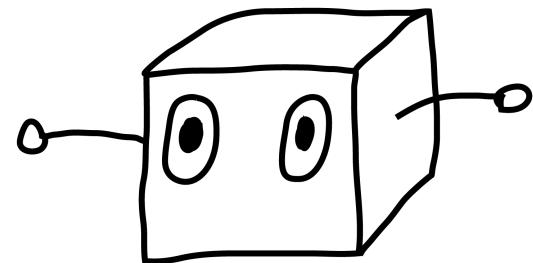


AI BASICS

From Beginnings to Transformers

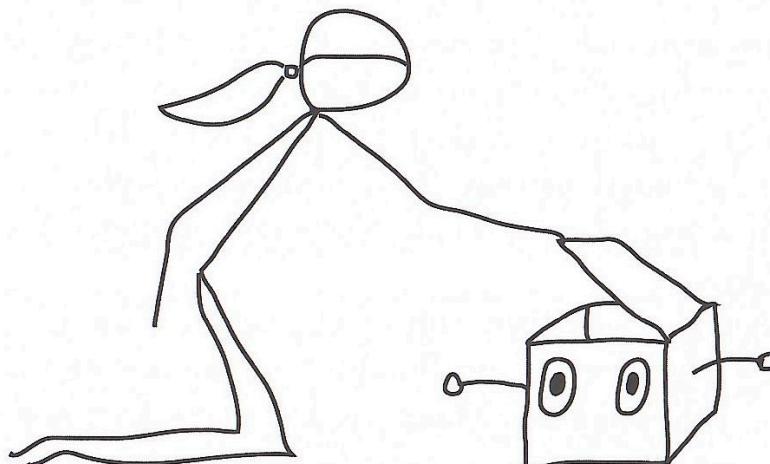
Angelika & Carsten

TGIF 2024.10.25



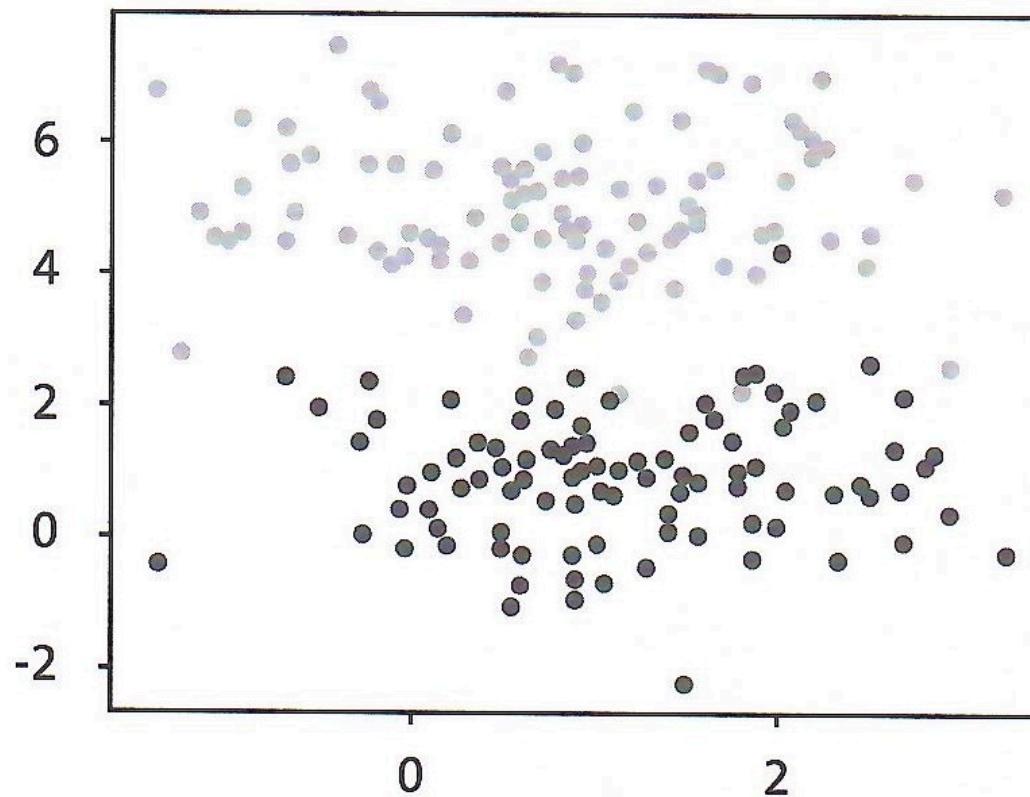
INTRODUCTION TO AI

- AI = Machines simulating human intelligence
- Areas: Machine Learning, Natural Language Processing (NLP)
- Techniques: Cluster Analysis, Neural Networks



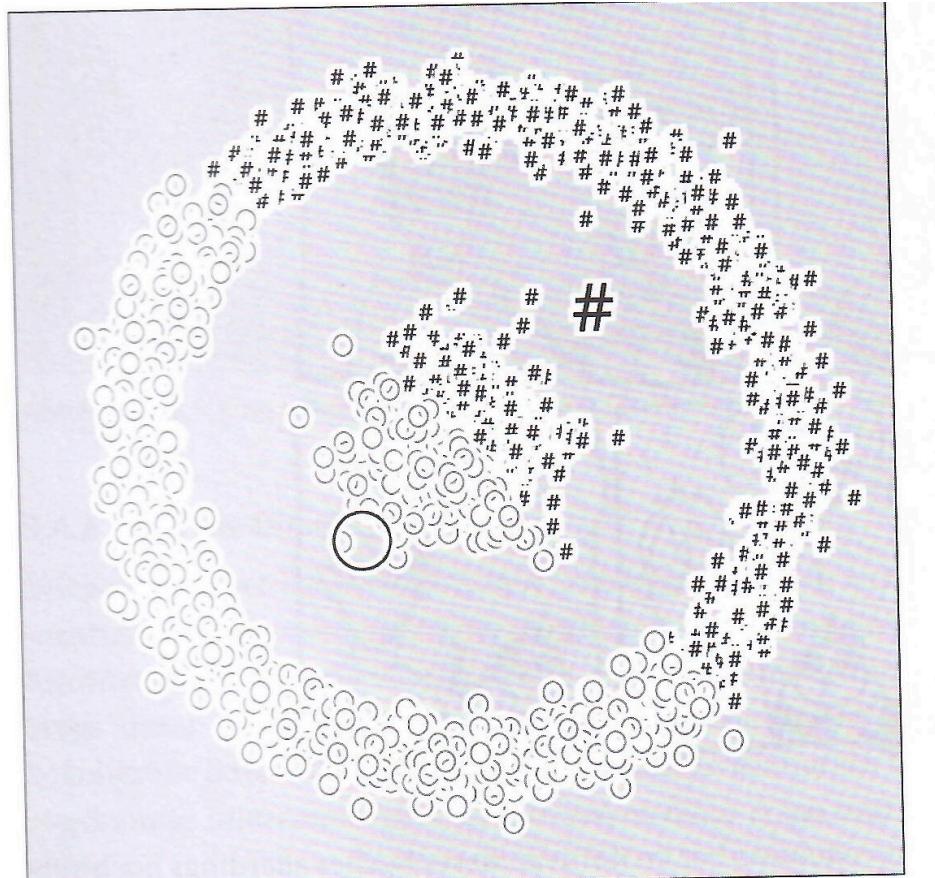
CLUSTER ANALYSIS

- Clustering: Grouping similar data points
- Techniques: K-Nearest Neighbors, k-means



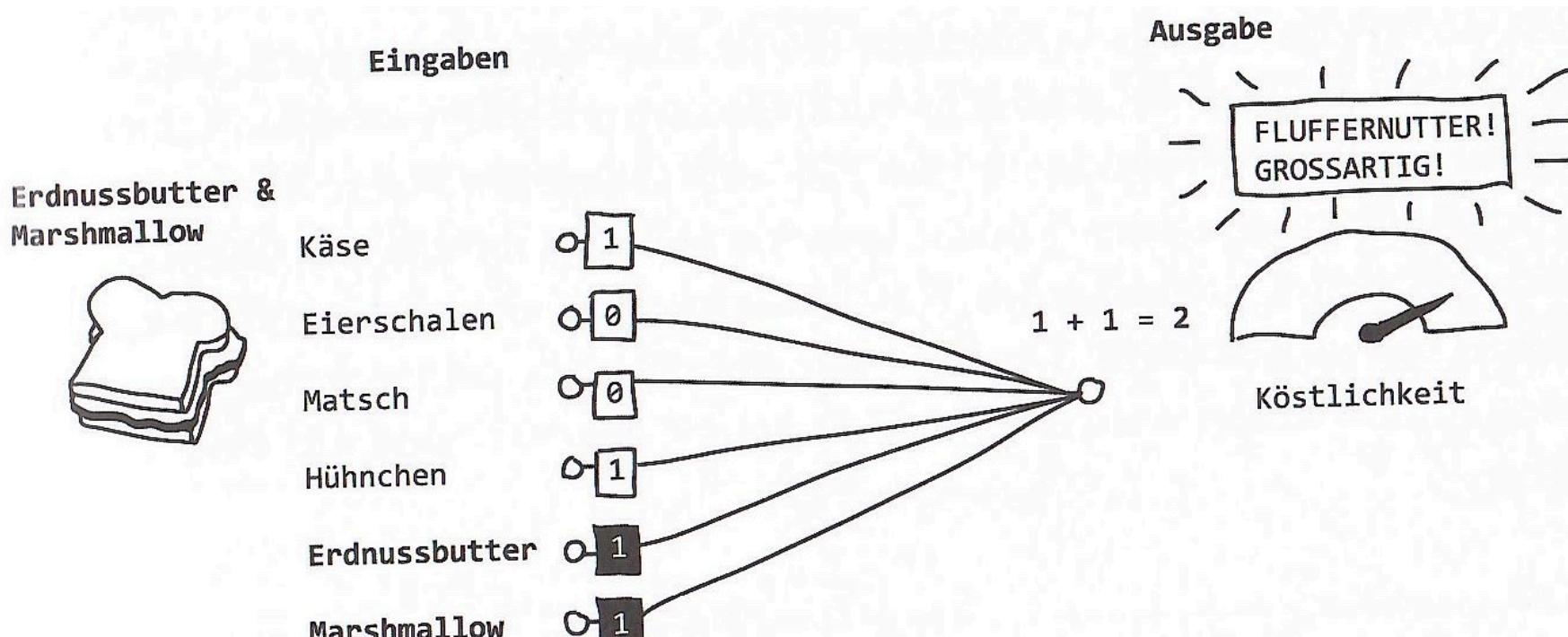
K-NEAREST NEIGHBORS (KNN)

- Authors: Evelyn Fix & Joseph Hodges (1951)
- Finds nearest neighbors, majority voting



EARLY AI: PERCEPTRON

- Author: Frank Rosenblatt (1957)
- Simple neural network for binary classification



NEURAL NETWORKS (NN)

- Mimics brain to recognize patterns
- Layers: Input, hidden, output
- Deep Learning: NN with many hidden layers

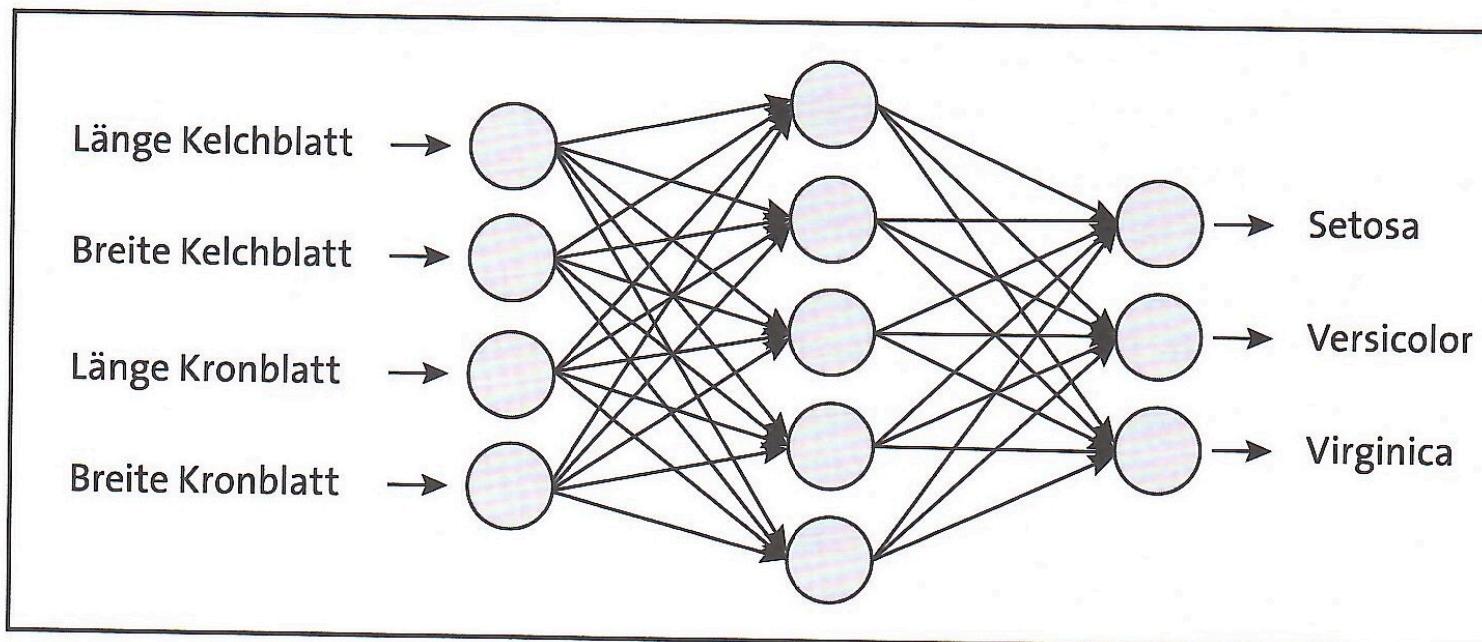
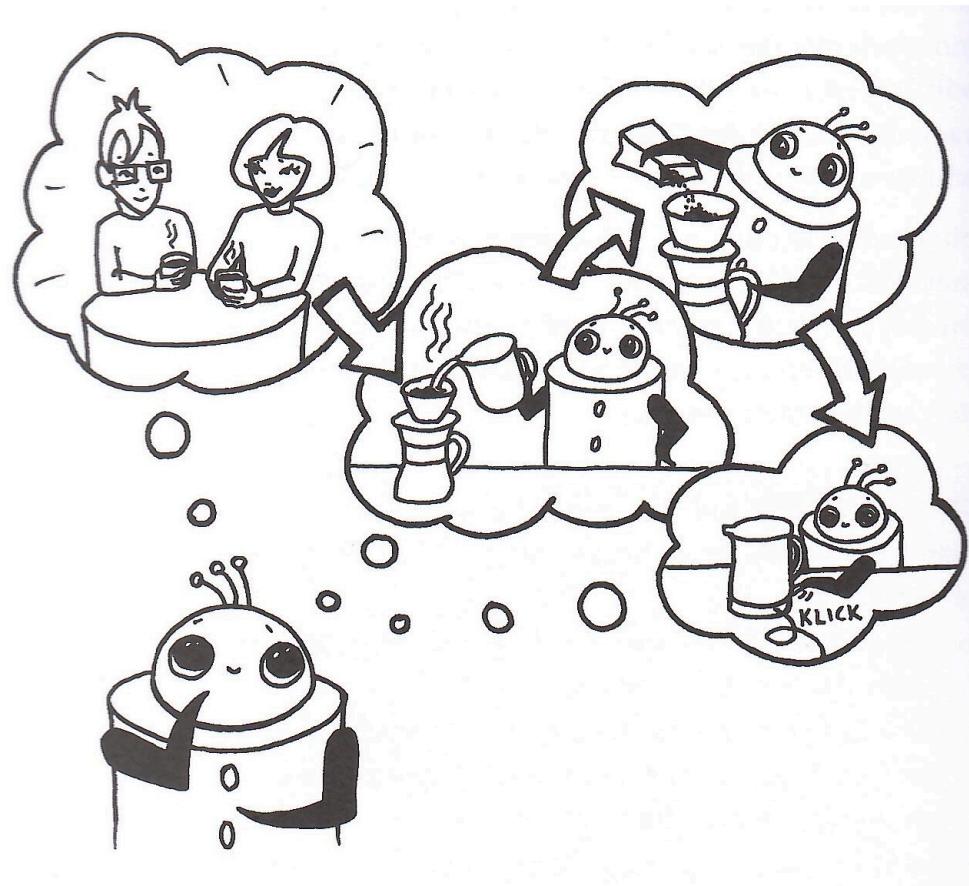


Abbildung 2.5 Neuronales Netz zur Bestimmung dreier Blüten

BACKPROPAGATION

- Learning algorithm in NNs
- Adjusts weights



SUPERVISED LEARNING

- Supervised: Labeled data

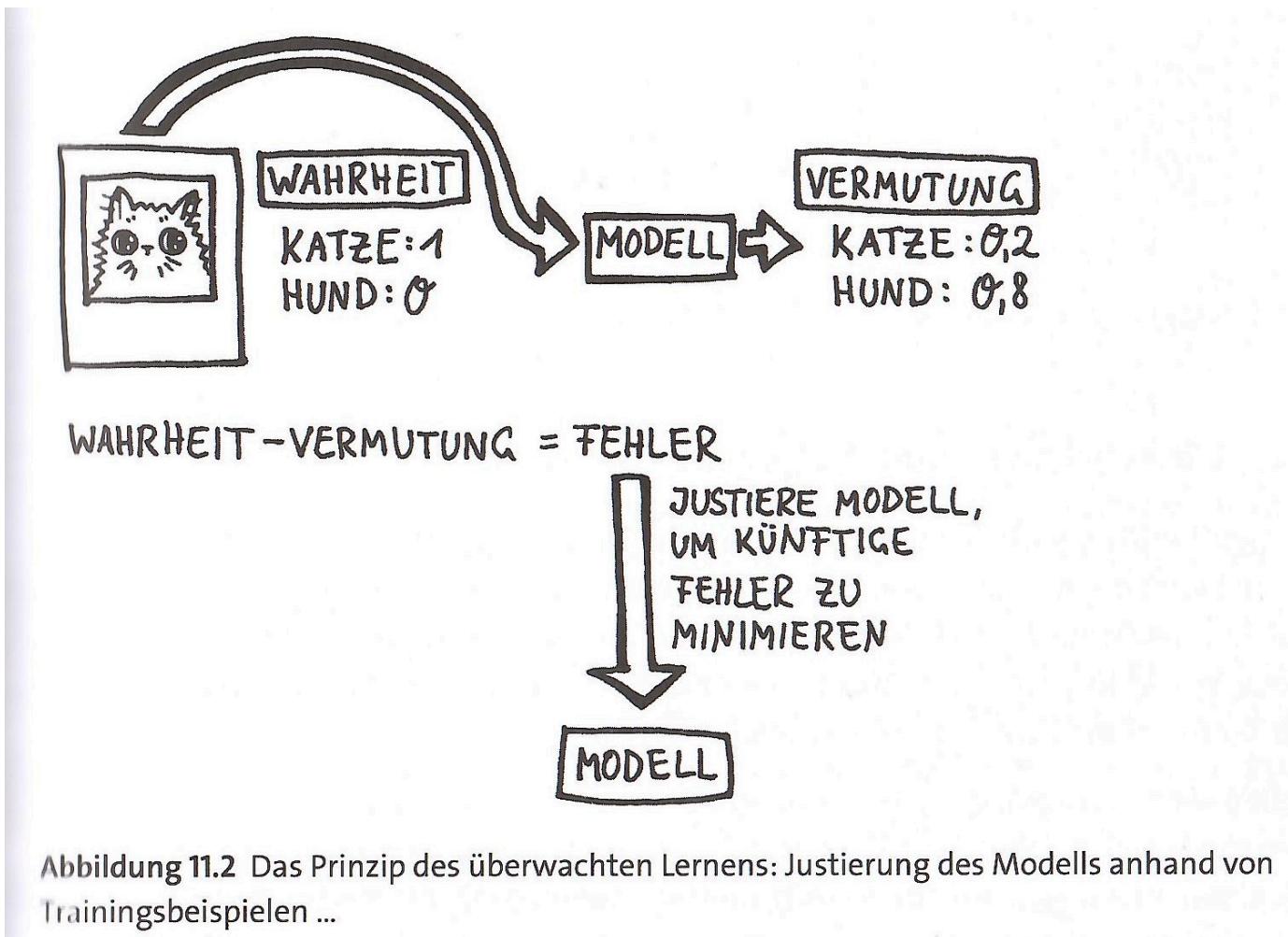
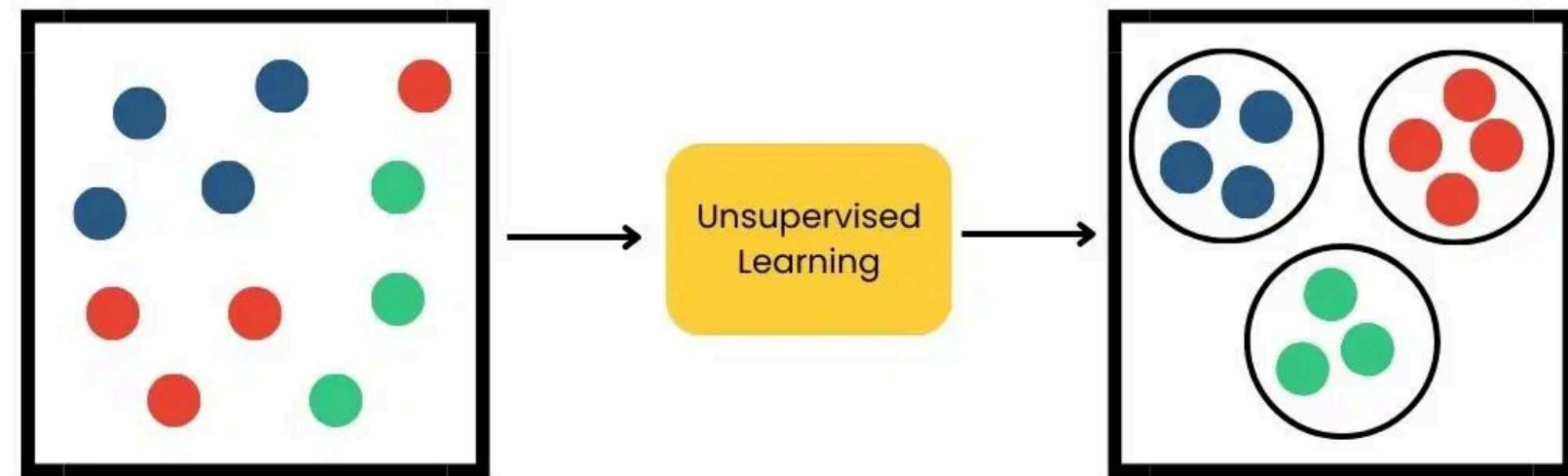


Abbildung 11.2 Das Prinzip des überwachten Lernens: Justierung des Modells anhand von Trainingsbeispielen ...

UNSUPERVISED LEARNING

- Unsupervised: Unlabeled data (clustering)



AUTOENCODERS

- Data compression, unsupervised learning

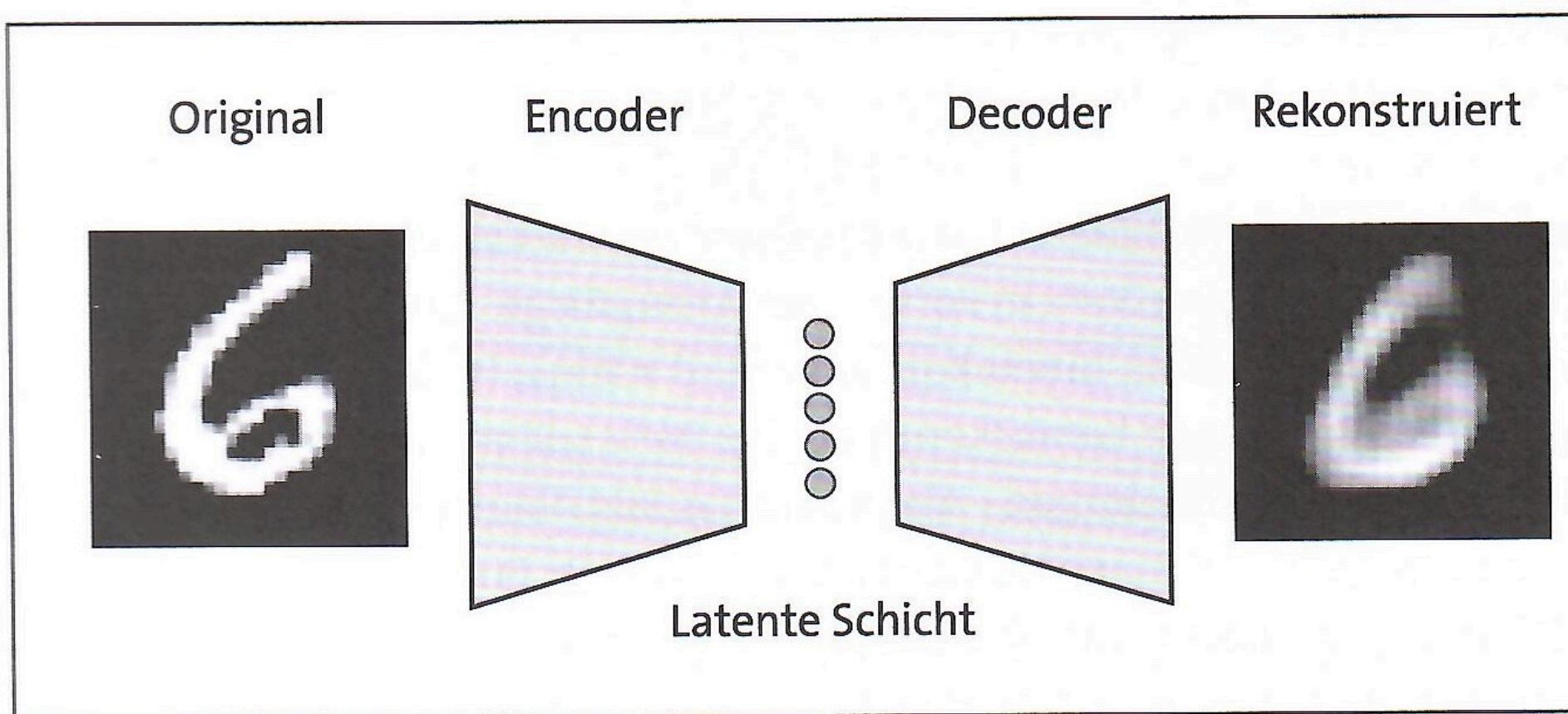
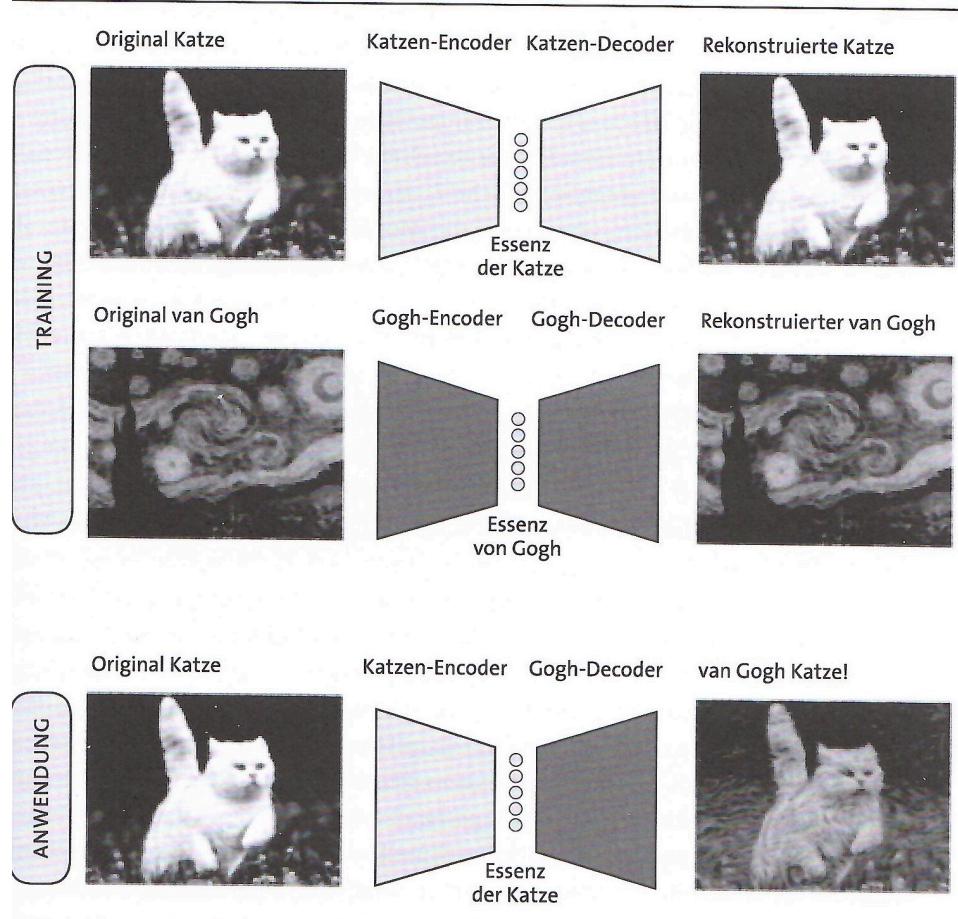


Abbildung 5.2 Das Schema eines Autoencoders

AUTOENCODER: DEEPFAKE



bildung 5.3 Bei einem Deepfake wird die mithilfe eines Autoencoders ermittelte Essenz des Bildes mit der Essenz eines anderen Bildes gemischt.

GAN: IMAGE GENERATOR

- GAN: Generative Adversarial Networks
- Two networks: Generator vs. Discriminator

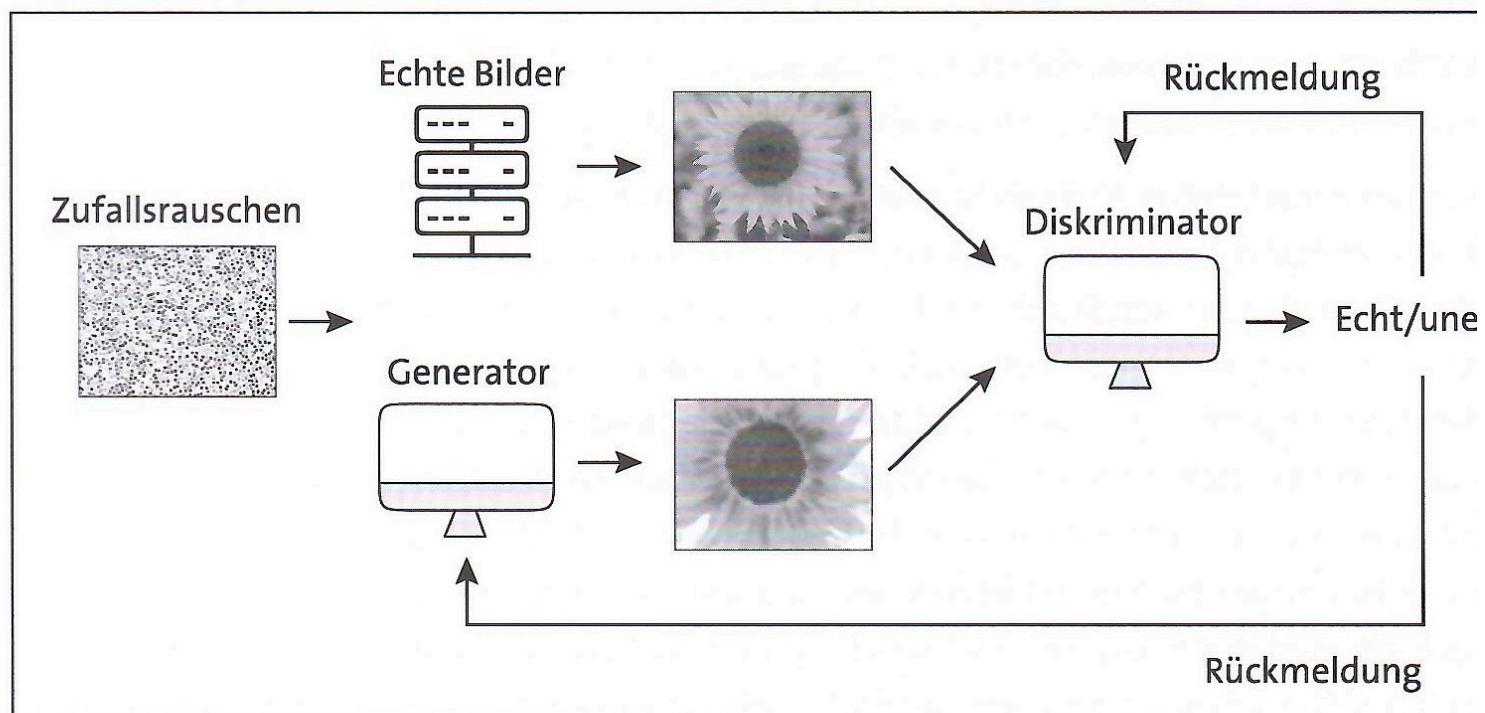
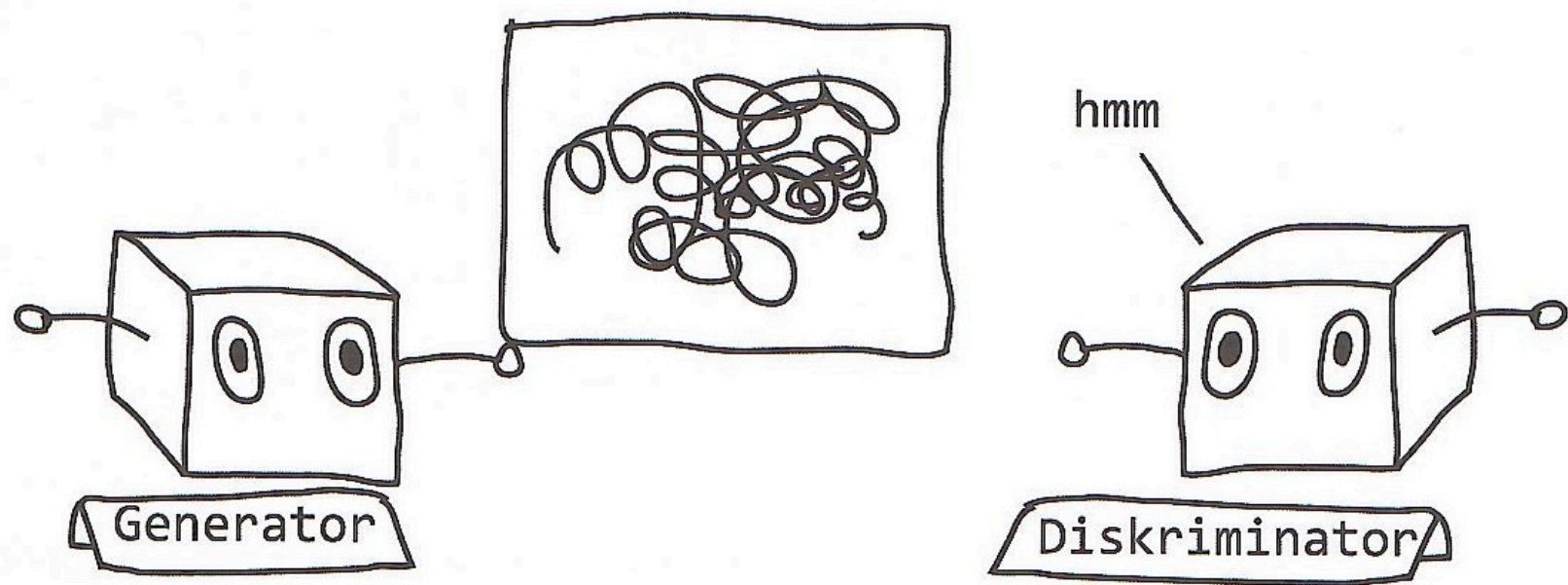


Abbildung 5.1 Aufbau eines Generative Adversarial Networks

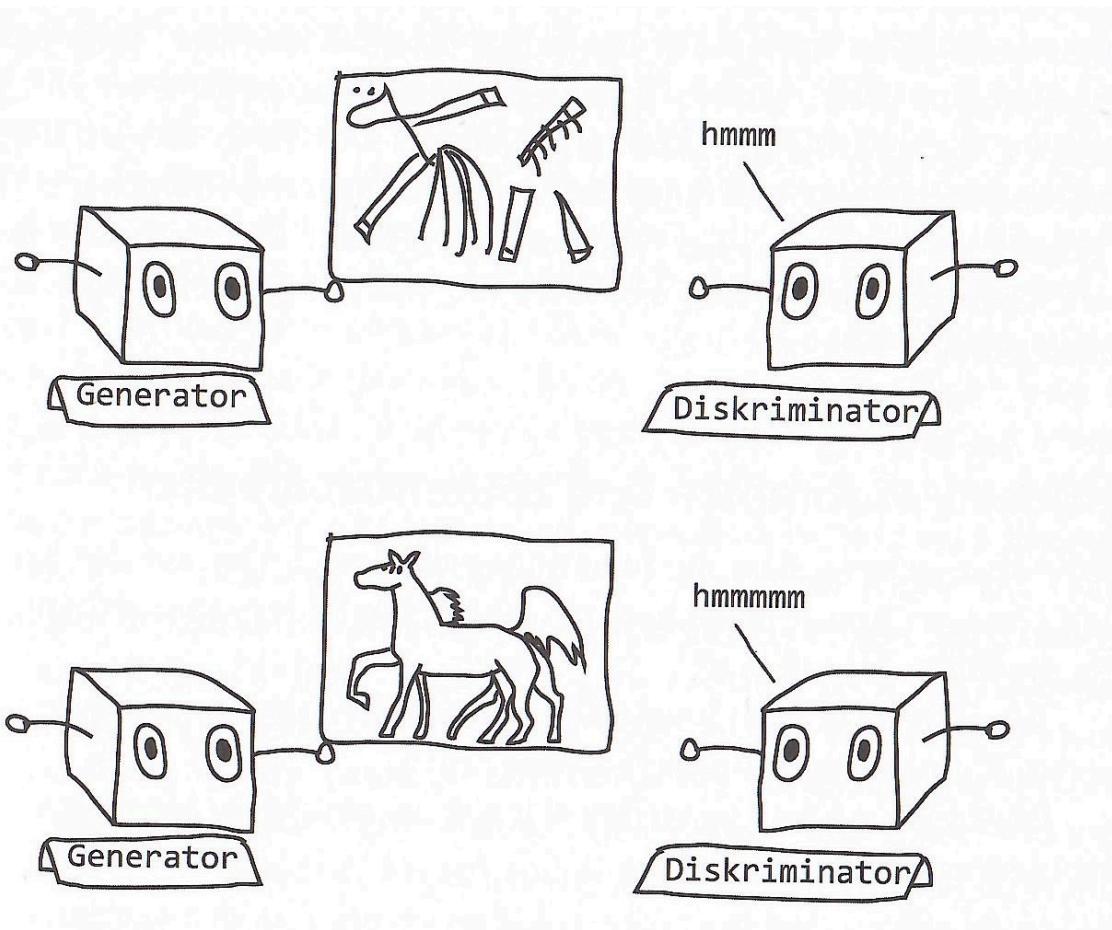
GAN IN ACTION: 1

Learn how to paint a Horse ... start randomly



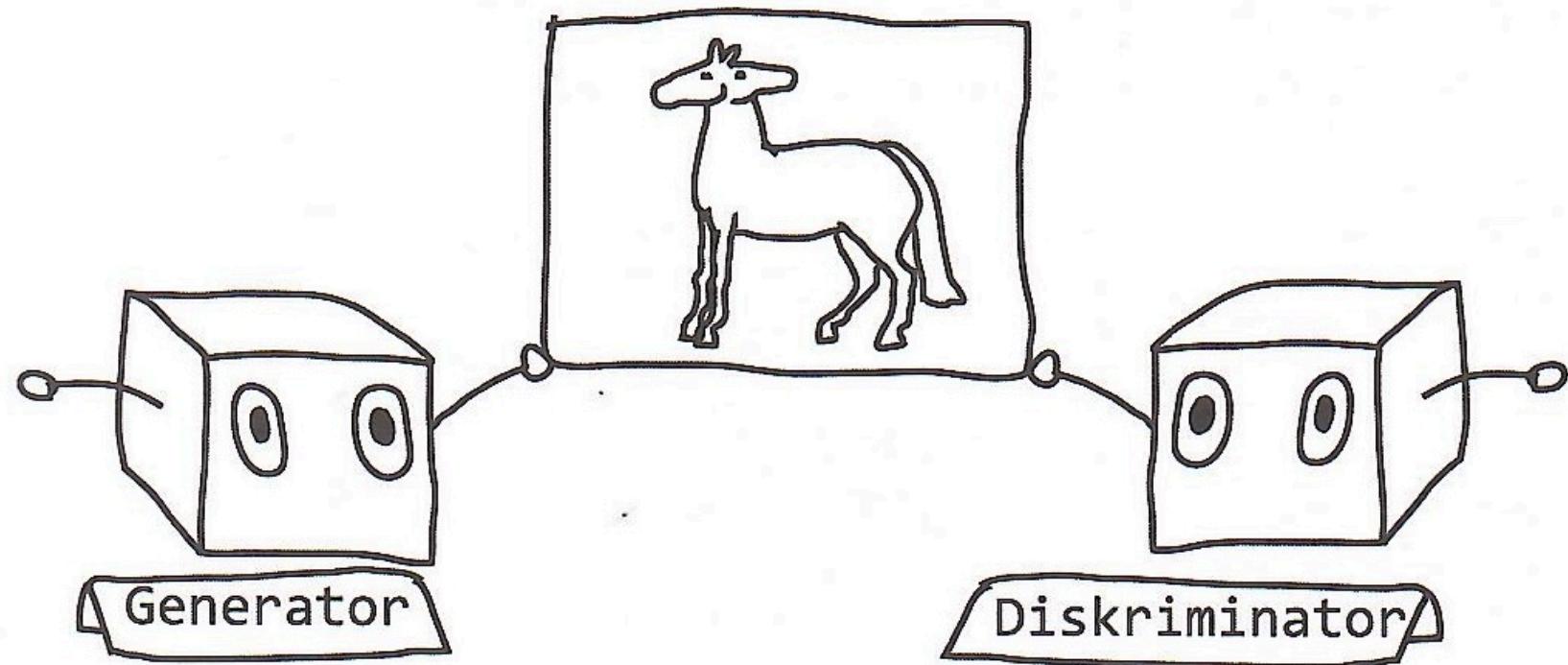
GAN IN ACTION: 2

Learn how to paint a Horse ... making progress



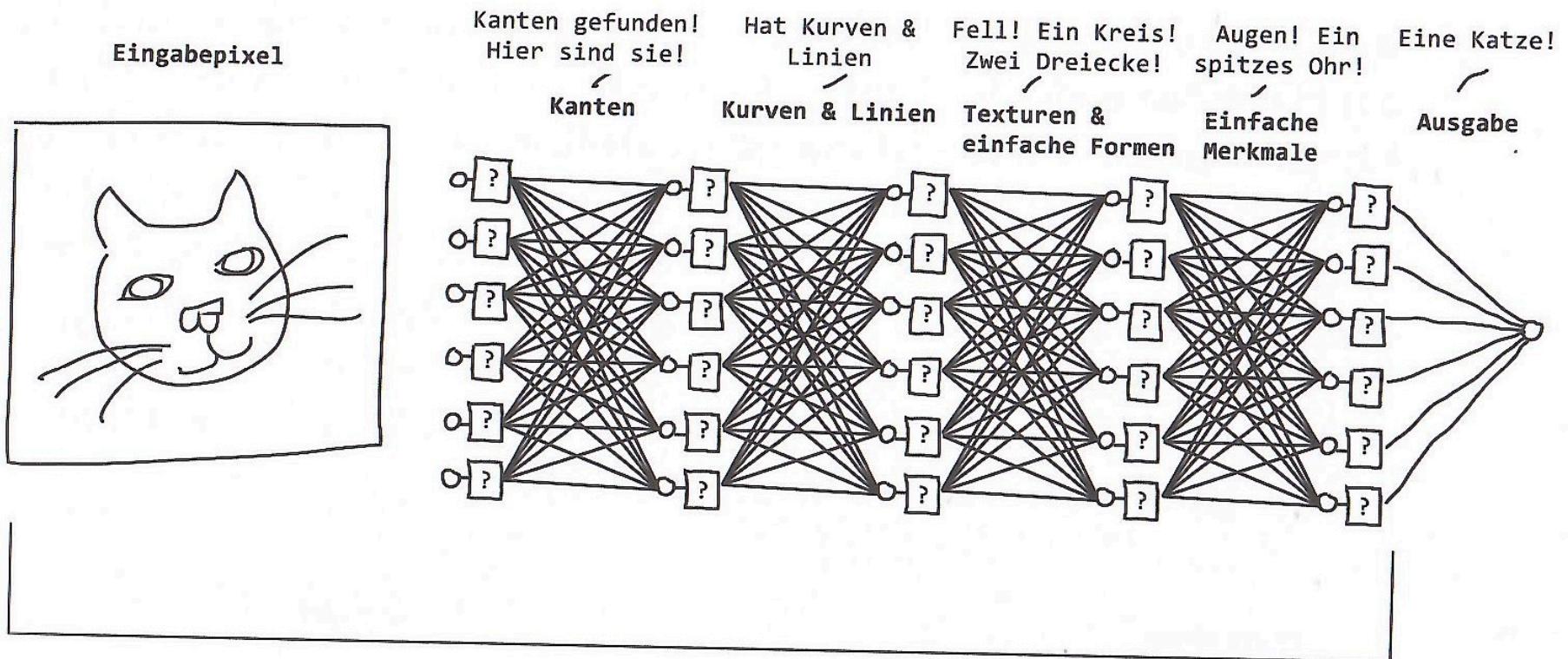
GAN IN ACTION: 3

Learn how to paint a Horse ... got it :)



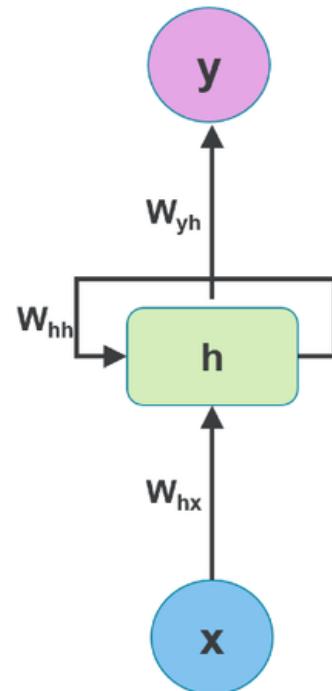
CNN

- CNN = Convolutional Neural Networks
- Designed for image processing



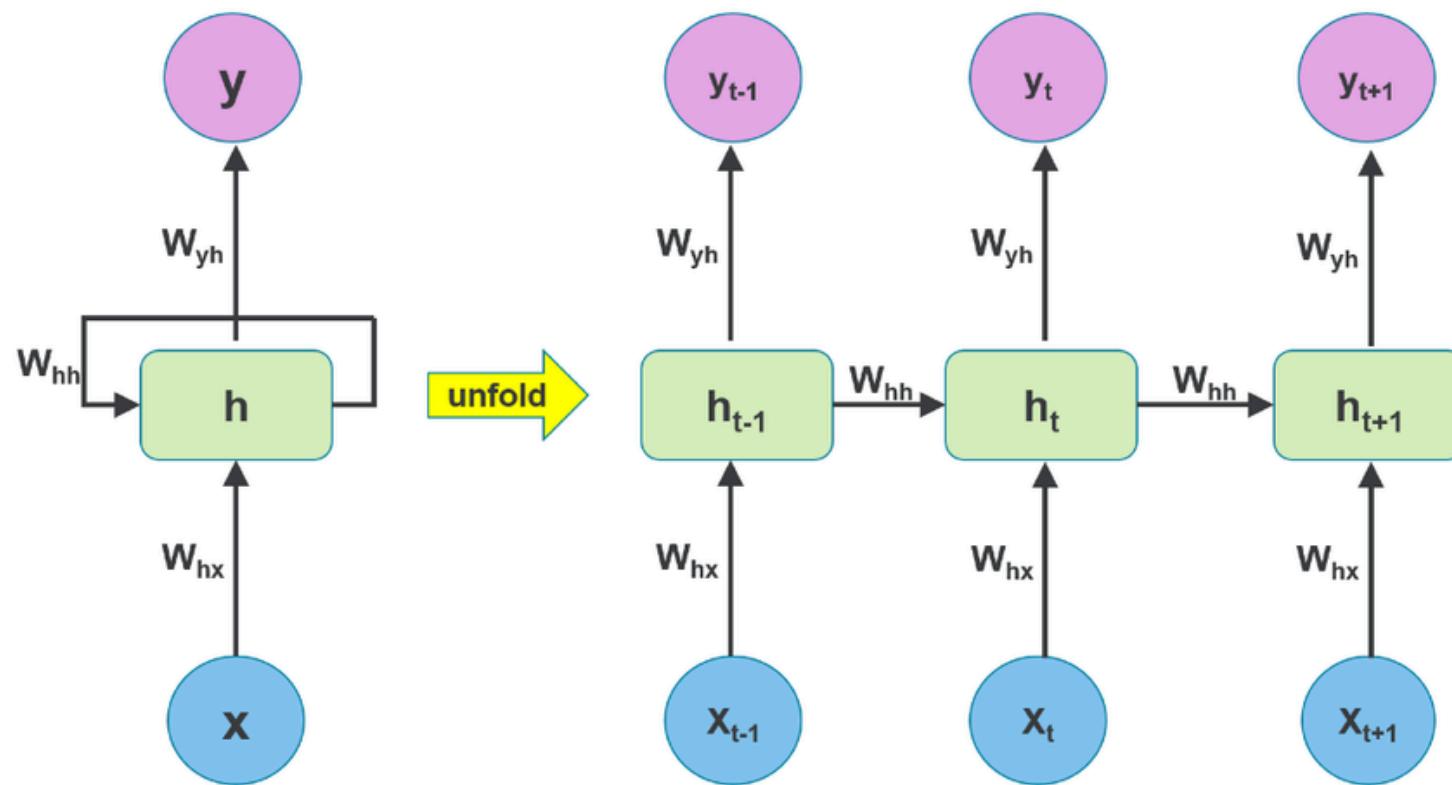
RNN

- RNN = Recurrent Neural Networks
- Processes sequences, remembers last step
- Use cases: Time-series, NLP



RNN: UNFOLD

- Unfold over 3 time steps: $t-1, t, t+1$



TRANSFORMERS

- Self-attention mechanism: knows the context
- Revolutionized NLP (GPT, BERT)

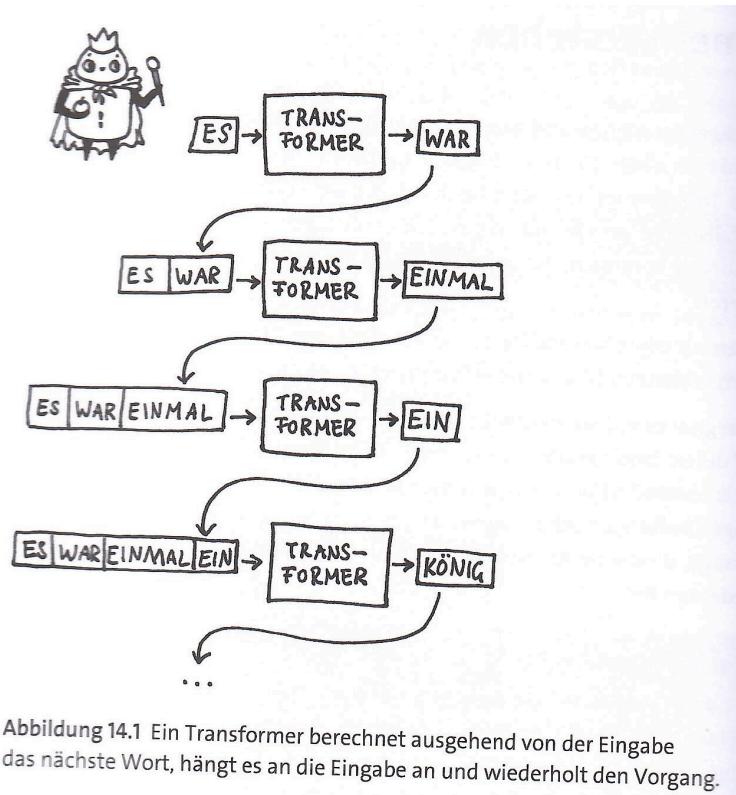
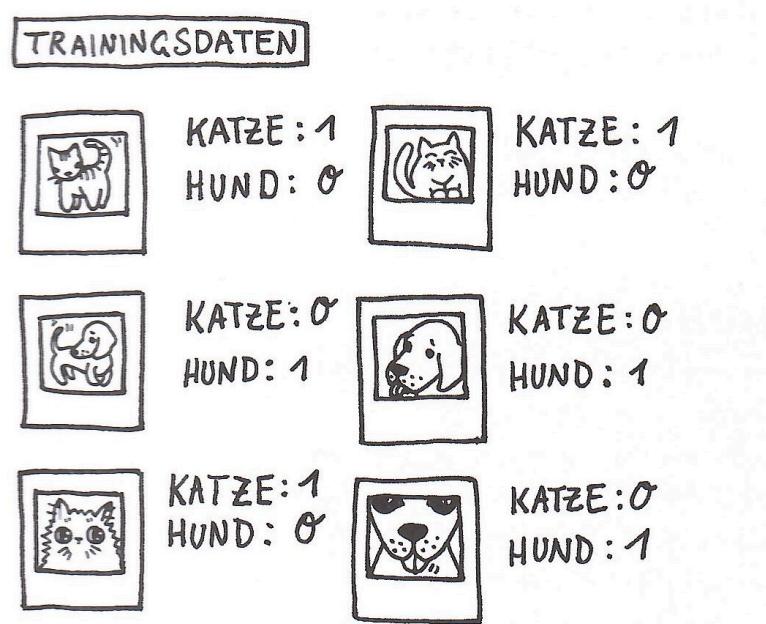


Abbildung 14.1 Ein Transformer berechnet ausgehend von der Eingabe das nächste Wort, hängt es an die Eingabe an und wiederholt den Vorgang.

NO DATA ... NO AI

- Data: Essential for training models
- Quality & quantity affect performance



REFERENCES

- Janelle Shane. You Look Like a Thing and I Love You
- Janelle Shane's blog: AIWeirdness.com
- Inga Strümke. [Künstliche Intelligenz](#), Rheinwerk
- Pit Noak, Sophia Sanner. [Künstliche Intelligenz verstehen](#), Rheinwerk