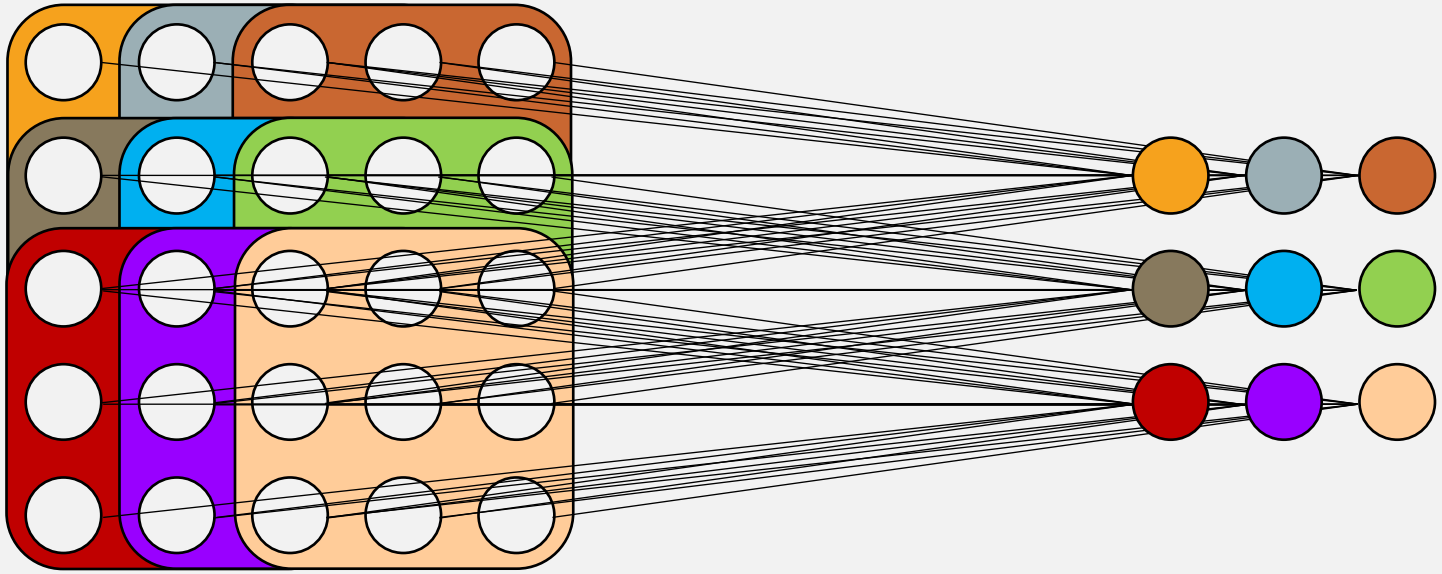
PERSPECTIVES IN ARTIFICIAL INTELLIGENCE

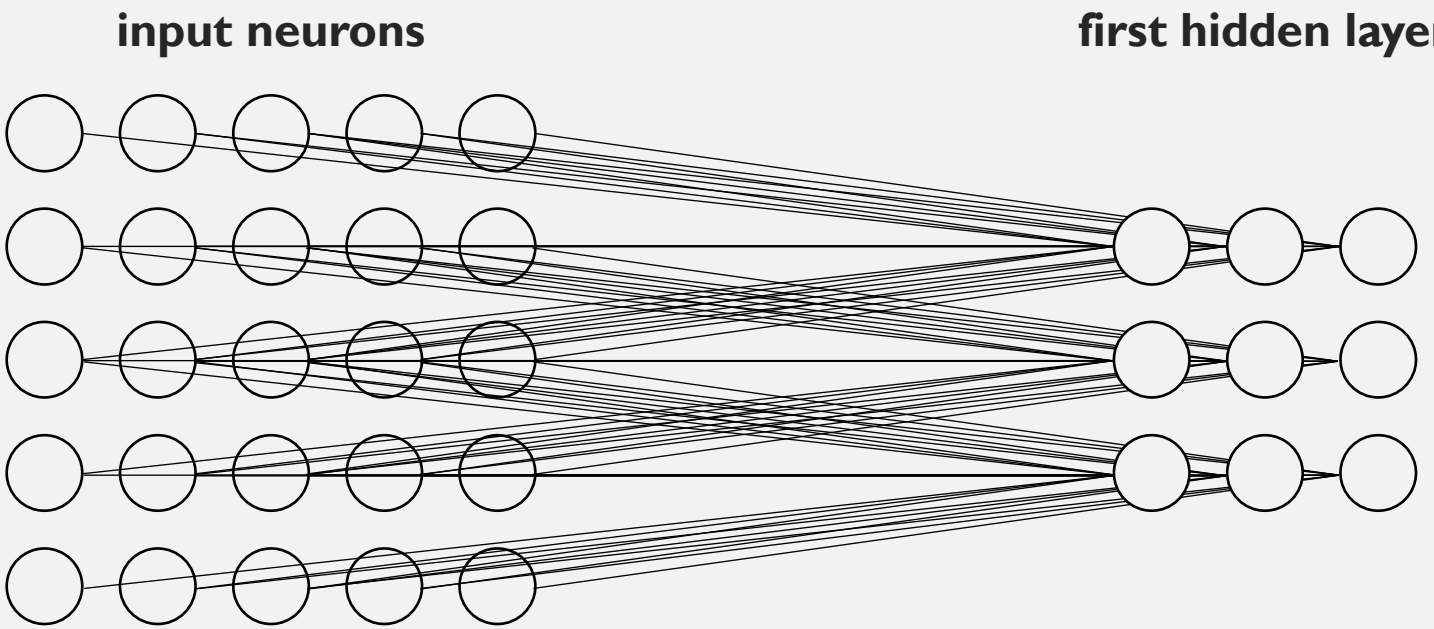
Lecture 12

MALI, 2024

CONVOLUTIONAL NEURAL NETWORKS

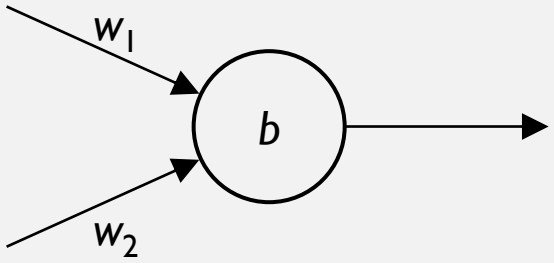


CONVOLUTIONAL NEURAL NETWORKS

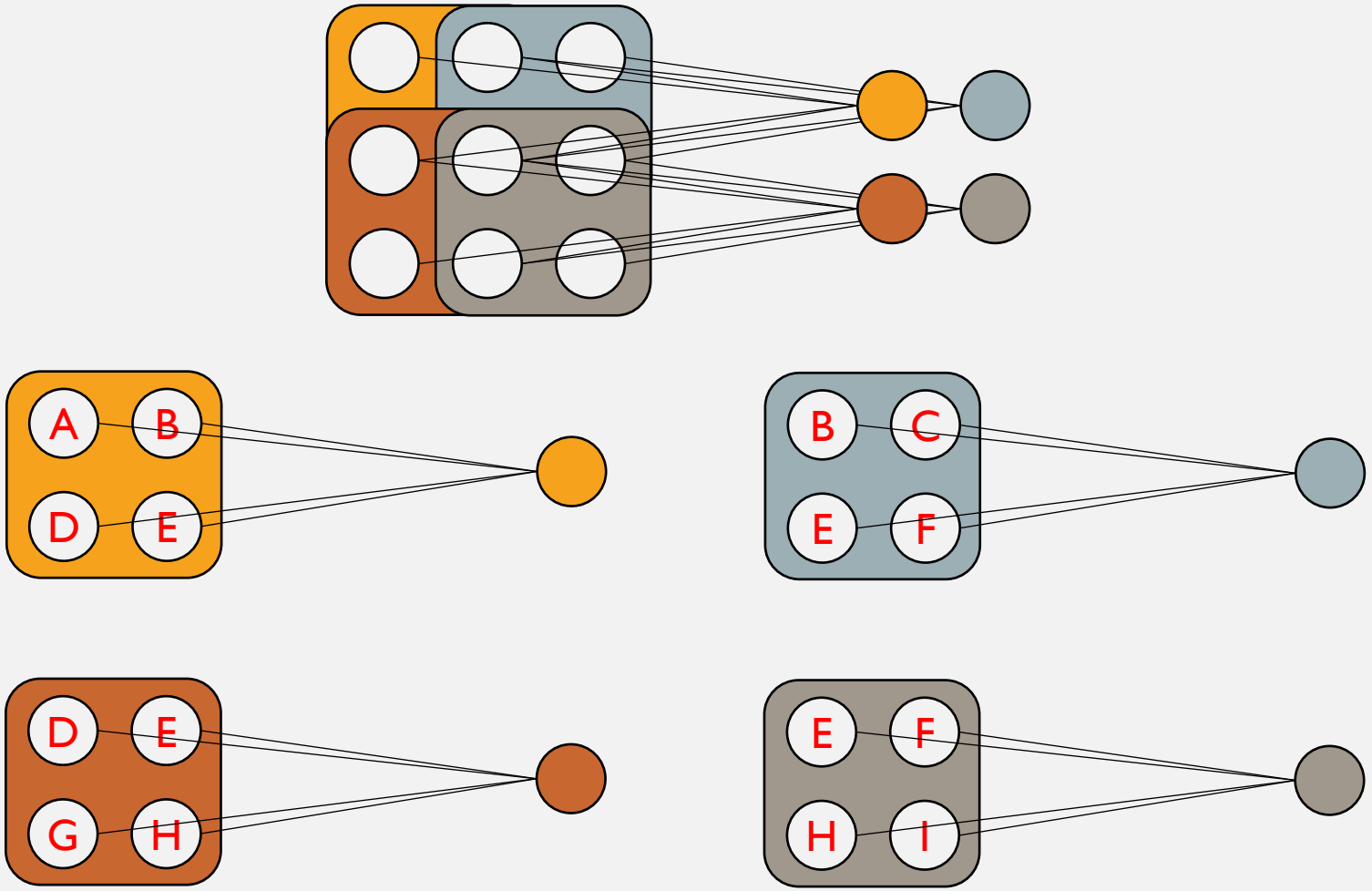


CONVOLUTIONAL NEURAL NETWORKS

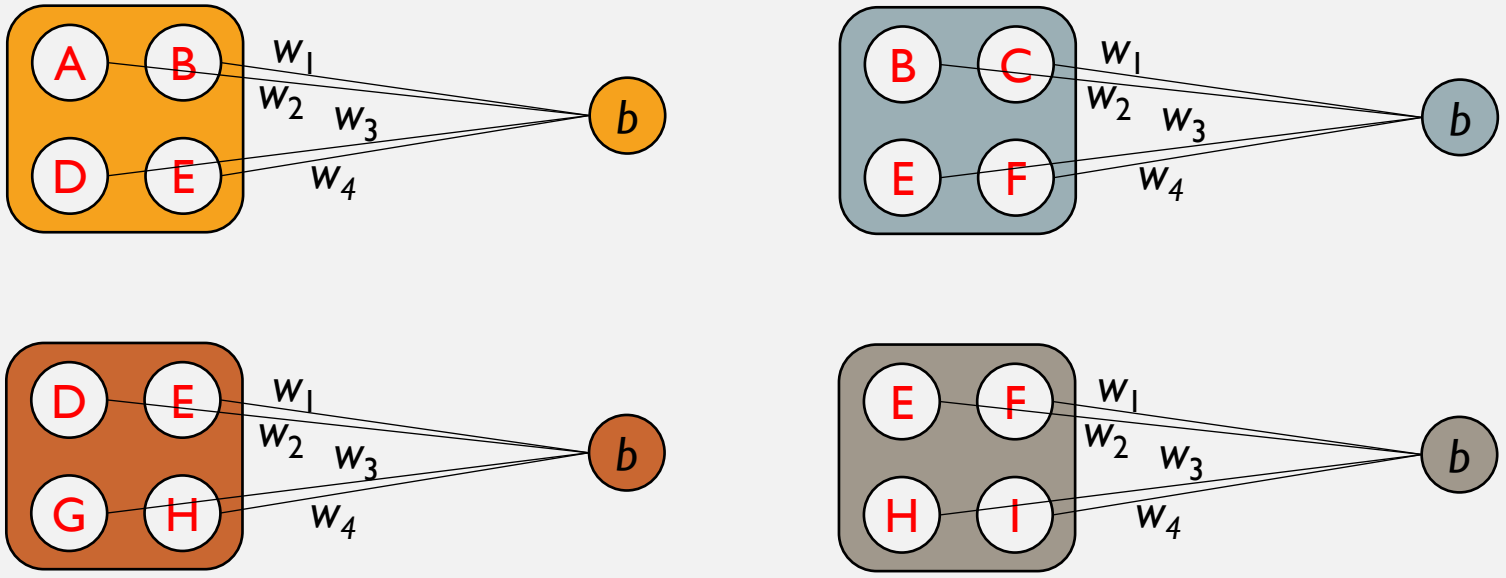
Remember this?



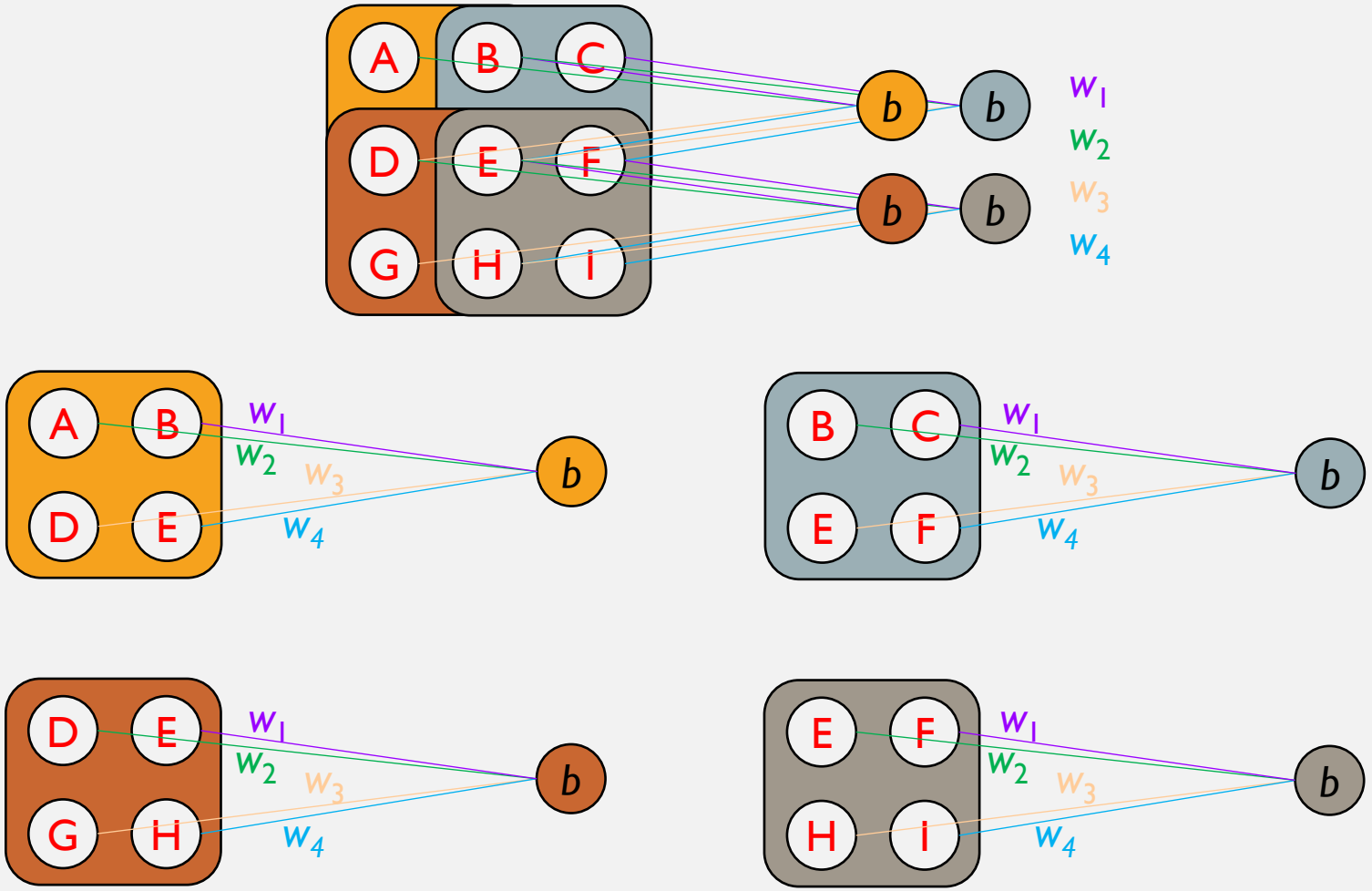
CONVOLUTIONAL NEURAL NETWORKS



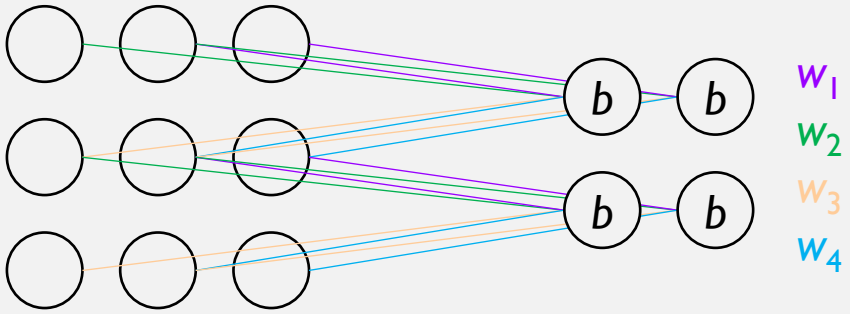
CONVOLUTIONAL NEURAL NETWORKS



CONVOLUTIONAL NEURAL NETWORKS

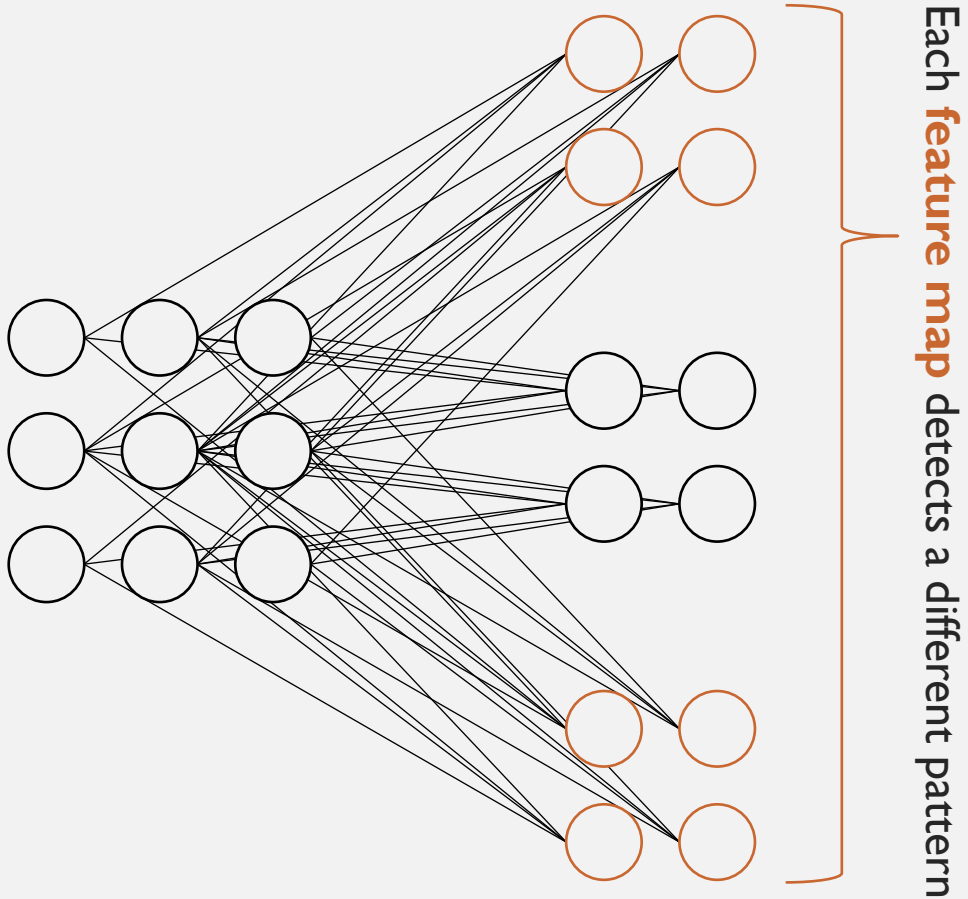


CONVOLUTIONAL NEURAL NETWORKS

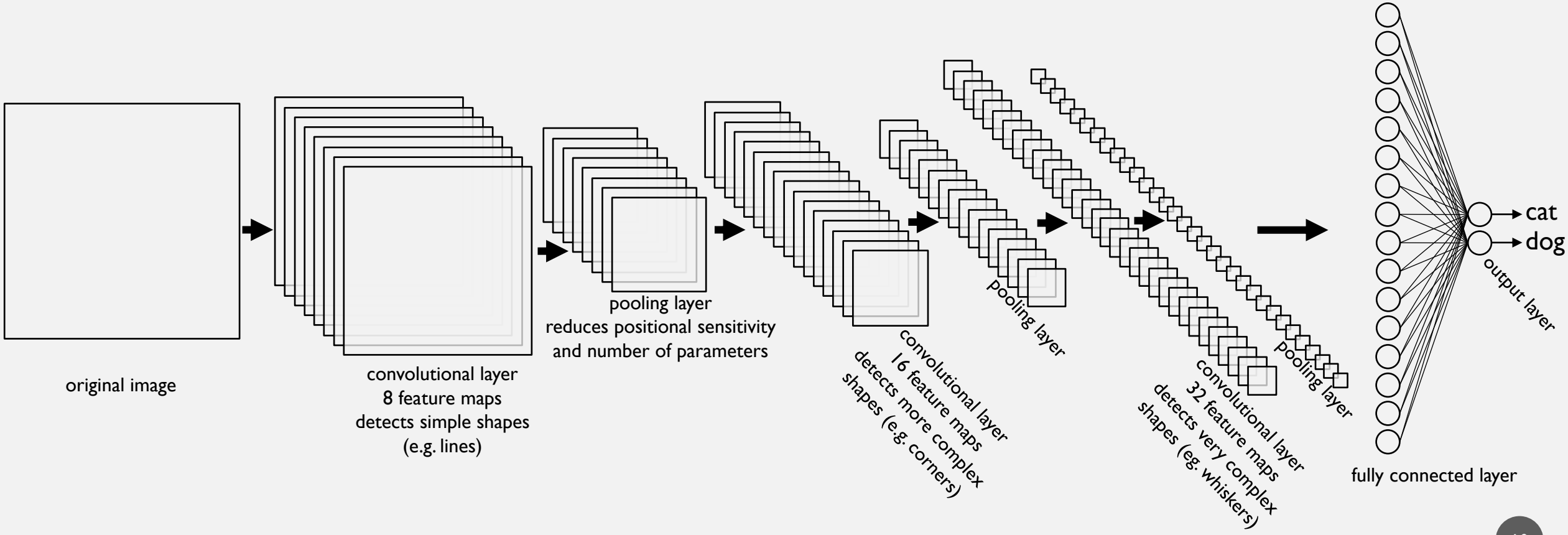


Each neuron in the hidden layer detects the same pattern, but at different positions in the image.

CONVOLUTIONAL NEURAL NETWORKS



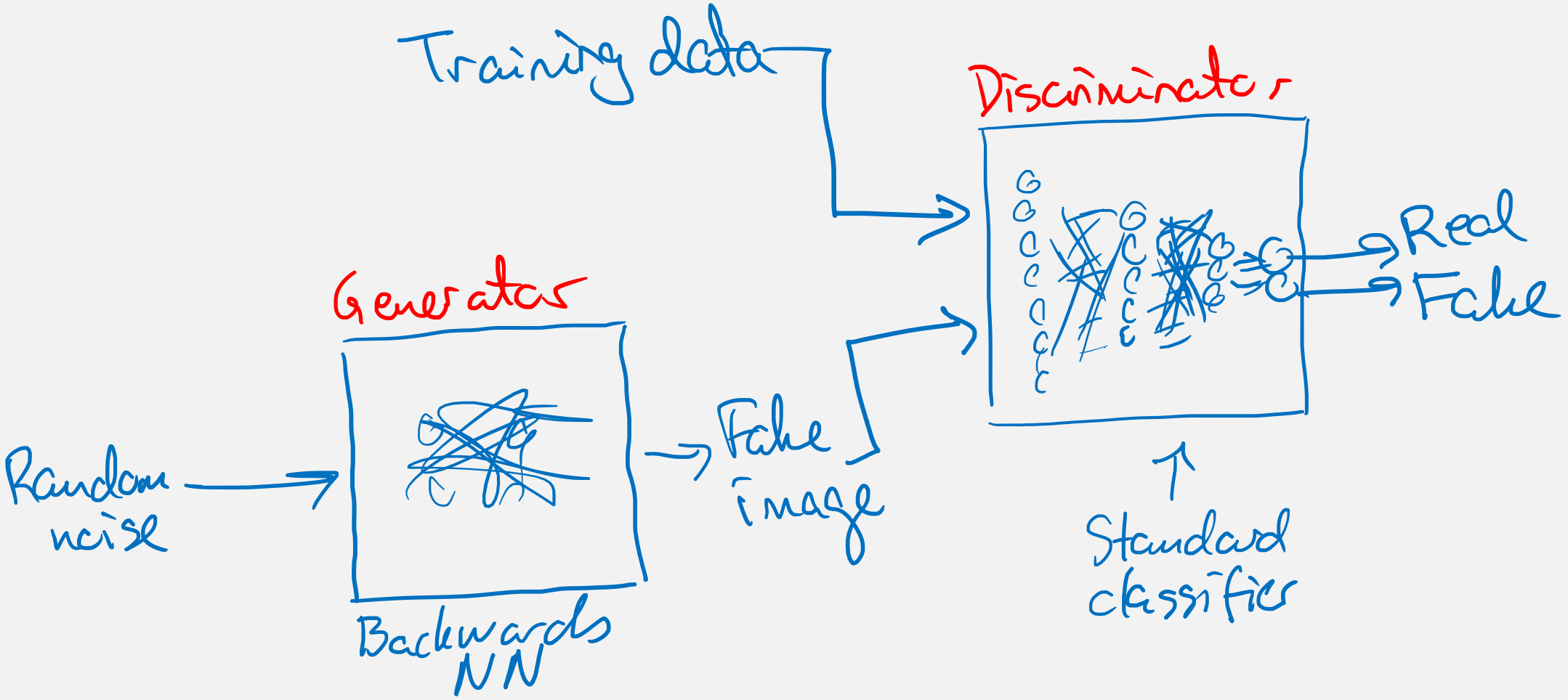
CONVOLUTIONAL NEURAL NETWORKS



CONVOLUTIONAL NEURAL NETWORKS

Jupyter Notebook **Convolutional neural networks**

GENERATIVE ADVERSARIAL NETWORKS



GENERATIVE ADVERSARIAL NETWORKS

- The **discriminator** becomes better and better at classifying real vs. fake

- The **generator** becomes better and better at generating images that look real

GENERATIVE ADVERSARIAL NETWORKS

Karras, *et al.*, "A Style-Based Generator Architecture for Generative Adversarial Networks."

GENERATIVE ADVERSARIAL NETWORKS

RECURRENT NEURAL NETWORKS

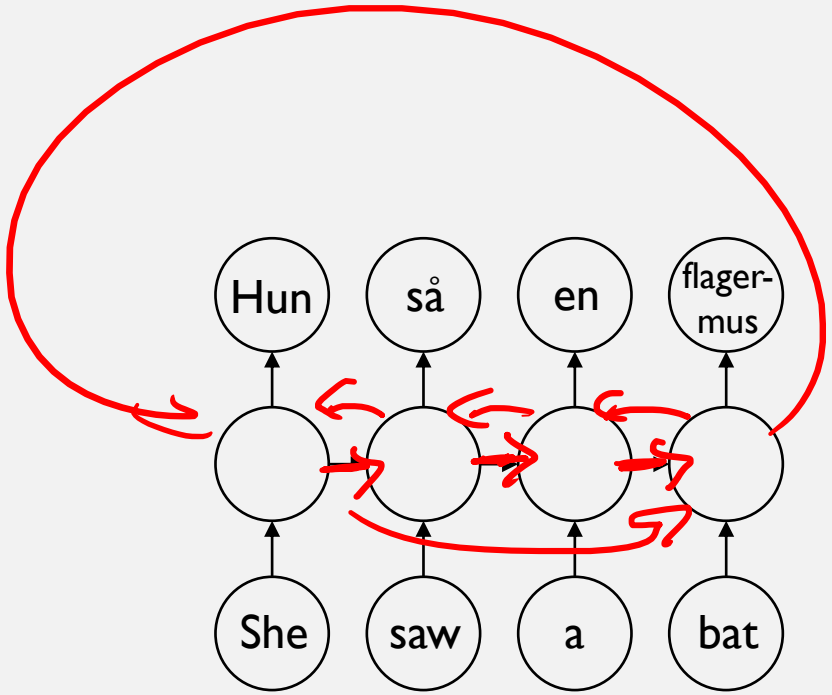
She saw a bat

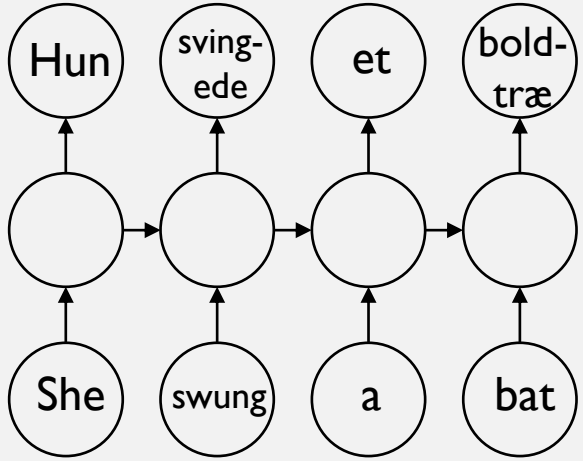
Hun så en flagermus

She swung a bat

Hun svingede et boldtræ

RECURRENT NEURAL NETWORKS

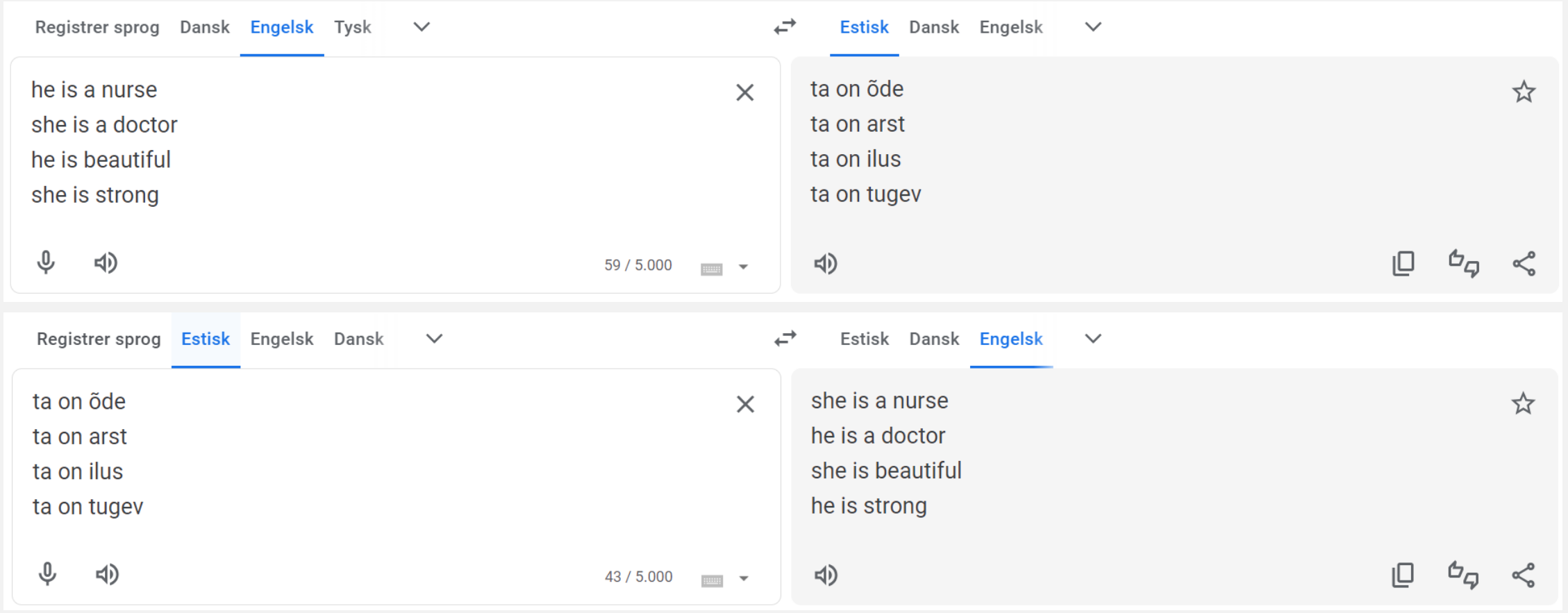




RECURRENT NEURAL NETWORKS

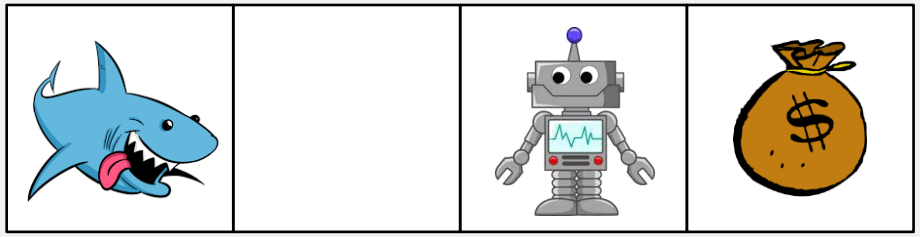
translate.google.com

RECURRENT NEURAL NETWORKS

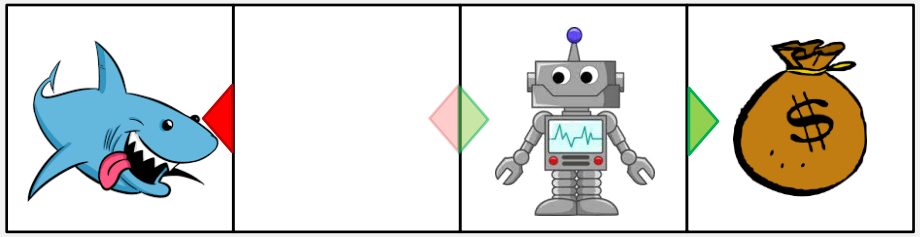


the model is only as good as the data it's trained on

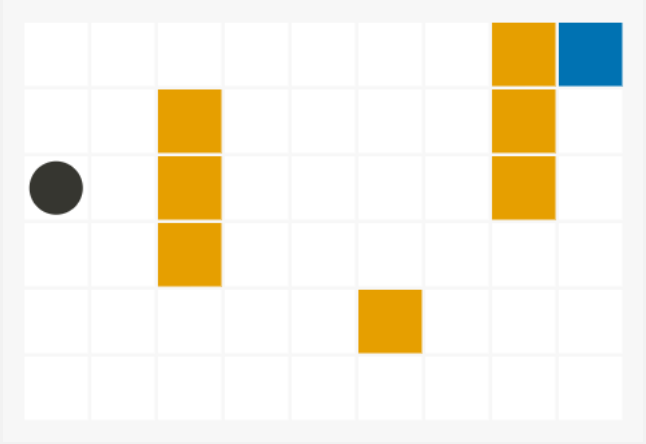
REINFORCEMENT LEARNING



REINFORCEMENT LEARNING



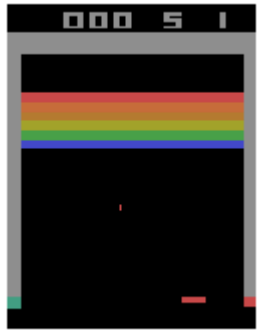
REINFORCEMENT LEARNING



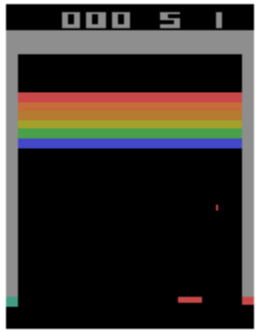
https://alazareva.github.io/rl_playground/

REINFORCEMENT LEARNING

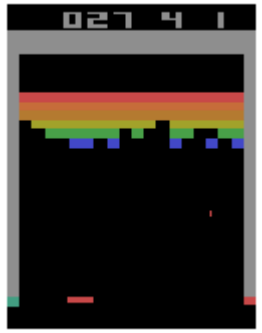
Before training



Early training



Late training



https://colab.research.google.com/github/keras-team/keras-io/blob/master/examples/rl/ipynb/deep_q_network_breakout.ipynb

REINFORCEMENT LEARNING

Silver, D., Huang, A., Maddison, C. *et al.* Mastering the game of Go with deep neural networks and tree search. *Nature* **529**, 484–489 (2016)

AI ETHICS

It's all fun and games …

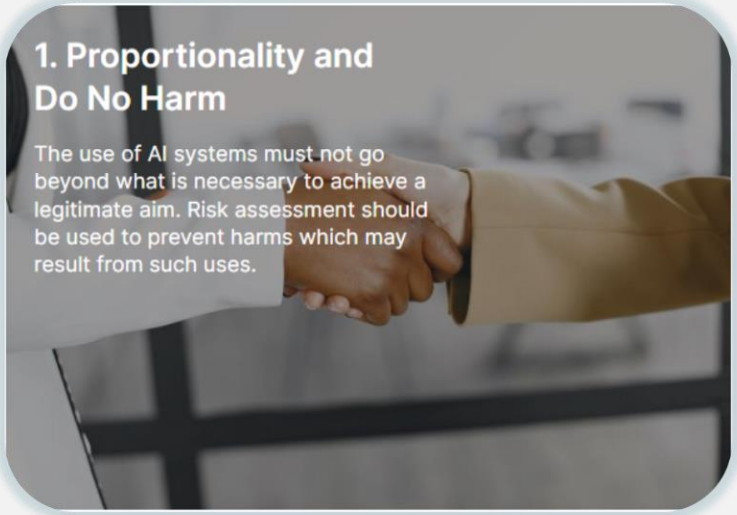
… until our judicial system can no longer trust images and videos

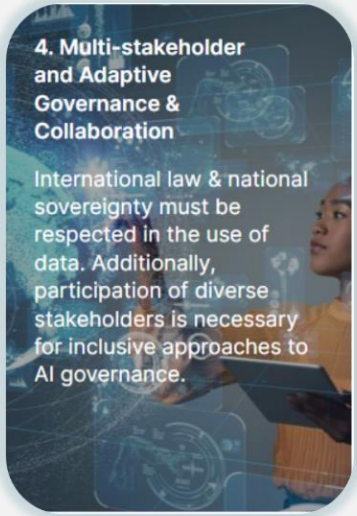
… until chatbots start instructing children how to hurt themselves

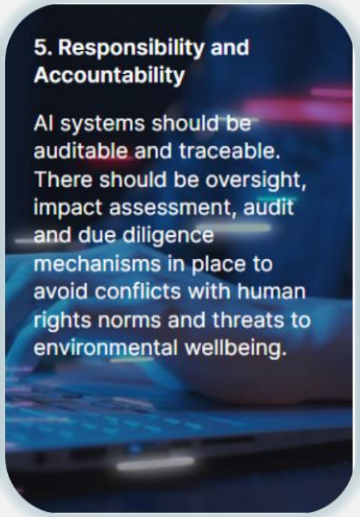
… until self-driving cars kill pedestrians and no one can say who's responsible

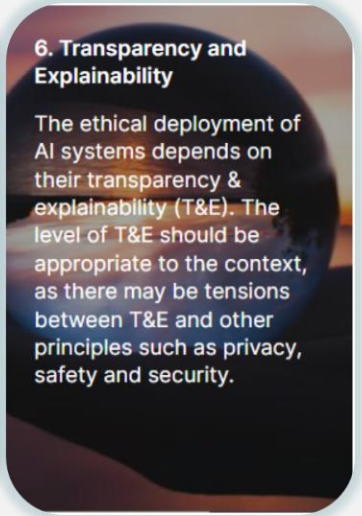
… until you end up starring in deepfake pornography

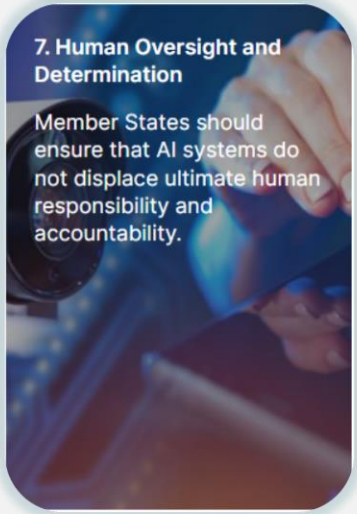
AI ETHICS

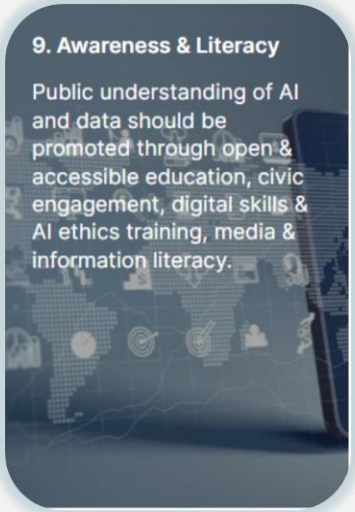










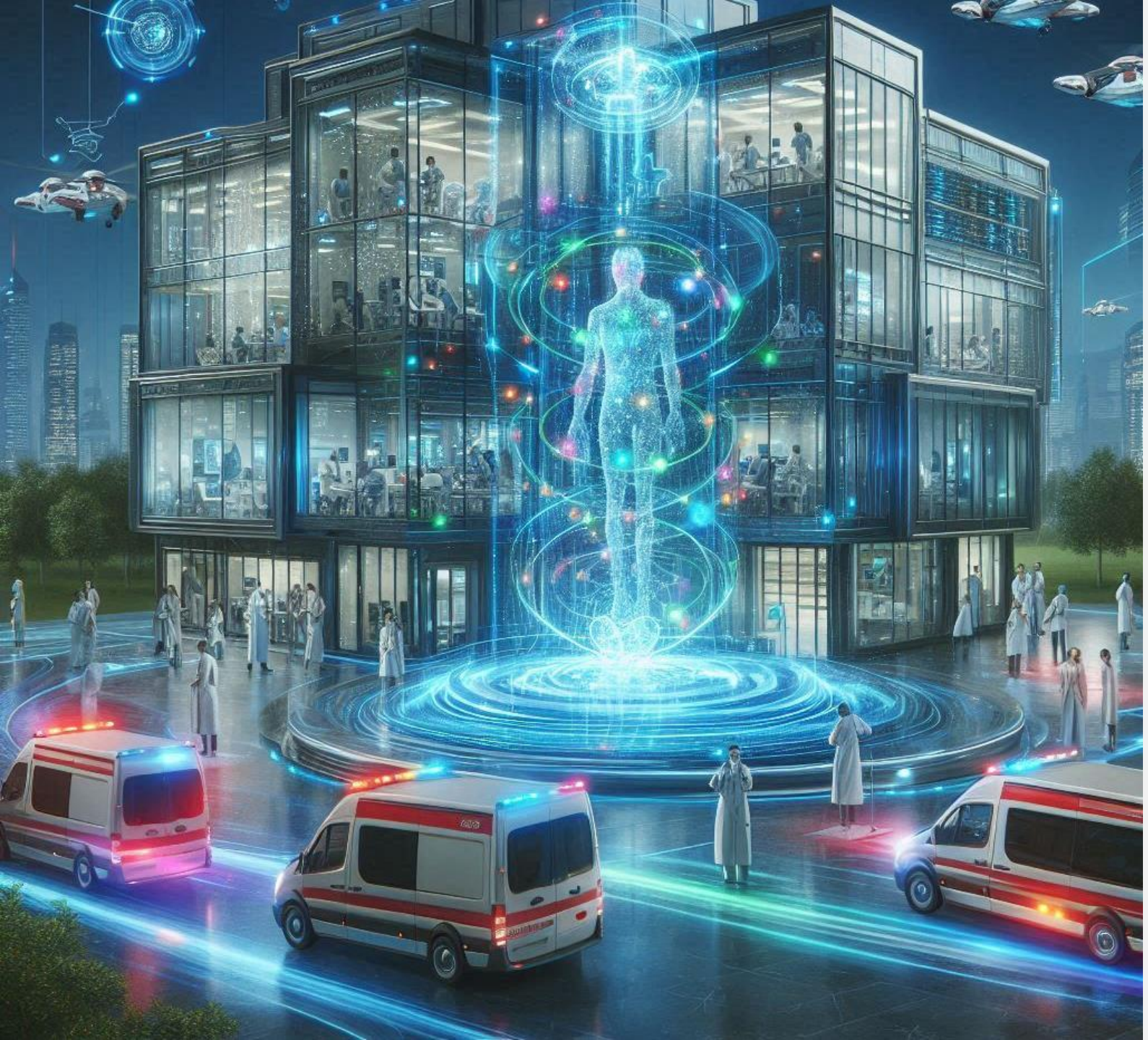


https://www.unesco.org/en/artificial-intelligence/recommendation-ethics

FR

You

what do you think ai can do in 10 years



ADVANCED HEALTCARE

AI WILL PLAY A SIGNIFICANT ROLE IN PERSONALIZED MEDICINE, DISEASE DIAGNOSIS, DRUG DISCOVERY, AND TREATMENT OPTIMIZATION

AUTONOMOUS VEHICLES

SELF-DRIVING CARS AND DRONES MAY BECOME MORE COMMONPLACE, REVOLUTIONIZING TRANSPORTATION AND LOGISTICS

NATURAL LANGUAGE PROCESSING

AI WILL CONTINUE TO IMPROVE IN UNDERSTANDING AND GENERATING HUMAN-LIKE TEXT, ENABLING MORE NATURAL INTERACTIONS WITH MACHINES

CLIMATE CHANGE SOLUTIONS

AI CAN AID IN CLIMATE MODELING, RESOURCE MANAGEMENT, AND THE DEVELOPMENT OF SUSTAINABLE TECHNOLOGIES TO COMBAT CLIMATE CHANGE

EDUCATION

AI-DRIVEN PERSONALIZED LEARNING PLATFORMS WILL ADAPT TO INDIVIDUAL STUDENT NEEDS, ENHANCING EDUCATIONAL OUTCOMES

CYBERSECURITY

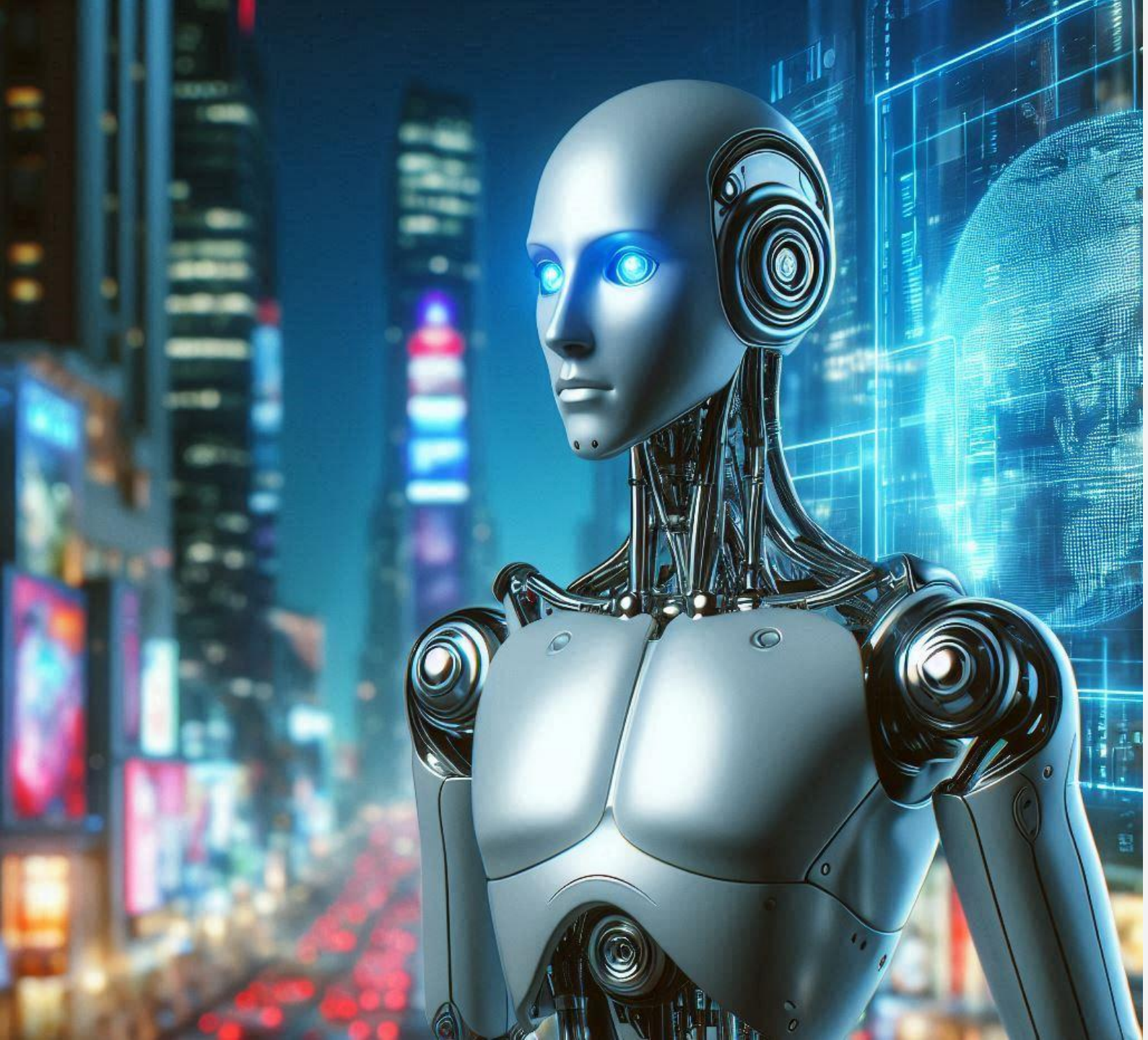
AI WILL BE CRUCIAL IN DEFENDING AGAINST CYBER THREATS, IDENTIFYING VULNERABILITIES, AND RESPONDING TO ATTACKS IN REAL-TIME

VIRTUAL ASSISTANTS

VIRTUAL ASSISTANTS WILL BECOME EVEN MORE INTEGRATED INTO DAILY LIFE, ASSISTING WITH TASKS, SCHEDULING, AND INFORMATION RETRIEVAL

CREATIVE INDUSTRIES

AI WILL CONTRIBUTE TO ART, MUSIC, AND LITERATURE CREATION, COLLABORATING WITH HUMAN CREATORS TO PRODUCE INNOVATIVE WORKS



ROBOTICS

ADVANCES IN AI WILL LEAD TO MORE SOPHISTICATED ROBOTS CAPABLE OF COMPLEX TASKS IN MANUFACTURING, HEALTHCARE, AND DOMESTIC SETTINGS

ETHICAL CONSIDERATIONS

THERE WILL BE INCREASED FOCUS ON ADDRESSING THE ETHICAL IMPLICATIONS OF AI, INCLUDING BIAS MITIGATION, TRANSPARENCY, AND ACCOUNTABILITY IN AI SYSTEMS

Only time will tell what's going to happen …