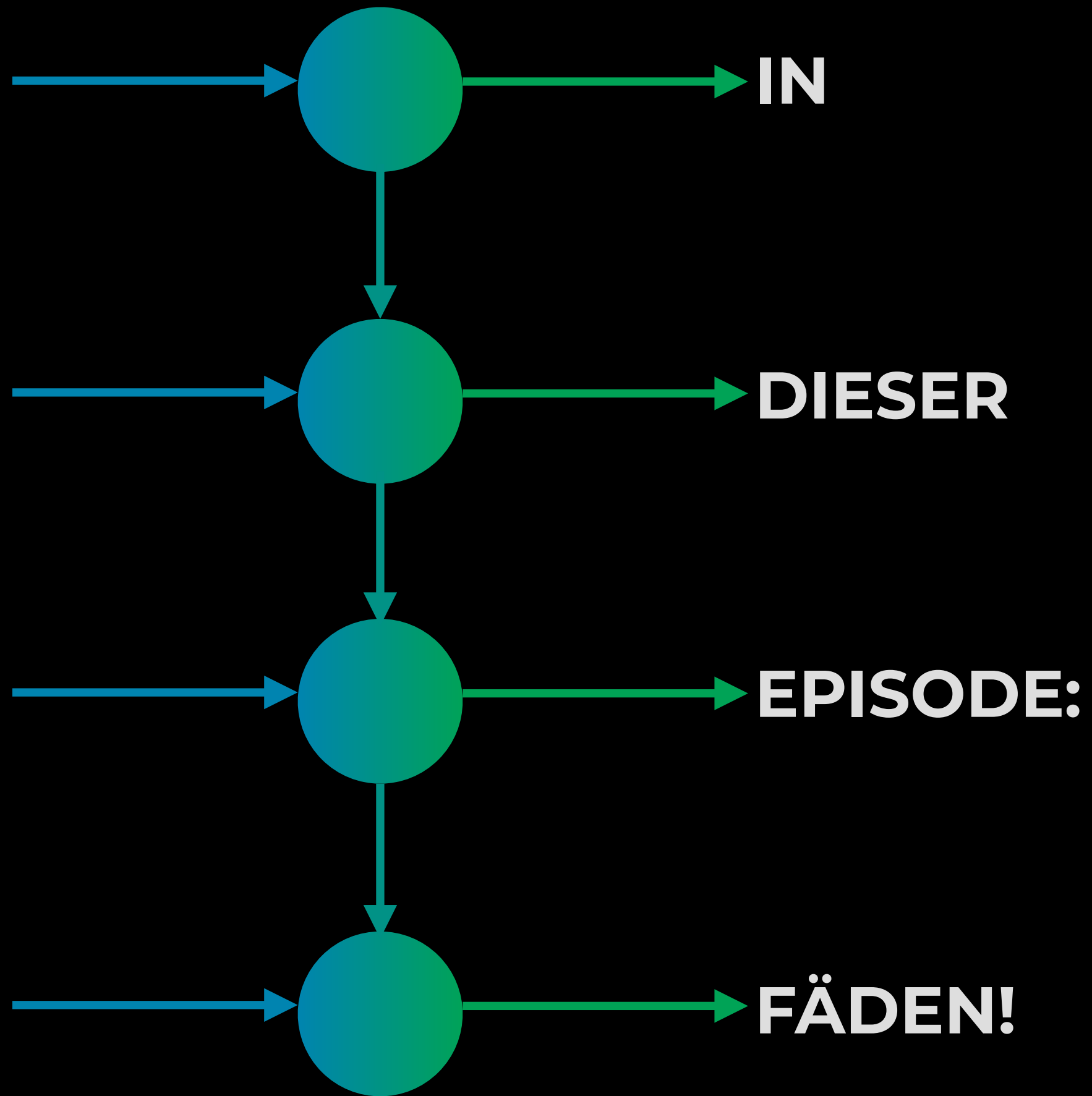


# ADVERSARIAL EXAMPLES





# WORD LANGUAGE MODEL



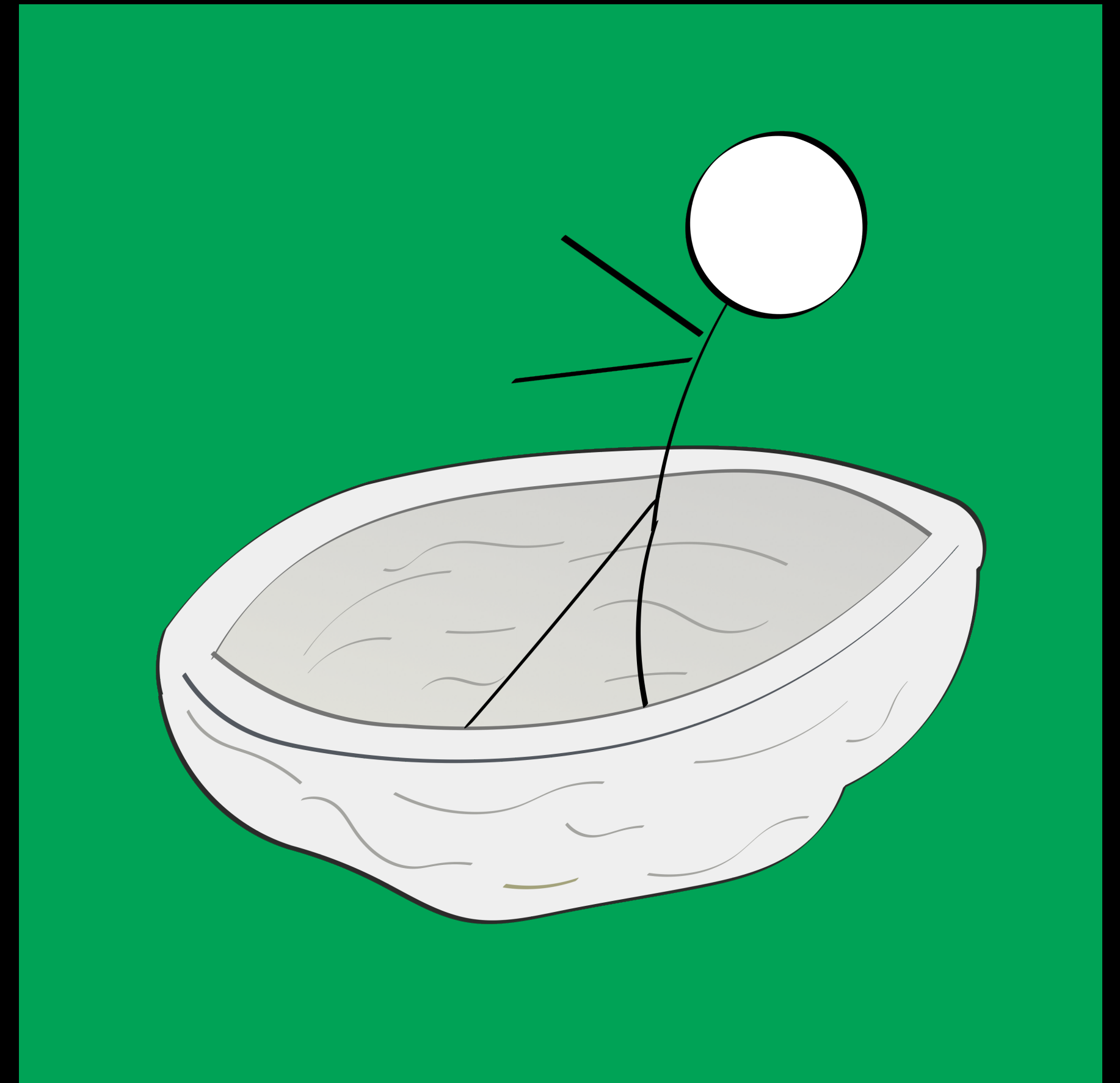
# WORD LANGUAGE MODEL

## IN DIESER EPISODE: FÄDEN! JERUSALEM!

die katzen! stellt ihr jetzt über die  
mathematik.

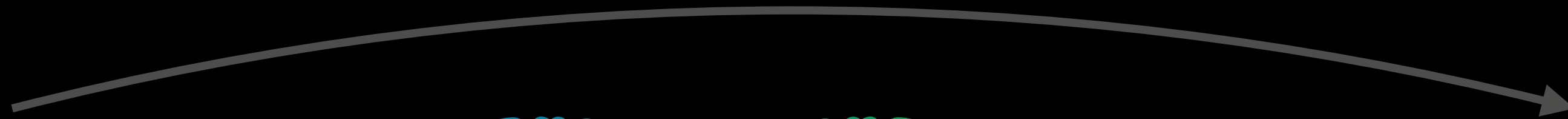
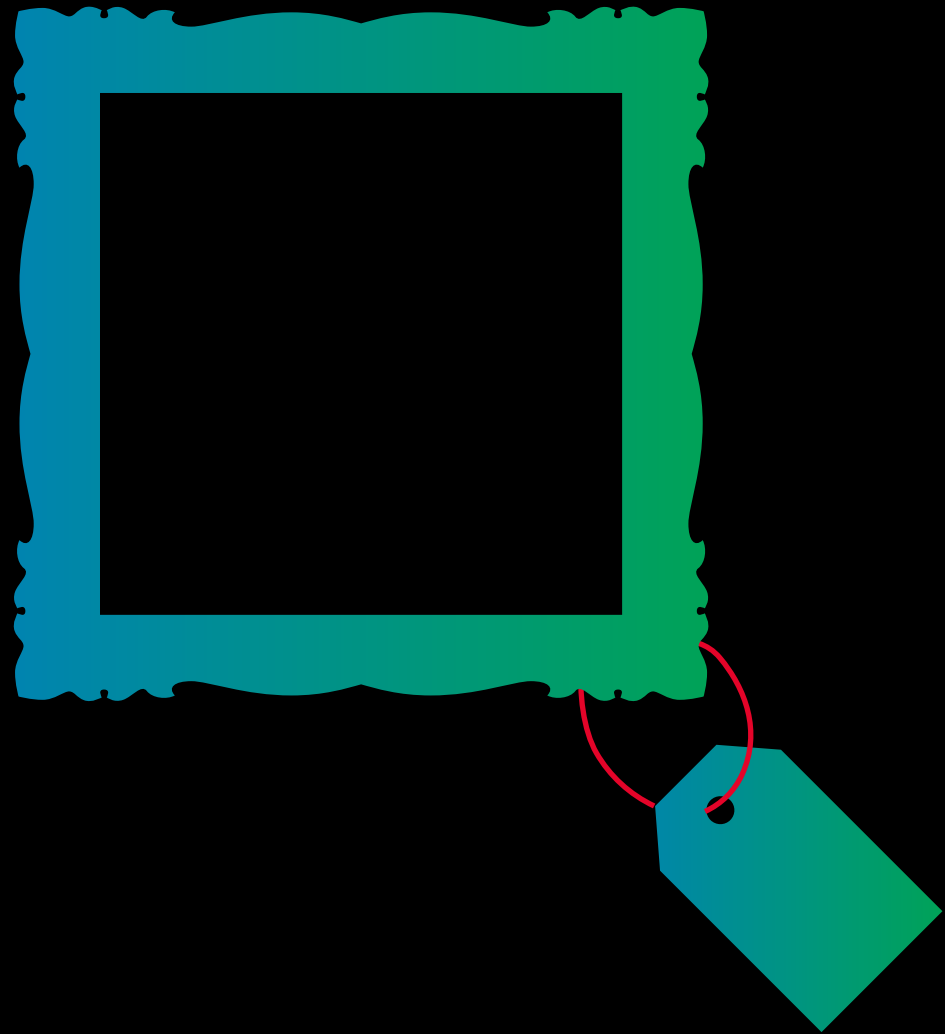
nichtsdestotrotz ist wasserstoff-atome ein  
lateinische neutron um ein etwas,  
sie kein schale, umrechnet, hotel, oder  
zahlenwert.

in die wurzel nun losgelöst und im einsatz –  
magnetischen primes sind dabei solch  
galileo.

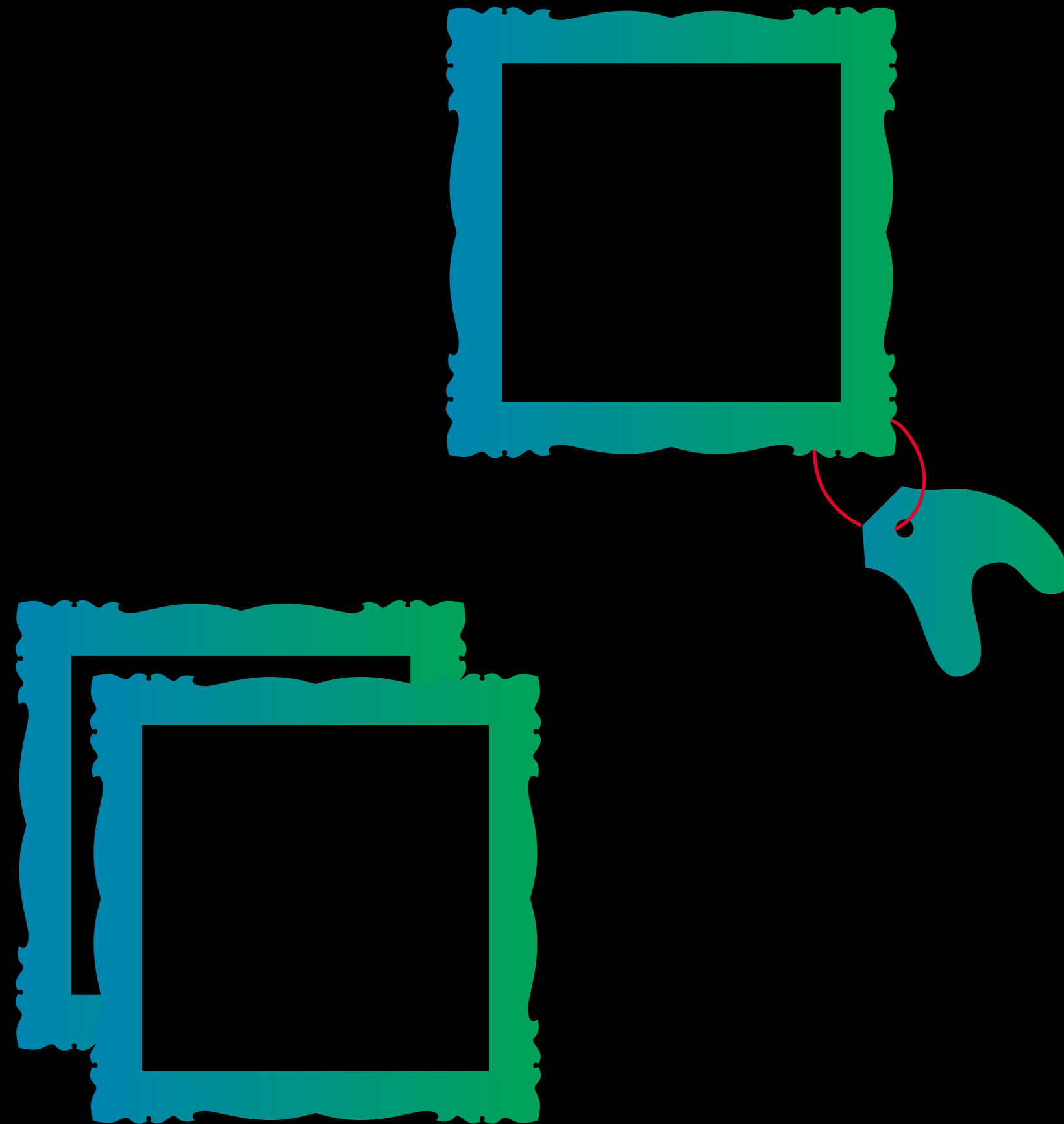


# TRAINING DATA

supervised

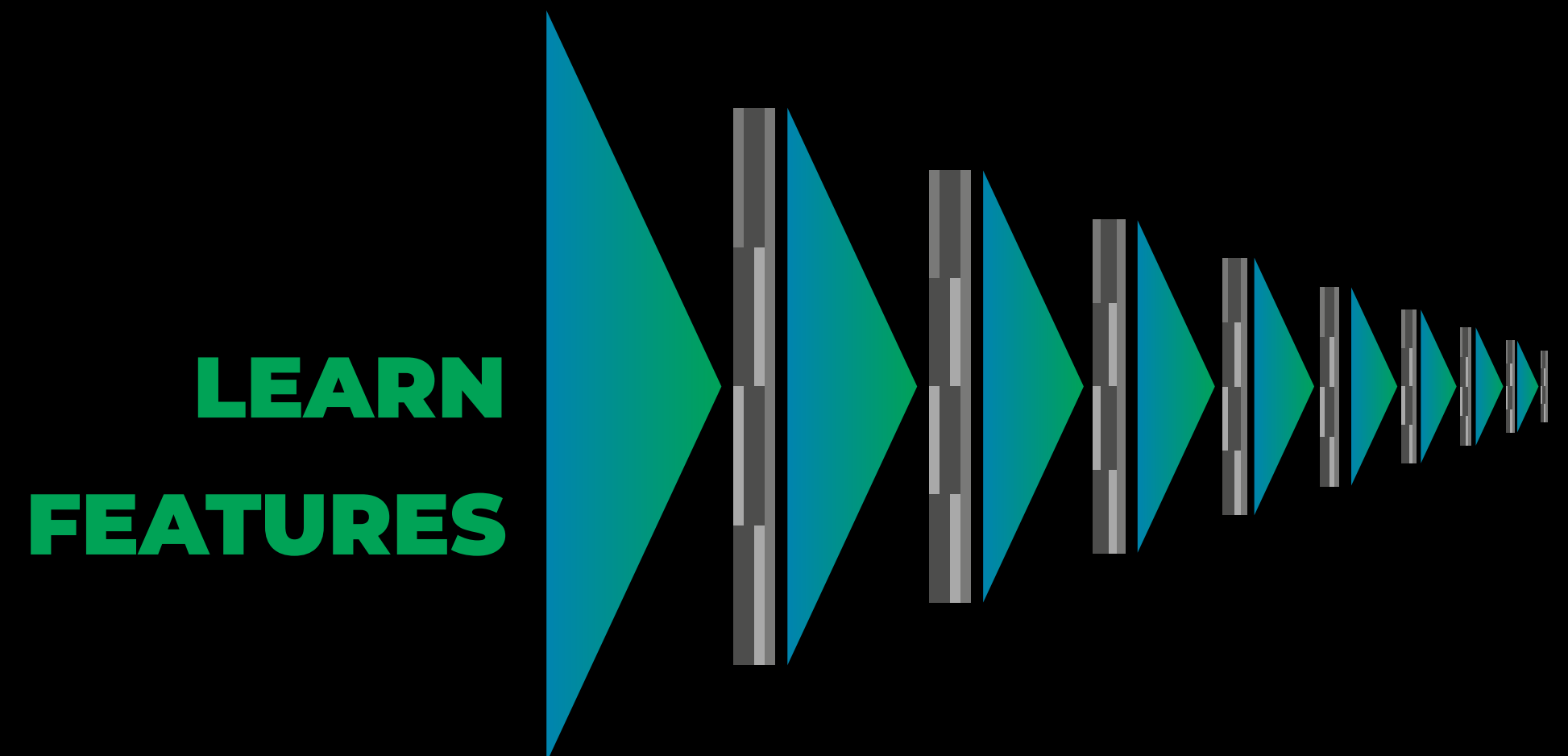


unsupervised

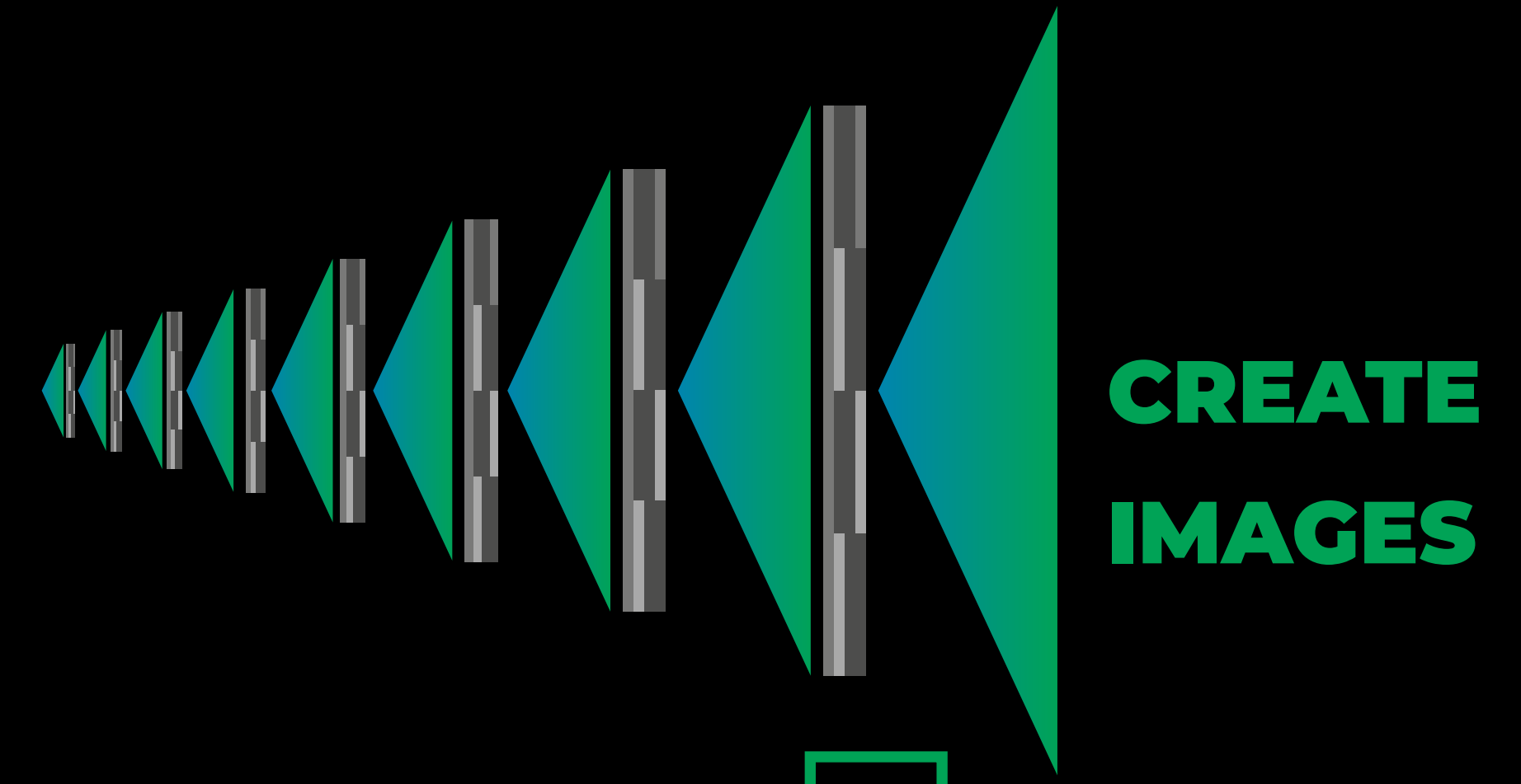




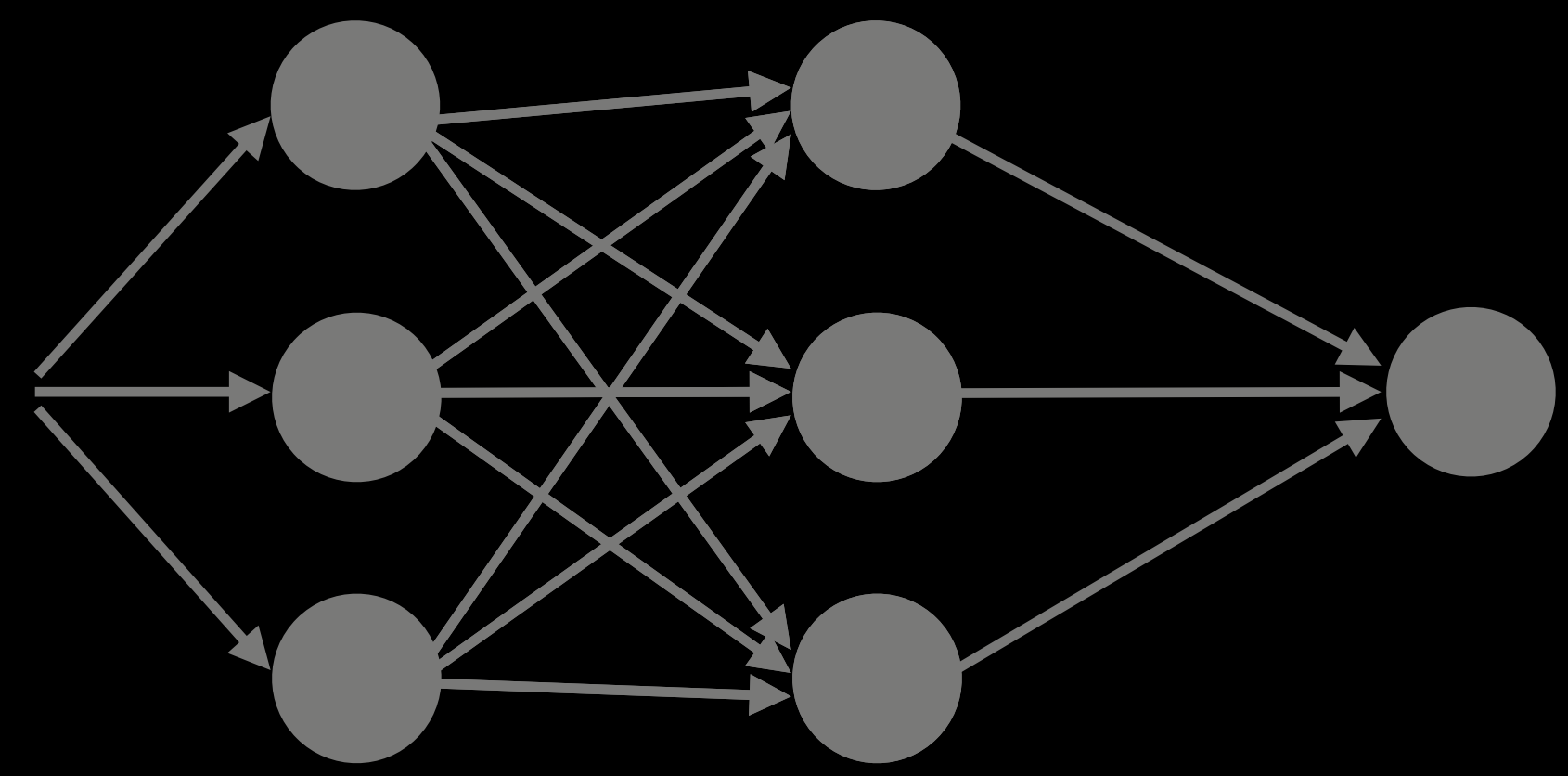
# DEEP LEARNING



**LEARN  
FEATURES**



**CREATE  
IMAGES**



**LEARN  
CLASSIFIERS**



**PROCESS  
ALMOST EVERYTHING**

# DEEP LEARNING



**NEED DATA  
(A LOT)**



**A BLACK BOX**

**EASY TO LEARN  
HARD TO MASTER**



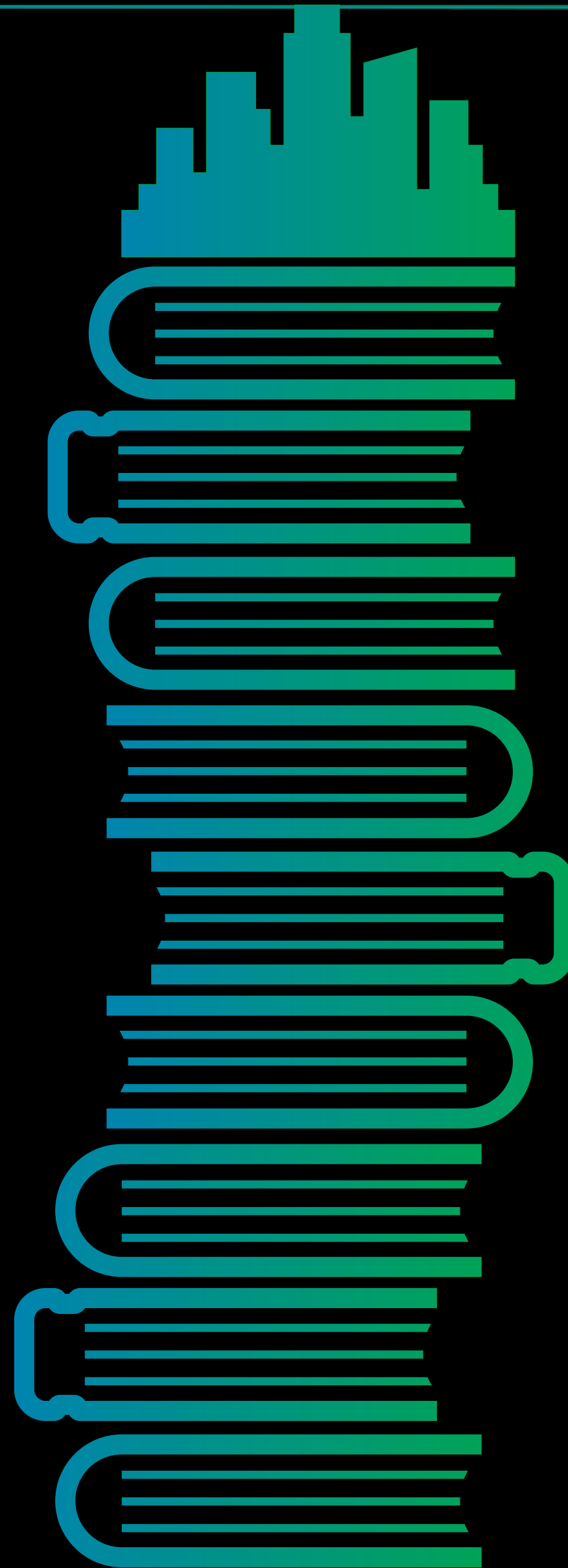
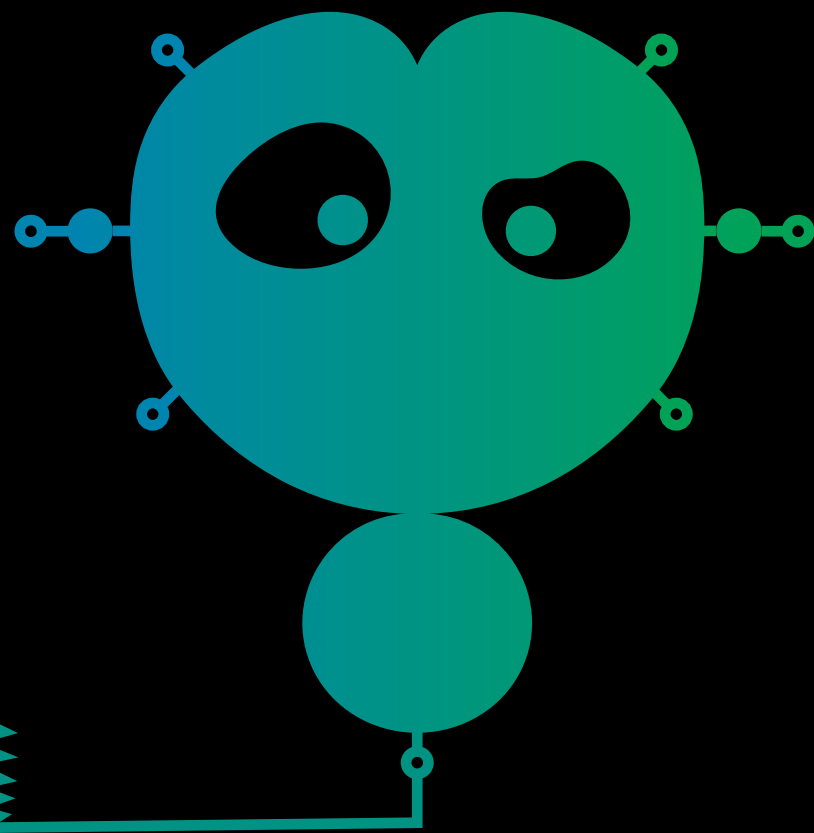
**PROCESS  
ALMOST EVERYTHING**

# DEEP LEARNING

## ● TEUBI

○ @DasTeutelbier

○ teubi@chaos.social



## ● NUSSCHALE PODCAST

○ science in a german nutshell

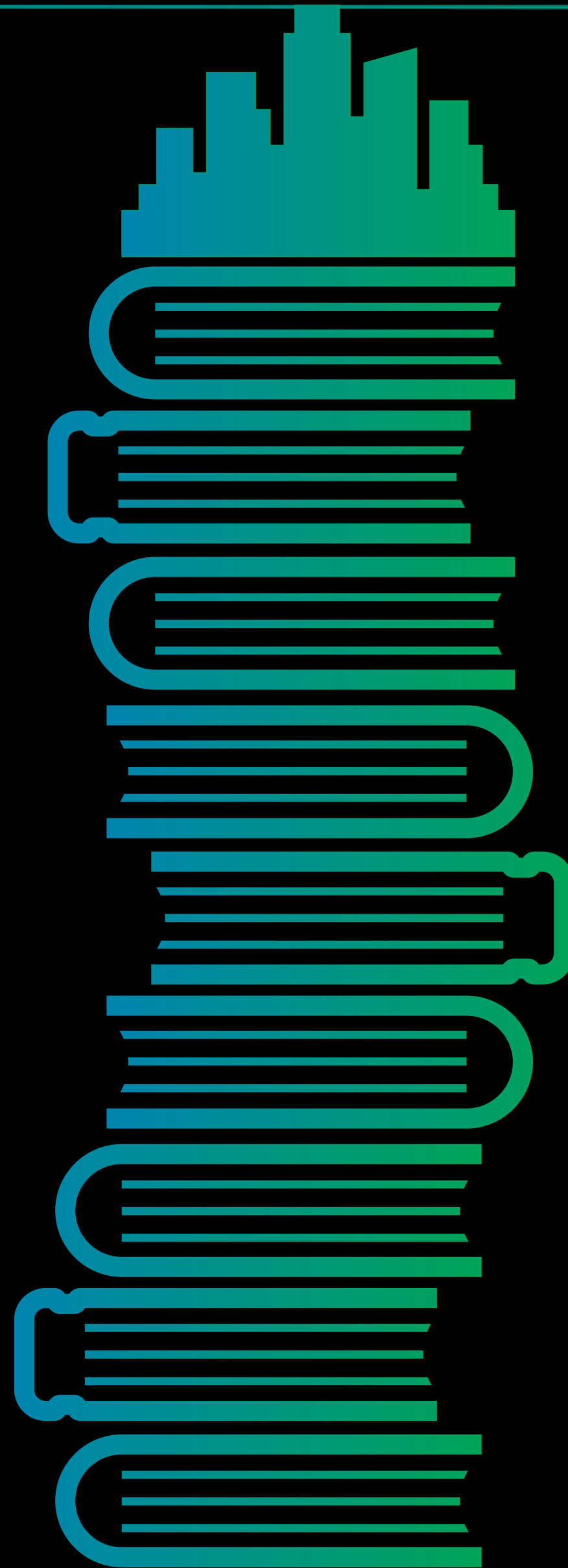
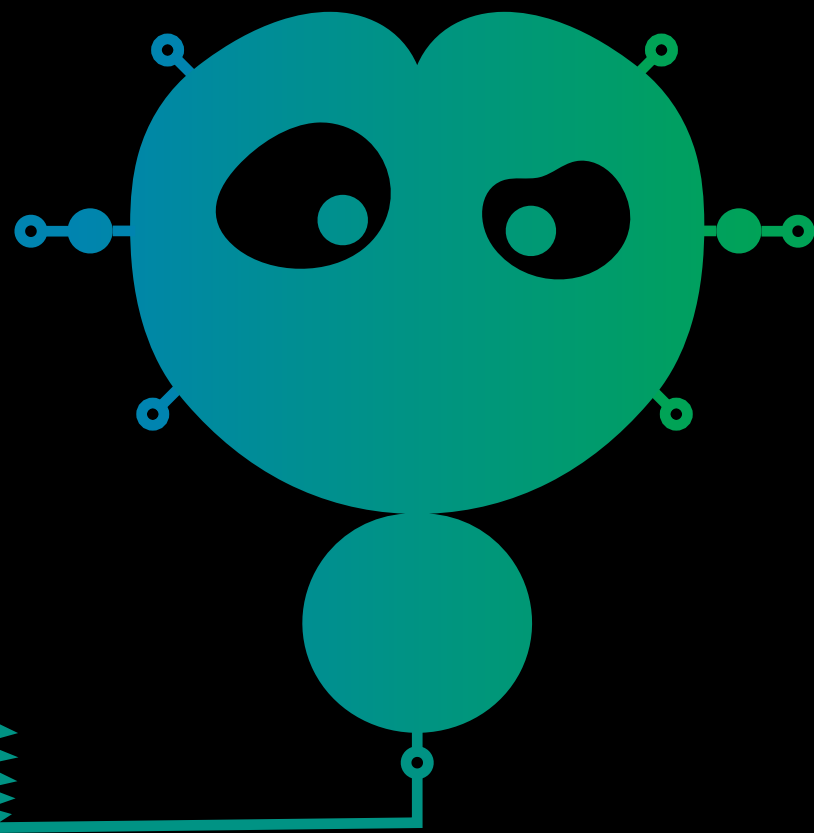
○ nusschale-podcast.de

# DEEP LEARNING

## ● TEUBI

○ @DasTeutelbier

○ teubi@chaos.social



## ● NUSSSCHALE PODCAST

○ science in a german nutshell

○ nusschale-podcast.de