

Pre-Trained Models

Transfer Learning und Transformer

Author

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Datum

9.11.2022

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PRE-TRAINED MODELS

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 - Pre-Trained Models
 - Transformer-Architektur
- **Code-Beispiele "from scratch"**
 - Human Action Recognition
 - Sentiment Analyse
- **Plattformen für Pre-Trained Models**
- **Code-Beispiele mit Pre-Trained Models**
 - Human Action Recognition
 - Sentiment Analyse
 - AutoTrain
- **Ausblick**

<CHAPTER 1 />

Intro

**Machine Learning
generiert Wissen aus Daten.**

PROBLEM

**Jedes Machine Learning
Modell kann nur eine
Aufgabe lösen.**

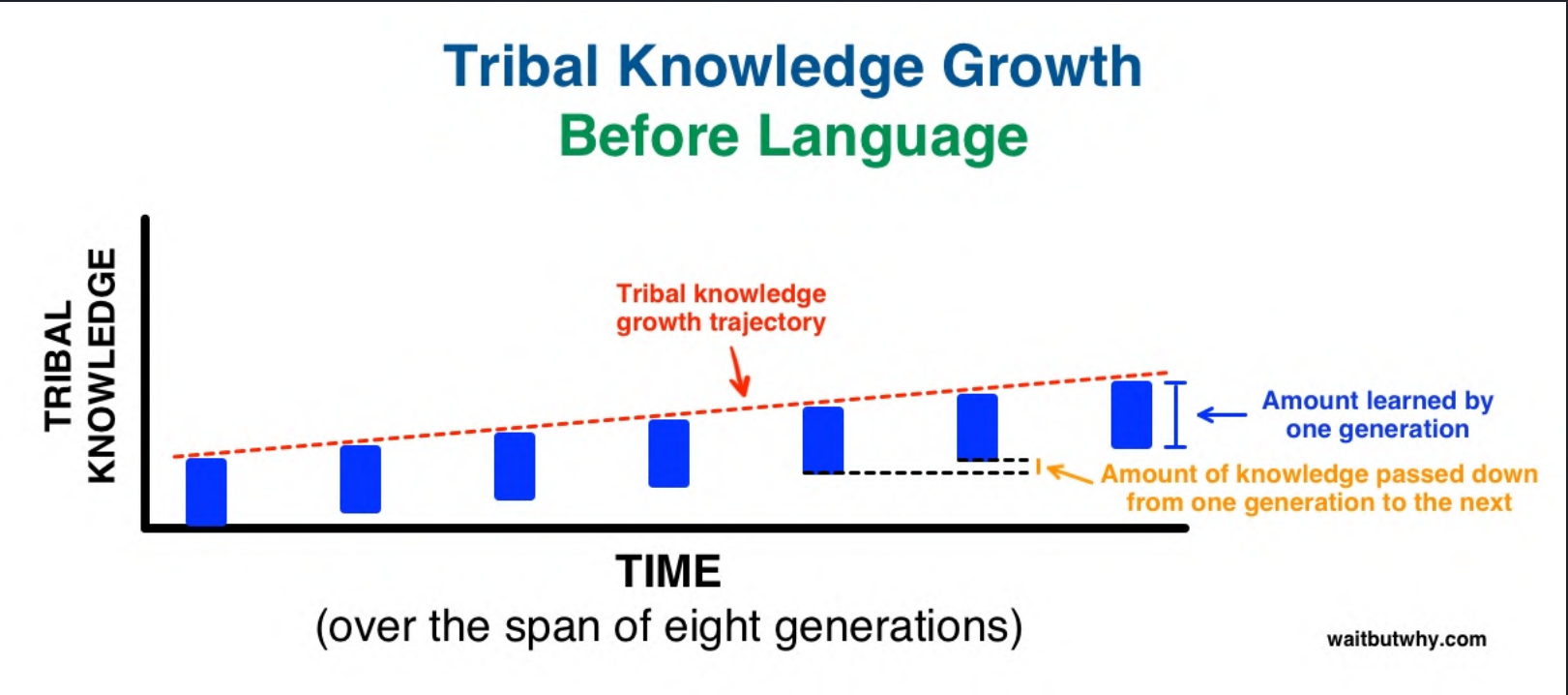
FRAGE

**Wie kann das
gelernte Wissen
auf andere Aufgaben
übertragen werden?**

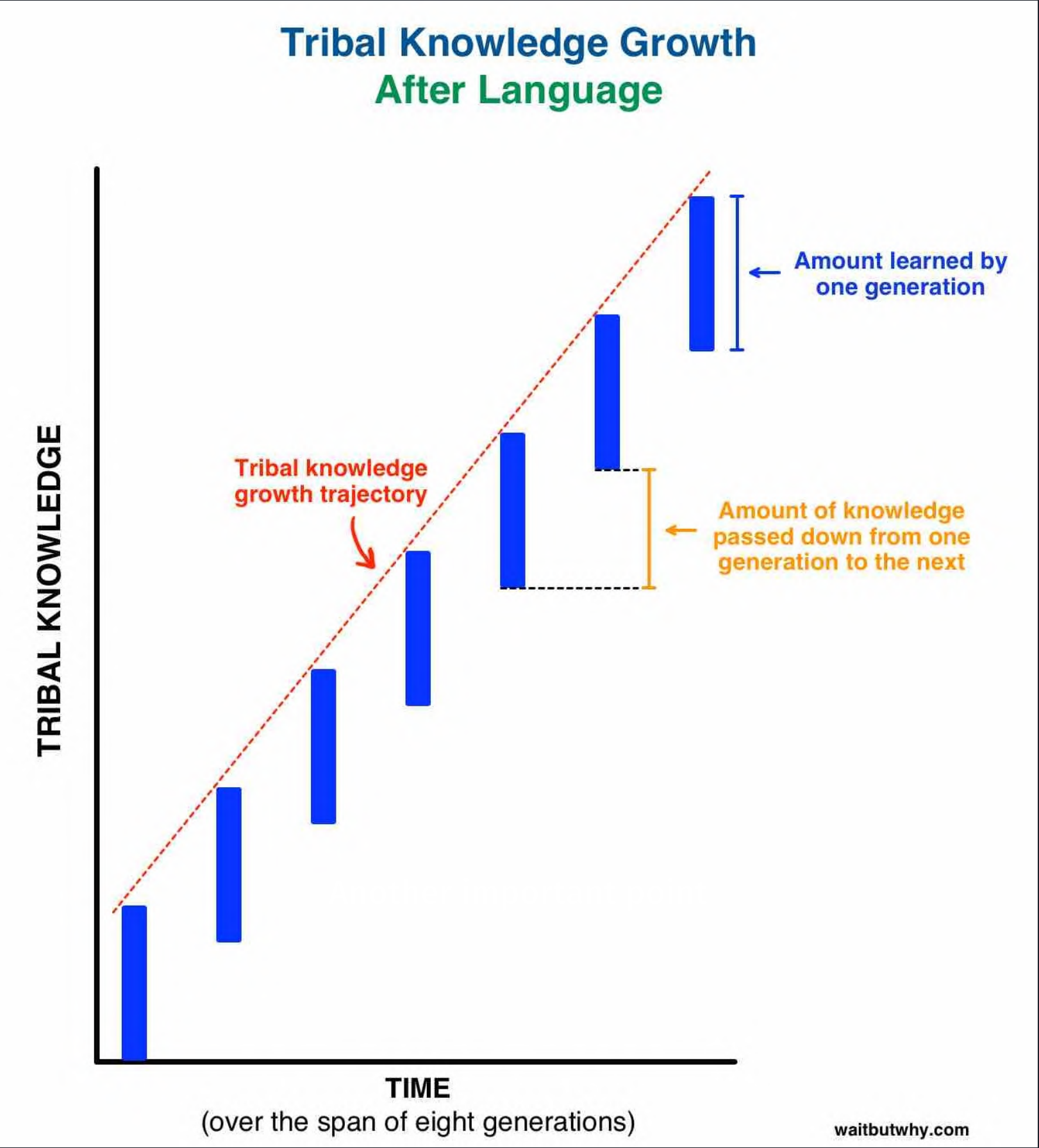
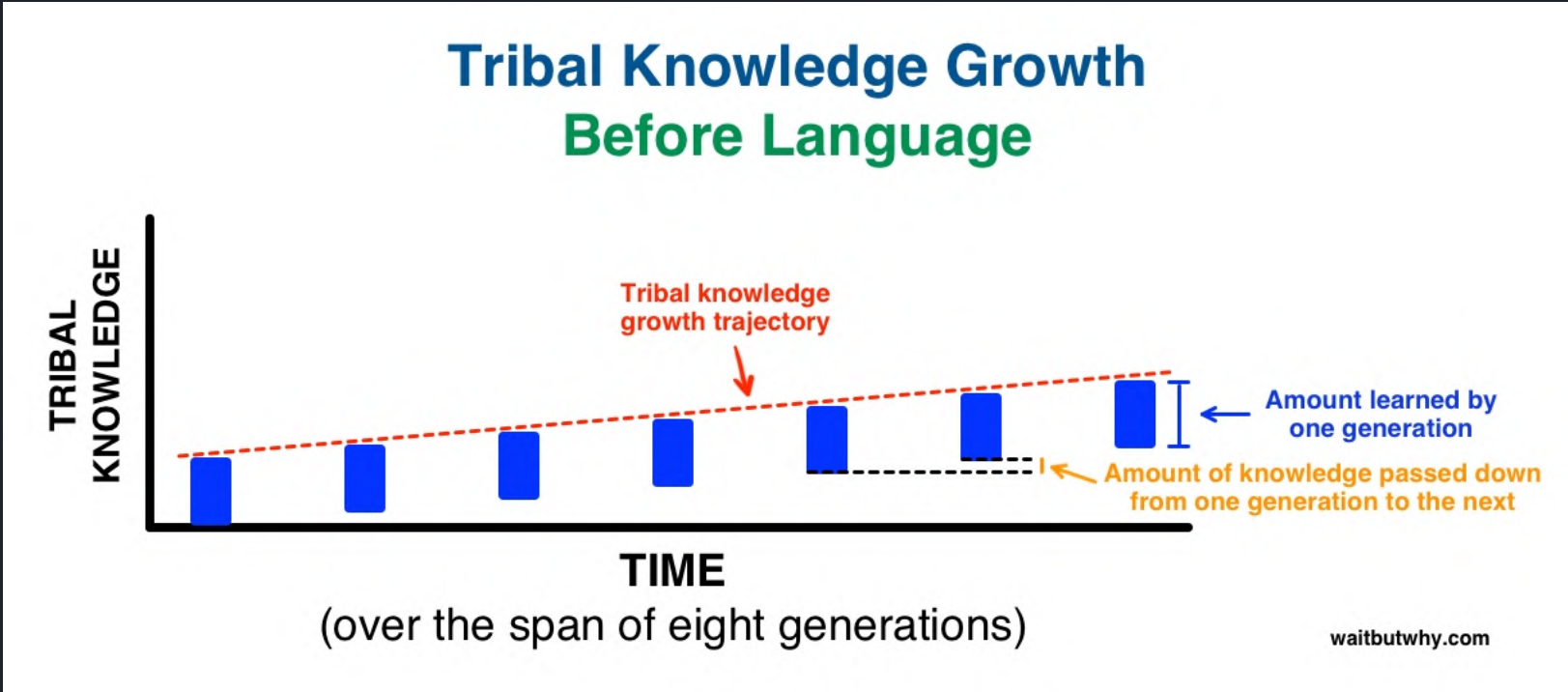
Transfer Learning

"UPCYCLING VON WISSEN"

ÜBERTRAG VON WISSEN



ÜBERTRAG VON WISSEN

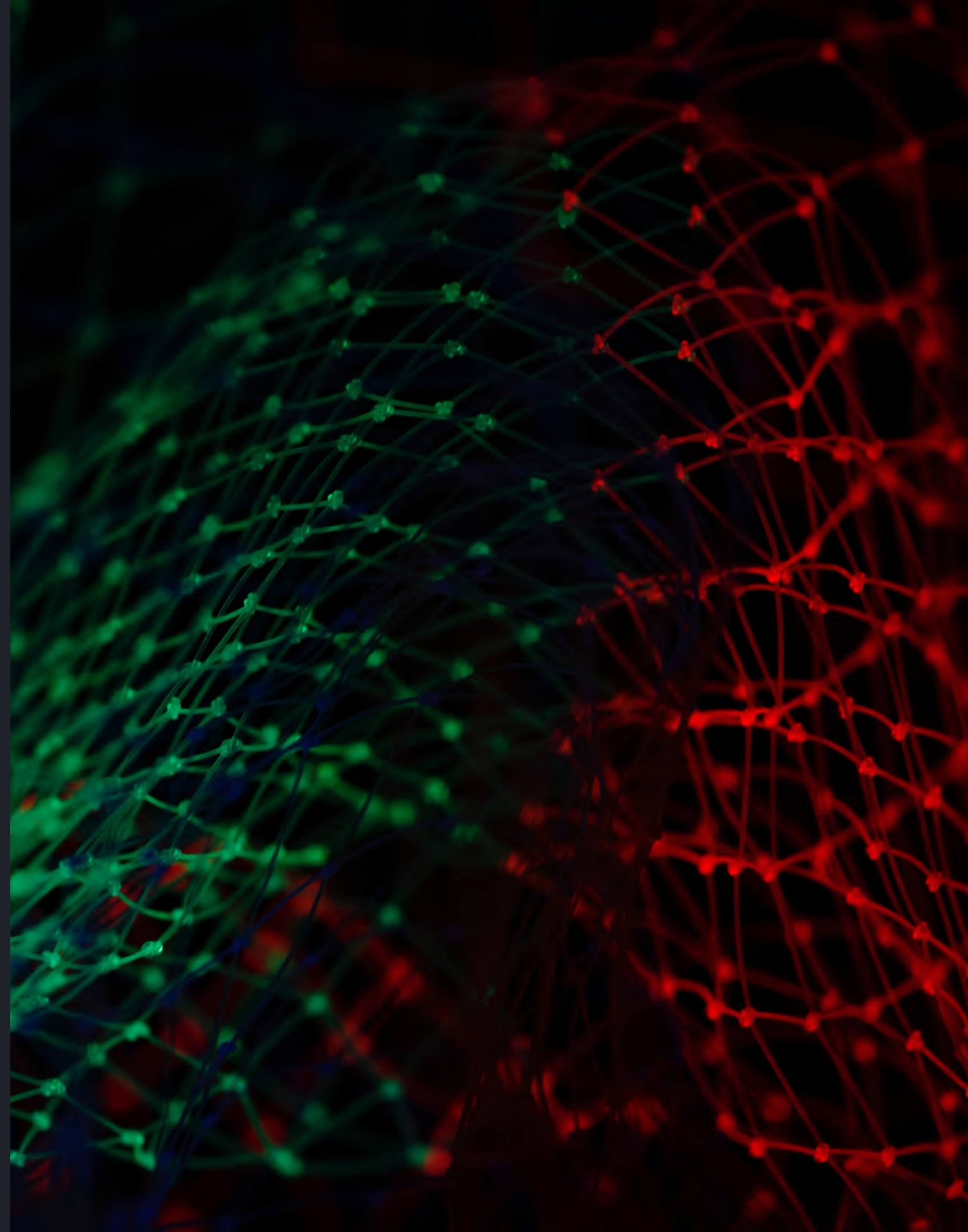


Transfer Learning

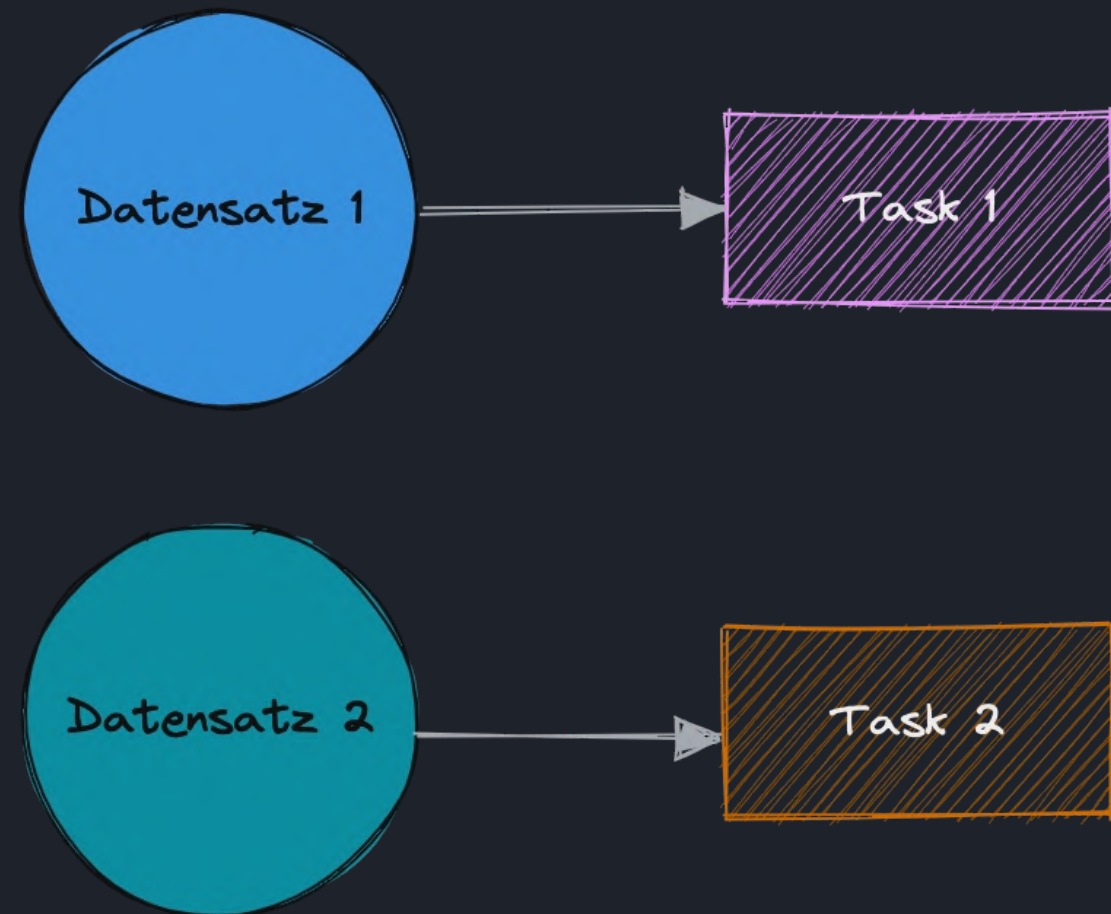
DEFINITION

"Die Anwendung von Fähigkeiten, Wissen und/oder Einstellungen, die in einer Situation gelernt wurden, auf eine andere Lernsituation"

Perkins, 1992

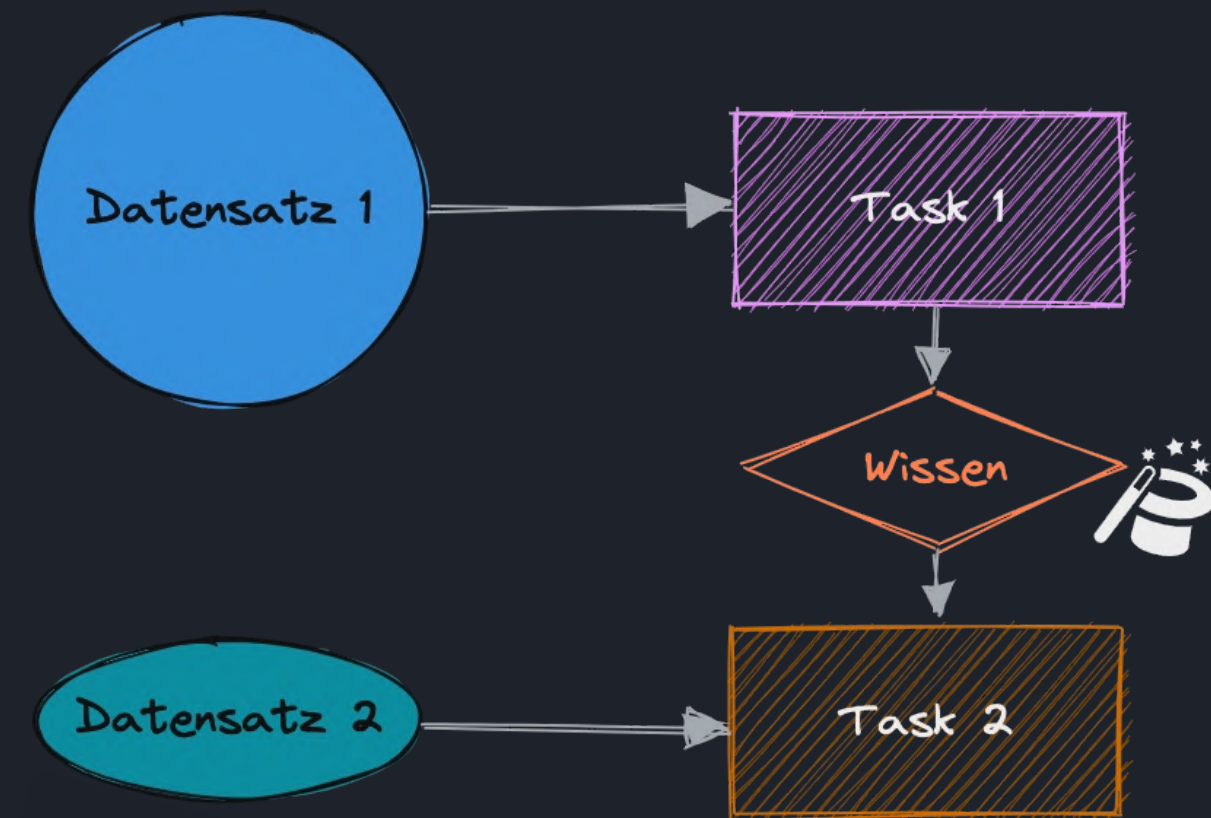


Traditionelles Machine Learning

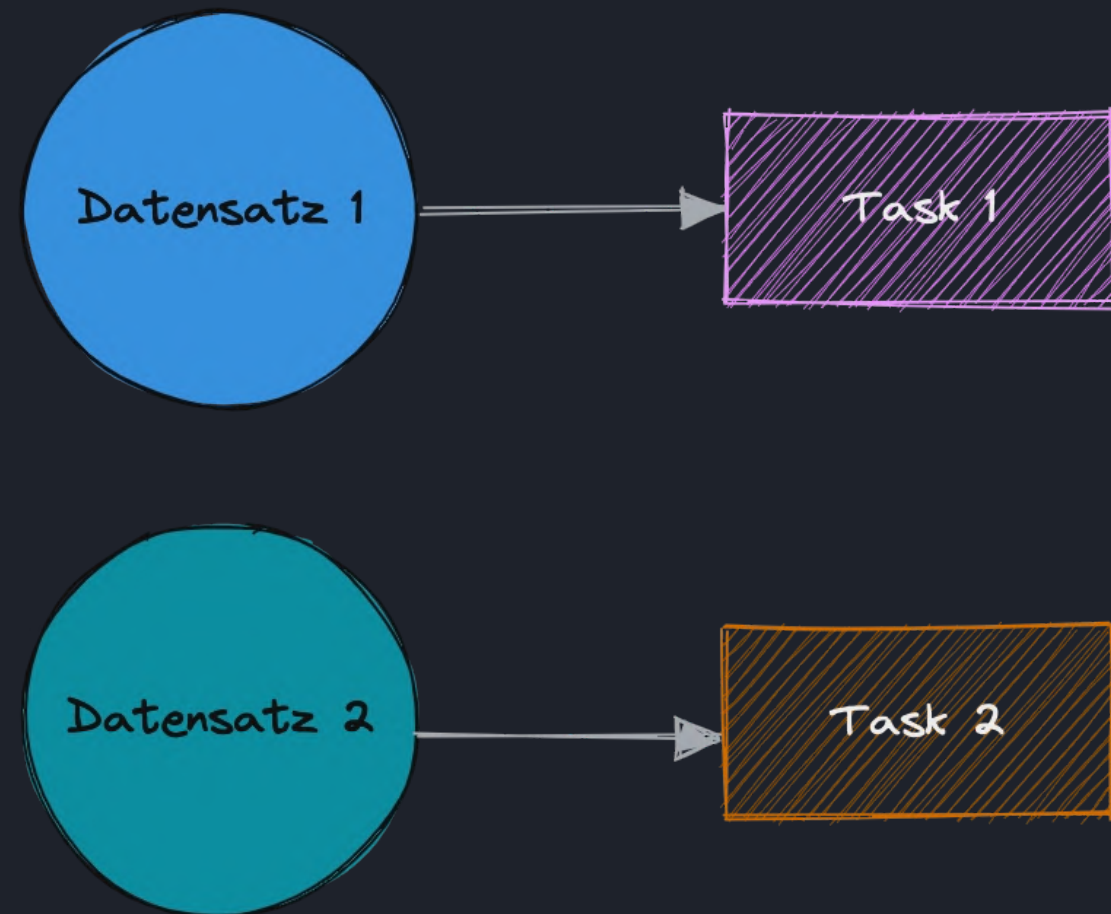


vs.

Transfer Learning

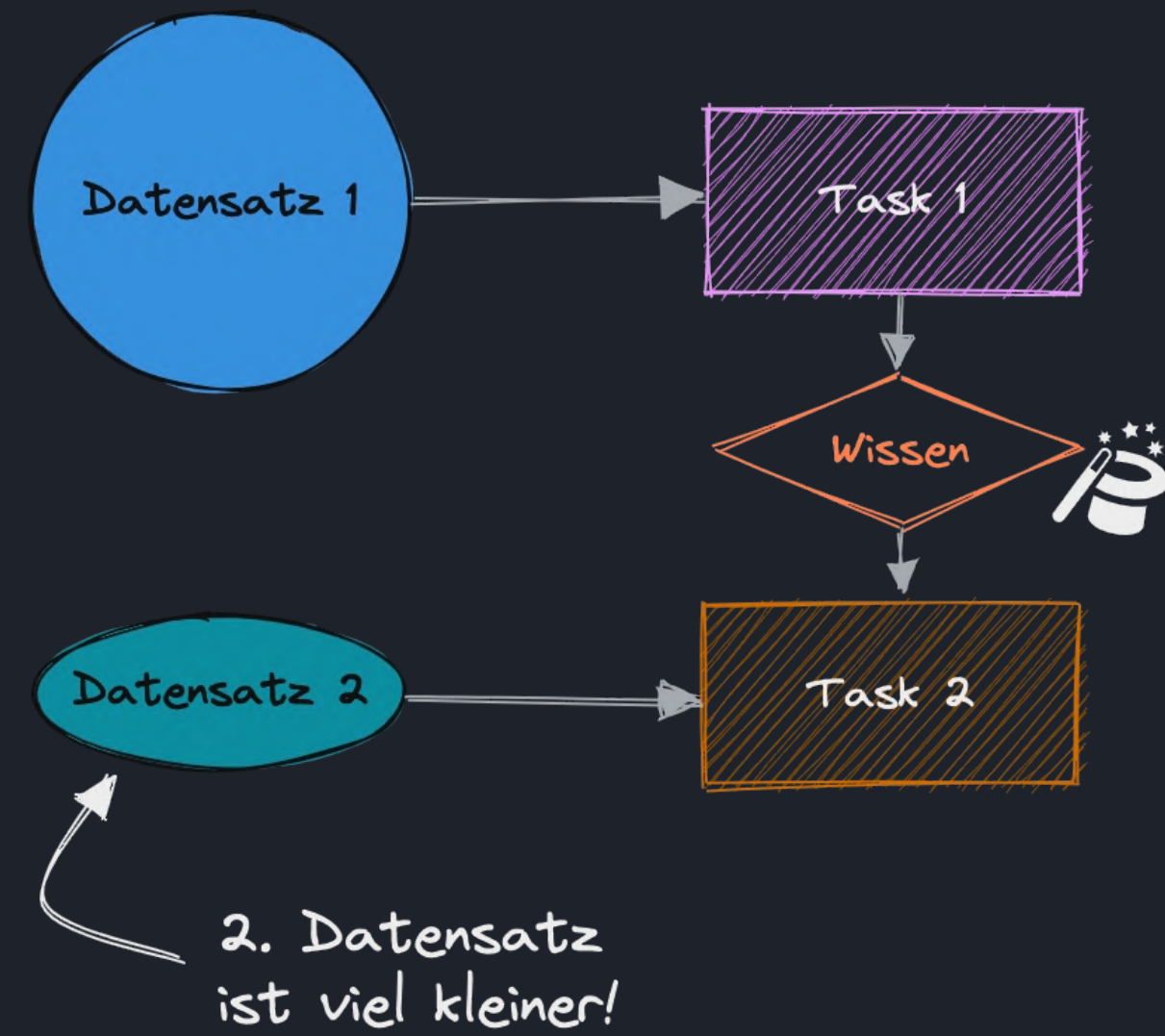


Traditionelles Machine Learning



vs.

Transfer Learning



Traditionelles ML vs. Transfer Learning

TRADITIONELLES MACHINE LEARNING

- Modelle werden von Grund auf trainiert
- Ignoriert bestehendes Wissen
- Ressourcen-intensives Training

TRANSFER LEARNING

- Erfordert weniger Daten, um neue Aufgaben zu lernen
- Nutzt adaptiertes Wissen von anderen Aufgaben
- Gute Modell-Performance mit wenig Training

TRANSFER LEARNING



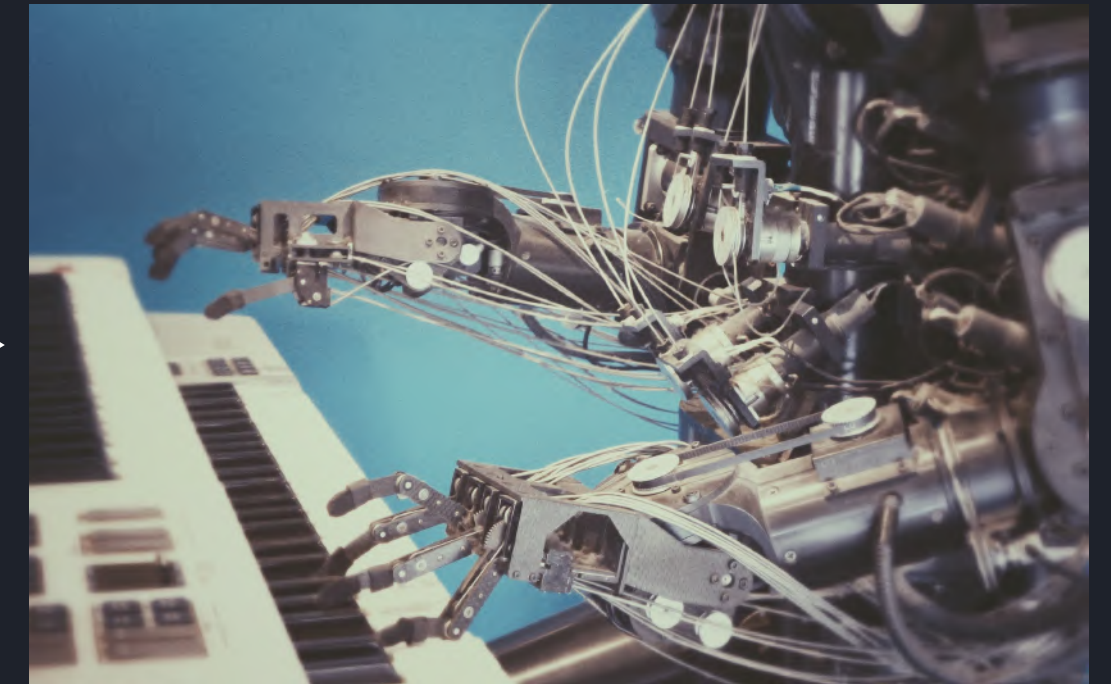
Pre-Training

- Große Datensätze (unlabeled)
- Self-supervised training
- Dauer: Stunden bis Tage



Fine-Tuning

- Kleinere Datensätze (labeled)
- Aufgaben-spezifisches Training
- Dauer: Minuten bis Stunden



Inference

Anwenden des Modells für Predictions

TRANSFER LEARNING



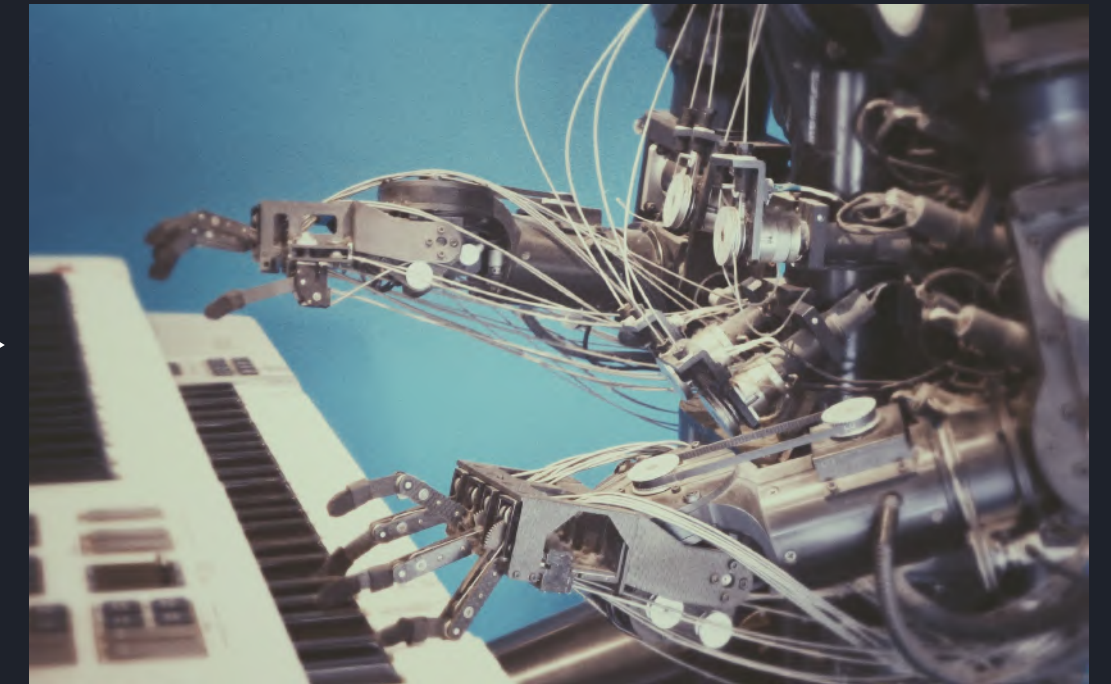
Pre-Training

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Fine-Tuning

- Kleinere Datensätze (labeled)
- Aufgaben-spezifisches Training
- Dauer: Minuten bis Stunden



Inference

Anwenden des Modells für Predictions

→ Pre-Trained Models

Pre-Trained Models

ANWENDUNG VON TRANSFER LEARNING

- Source Task → Downstream Task
- Feature Representation Transfer vs. Parameter Transfer
- Gelerntes Wissen steckt in Parametern
- Mehrere Milliarden Parameter (GPT-3)
- Frozen Layers

gpt2


📄 • Updated 19 days ago • ↓ 31.7M • ♥ 283

xlm-roberta-base


📄 • Updated Jun 6 • ↓ 18.1M • ♥ 104

roberta-base


📄 • Updated Sep 29 • ↓ 7.63M • ♥ 77

 **Jean-Baptiste/camembert-ner**

📄 • Updated 27 days ago • ↓ 7.06M • ♥ 38

 **facebook/bart-base**


📄 • Updated Jun 3 • ↓ 6.31M • ♥ 36

 **dmis-lab/biobert-base-cased-v1.2**

📄 • Updated Jun 24, 2021 • ↓ 4.83M • ♥ 6

bert-base-chinese


📄 • Updated Jul 22 • ↓ 3.71M • ♥ 152

 **vblagoje/bert-english-uncased-finetuned-pos**


📄 • Updated May 20, 2021 • ↓ 2.87M • ♥ 13

distilroberta-base


📄 • Updated Jul 22 • ↓ 2.45M • ♥ 35

 **finiteautomata/bertweet-base-sentiment-analysis**


📄 • Updated Jun 23 • ↓ 2.16M • ♥ 33

 **sentence-transformers/all-MiniLM-L6-v2**


📄 • Updated 1 day ago • ↓ 1.99M • ♥ 117

 **microsoft/tapex-base**


📄 • Updated May 17 • ↓ 1.84M • ♥ 7

 **Rostlab/prot_bert**

📄 • Updated Dec 11, 2020 • ↓ 1.52M • ♥ 25

 **Seethal/sentiment_analysis_generic_dataset**


📄 • Updated Apr 19 • ↓ 1.28M • ♥ 1

 **pysentimiento/robertuito-sentiment-analysis**


📄 • Updated Jun 23 • ↓ 1.27M • ♥ 11

bert-base-uncased

📄 • Updated Oct 3 • ↓ 24.9M • ♥ 323

 **openai/clip-vit-large-patch14**

📄 • Updated Oct 4 • ↓ 9.85M • ♥ 66

 **allenai/specter**

📄 • Updated Jun 25 • ↓ 7.21M • ♥ 20

bert-base-cased


📄 • Updated Sep 6, 2021 • ↓ 6.38M • ♥ 54

distilbert-base-uncased

📄 • Updated May 31 • ↓ 6.26M • ♥ 100

roberta-large

📄 • Updated Sep 29 • ↓ 4.56M • ♥ 64

 **cardiffnlp/twitter-roberta-base-sentiment**

📄 • Updated Apr 6 • ↓ 3.6M • ♥ 91

bert-base-multilingual-cased


📄 • Updated Aug 7 • ↓ 2.58M • ♥ 59

distilbert-base-uncased-finetuned-sst-2-english


📄 • Updated Aug 16 • ↓ 2.16M • ♥ 101

albert-base-v2

📄 • Updated Aug 30, 2021 • ↓ 2.06M • ♥ 26

 **prajjwal1/bert-tiny**


Updated Oct 27, 2021 • ↓ 1.96M • ♥ 12

 **allenai/led-base-16384**

📄 • Updated Jan 11, 2021 • ↓ 1.76M • ♥ 10

t5-small

📄 • Updated Jul 22 • ↓ 1.37M • ♥ 38

 **deepset/roberta-base-squad2**

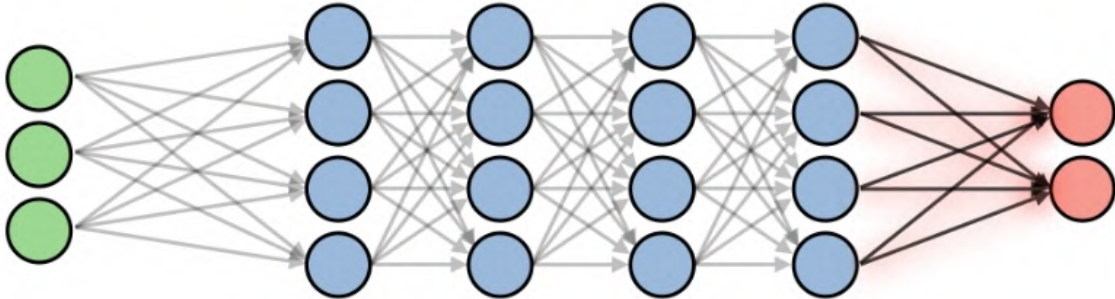
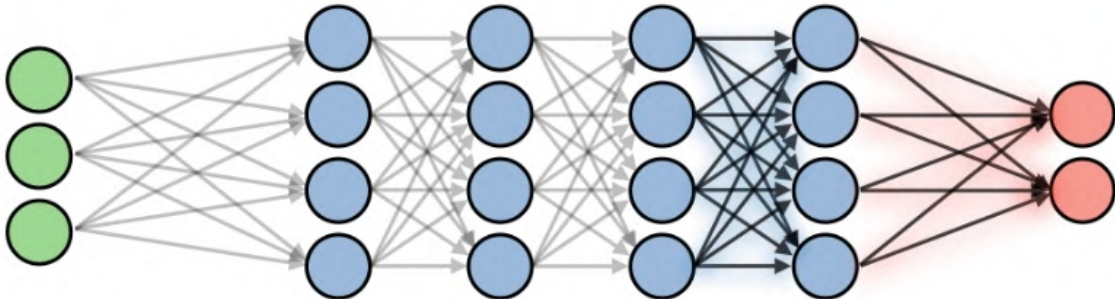
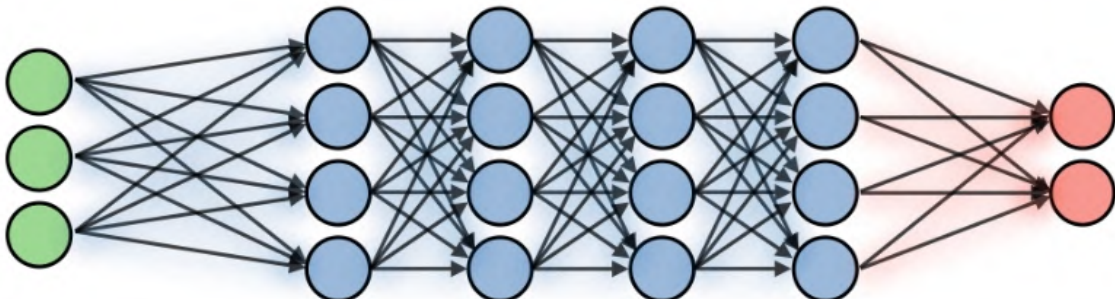
📄 • Updated Sep 21 • ↓ 1.28M • ♥ 149

t5-base

📄 • Updated Jul 22 • ↓ 1.15M • ♥ 68

Pre-Trained Models

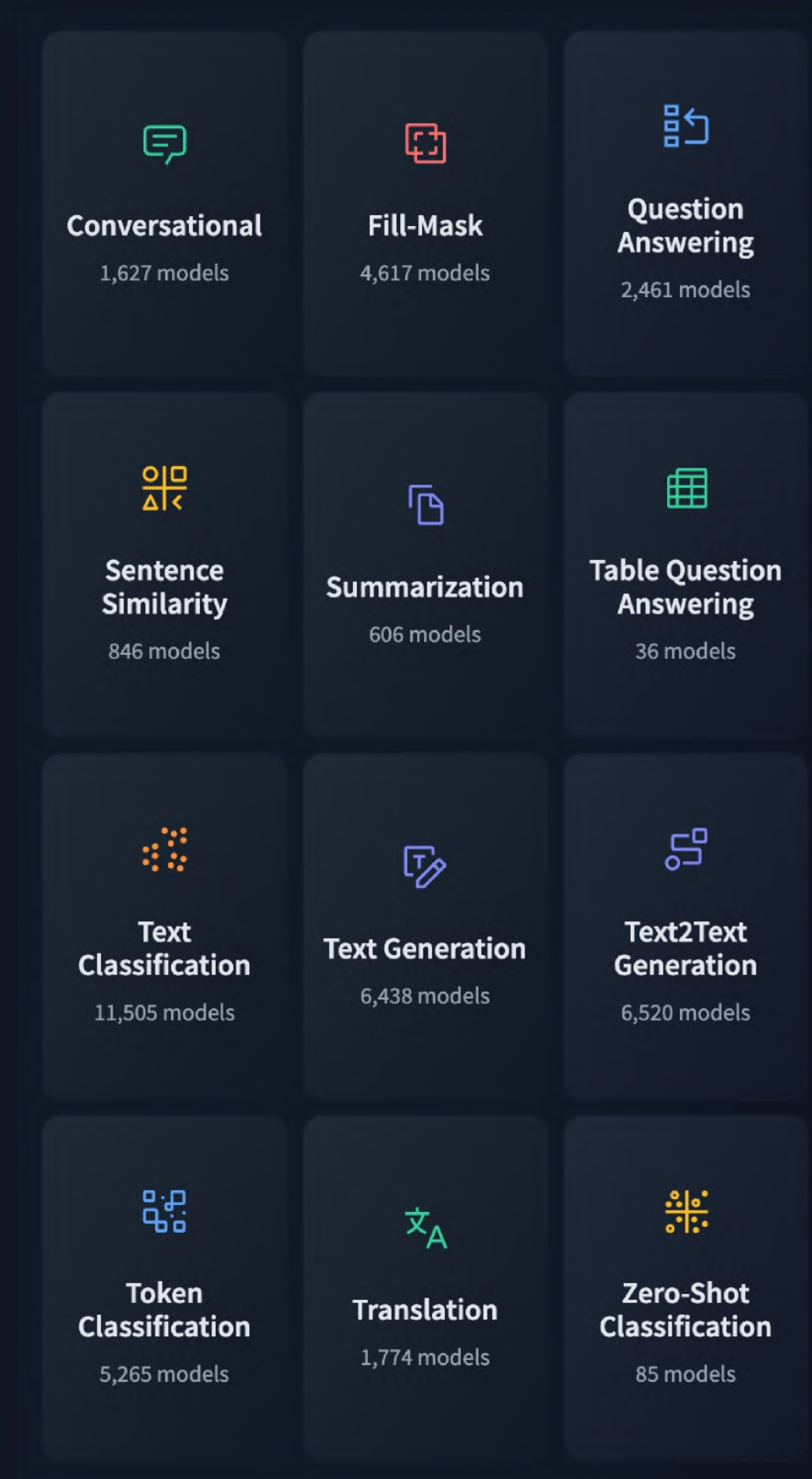
FROZEN LAYERS

Training size	Illustration	Explanation
Small		Freezes all layers, trains weights on softmax
Medium		Freezes most layers, trains weights on last layers and softmax
Large		Trains weights on layers and softmax by initializing weights on pre-trained ones



Transformer

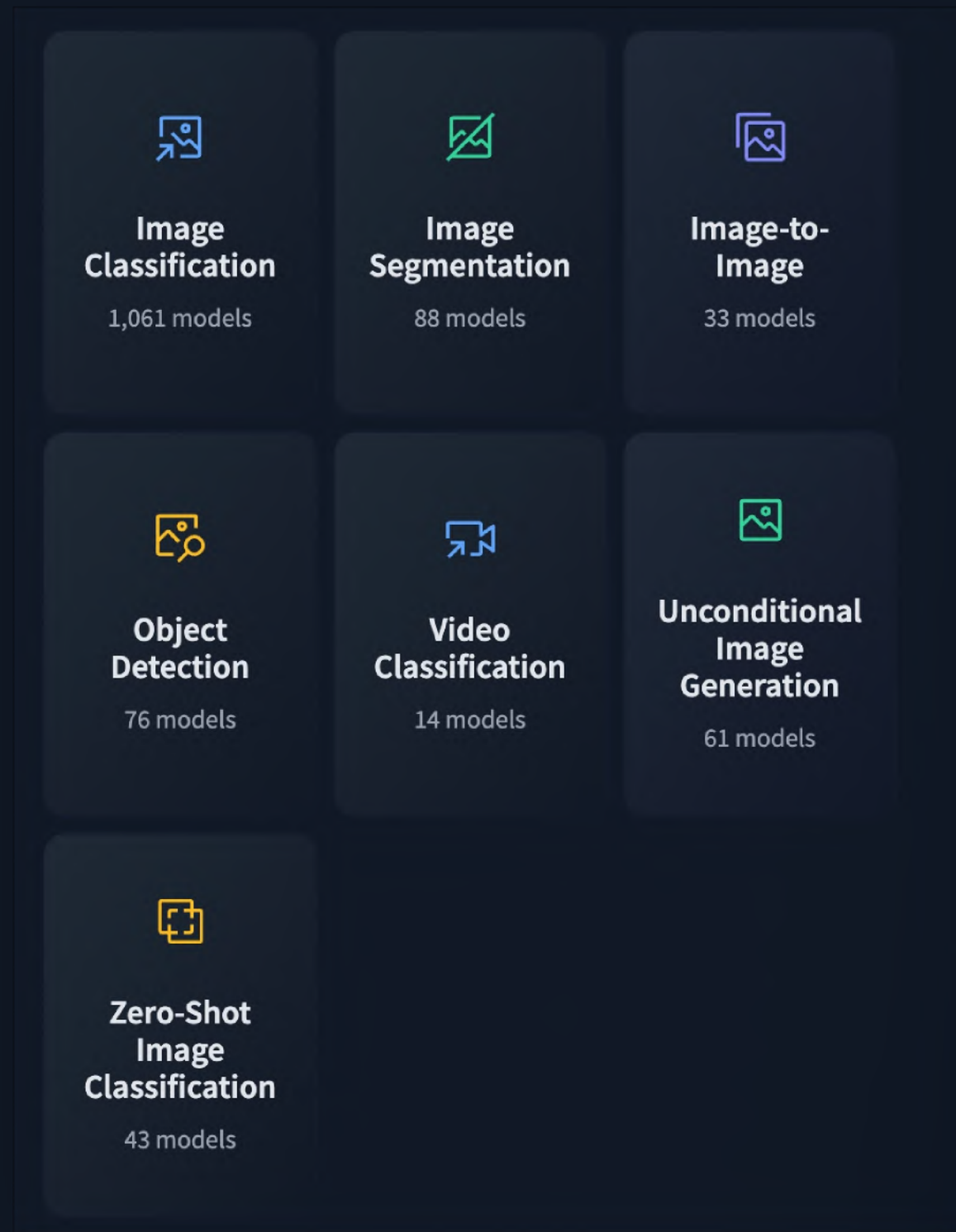
ARCHITEKTUR FÜR
DEEP NEURAL NETWORKS



Transformer

NATURAL LANGUAGE PROCESSING

- **Wav2Vec2** - Speech Recognition
- **BERT** - Text Understanding
- **GPT-3** - Text Generation
- **T5** - Translation



Transformer

COMPUTER VISION

- **ViT** - Image Classification
- **DETR** - Object Detection
- **SegFormer** - Semantic Segmentation

GRUNDLAGEN VON TRANSFORMERN

The weather is nice.

① ② ③ ④

Positional Encoding

Reihenfolge der Wörter in Daten



Attention

Transformieren von Satzstrukturen

Server, can I have the check?

Whoops, I crashed the server.

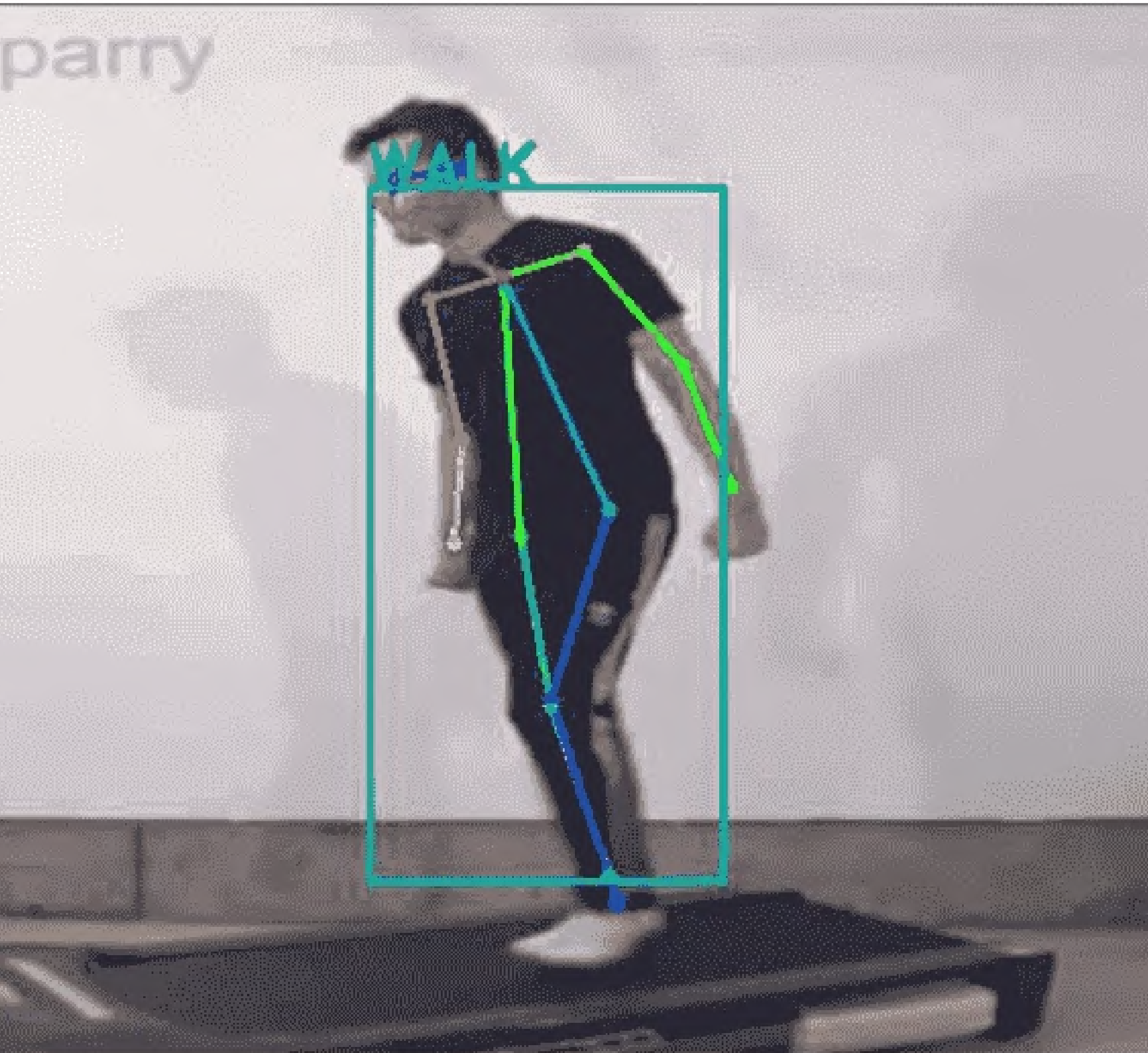
Self-Attention

Sprachverständnis wird gelernt

<CHAPTER 2 />

It's coding time!

(FROM SCRATCH)



Angry

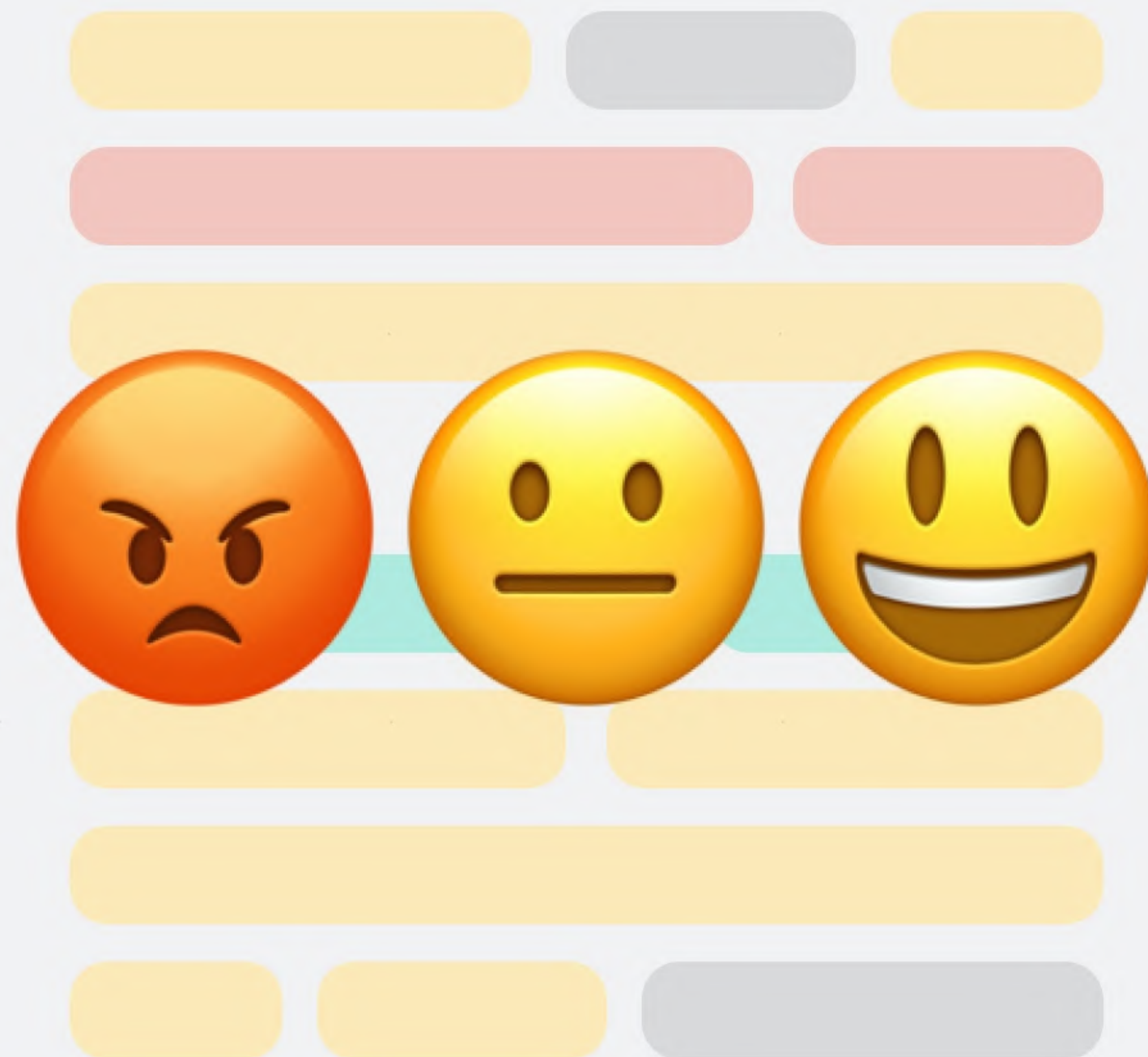
Human Action Recognition

- Menschliches Verhalten verstehen
- Verschiedene Datenmodalitäten

- Bilder
- Skelette
- Infrarot

- Datensatz:

https://huggingface.co/datasets/Bingsu/Human_Action_Recognition



IMDB Sentiment Analysis

- Aussagen als positiv oder negativ bewerten
- Kontext: Filmreviews
- Datensatz:

<https://huggingface.co/datasets/imdb>

<CHAPTER 3 />


Plattformen


FÜR PRE-TRAINED MODELS


TENSORFLOW HUB / PYTORCH HUB

TensorFlow Hub ist ein Repository für geschulte Modelle für maschinelles Lernen.

TensorFlow Hub ist ein Repository mit geschulten Modellen für maschinelles Lernen, die zur Feinabstimmung bereit und überall einsetzbar sind. Verwenden Sie trainierte Modelle wie BERT und Faster R-CNN mit nur wenigen Codezeilen wieder.

 [Siehe die Anleitung](#)
Erfahren Sie, wie Sie TensorFlow Hub verwenden und wie es funktioniert.

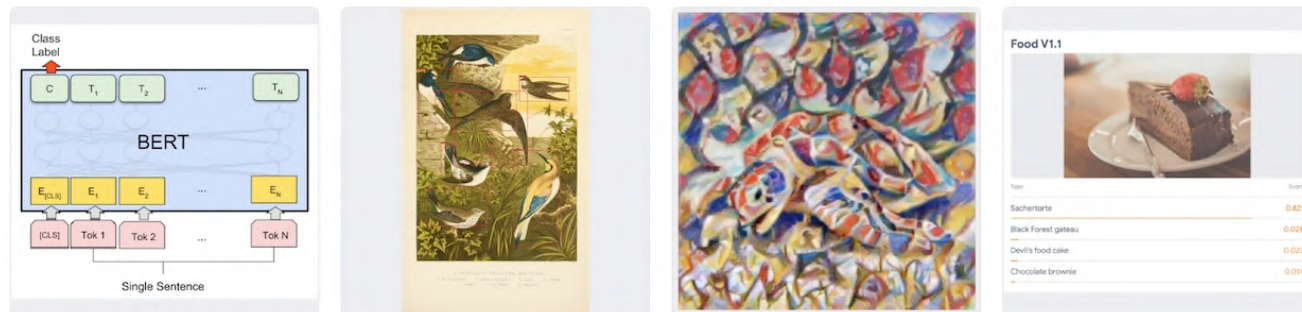
 [Siehe Tutorials](#)
Tutorials zeigen Ihnen End-to-End-Beispiele mit TensorFlow Hub.

 [Siehe Modelle](#)
Finden Sie geschulte TF-, TFLite- und TF.js-Modelle für Ihren Anwendungsfall.

```
!pip install --upgrade tensorflow_hub  
  
import tensorflow_hub as hub  
  
model = hub.KerasLayer("https://tfhub.dev/google/nnlm-en-dim128/2")  
embeddings = model(["The rain in Spain.", "falls",  
                    "mainly", "In the plain!"])  
  
print(embeddings.shape)  #(4,128)
```

Modelle

Auf [TFHub.dev](https://tfhub.dev) finden Sie geschulte Modelle aus der TensorFlow-Community



TensorFlow Hub

<https://www.tensorflow.org/hub>

PYTORCH HUB

Discover and publish models to a pre-trained model repository designed for research exploration. Check out the models for [Researchers](#), or learn [How It Works](#).

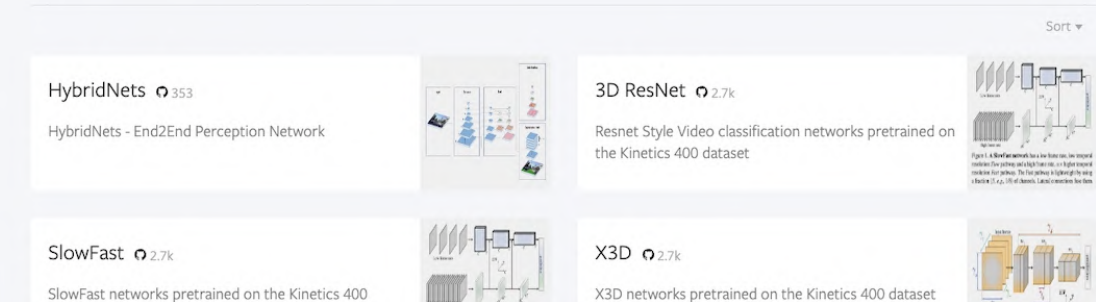
[Contribute Models](#)

**This is a beta release - we will be collecting feedback and improving the PyTorch Hub over the coming months.*

FOR RESEARCHERS —
EXPLORE AND EXTEND MODELS
FROM THE LATEST
CUTTING EDGE RESEARCH

[All](#) [Audio](#) [Generative](#) [Nlp](#) [Scriptable](#) [Vision](#)


Q



PyTorch Hub

<https://pytorch.org/hub/>

TENSORFLOW.JS

 **TensorFlow**

Installieren

Lernen ▾

API ▾

Ressourcen ▾

Gemeinschaft ▾

Warum TensorFlow ▾

Suche

Deutsch ▾

GitHub

Anmelden

For JavaScript

Übersicht

Tutorials

Leiten

Modelle

Demos

API


translated by Google

Diese Seite wurde von der [Cloud Translation API](#) übersetzt.

Switch to English


Modelle


Entdecken Sie vortrainierte TensorFlow.js-Modelle, die sofort in jedem Projekt verwendet werden können.



Bildklassifizierung


Klassifizieren Sie Bilder mit Labels aus der ImageNet-Datenbank (MobileNet).


[Code anzeigen](#) 



Objekterkennung


Lokalisieren und identifizieren Sie mehrere Objekte in einem einzigen Bild (Coco SSD).


[Code anzeigen](#) 




Körpersegmentierung

Segmentieren Sie Person(en) und Körperteile in Echtzeit (BodyPix).


[Code anzeigen](#) 



Posenerkennung



Erkennung von Texttoxizität




Universeller Satzcodierer

<https://www.tensorflow.org/js>


HUGGING FACE 🤗

☆ Spaces of the week 🔥




Text to Naruto

lambdalabs 5 days ago 24




DGS Diffusion Space

DGSpitzer 2 days ago 20




Maxim Spaces

sayakpaul 11 days ago 3




Prompt Extend

daspartho 6 days ago 36




SuperGlue Image Matching

Pinwheel 2 days ago 7




Stable Diffusion Mat Outpaintin...

Rothfeld 4 days ago 21



StableDiffusionBiasExplorer


sasha 3 days ago 11



Finetuned Diffusion


anzorq 3 days ago 191

All running apps, most recent first




Way 2 Mel

nakas 3 minutes ago




Unity Test

simulate-tests 6 minutes ago



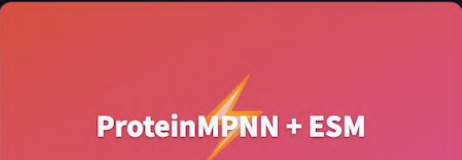
Minima

bmwrks 16 minutes ago




Mariposas

Frrozcol 20 minutes ago




ProteinMPNN + ESM

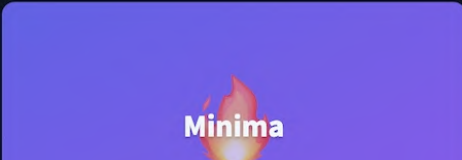


Stable Diffusion Multiplayer

202



Wikiapp



Minima

Models 85,106

Filter by name

gpt2

Updated 18 days ago • ↓ 32M • ♥ 280

bert-base-uncased

Updated Oct 3 • ↓ 25.7M • ♥ 323

xlm-roberta-base

Updated Jun 6 • ↓ 19.4M • ♥ 103

openai/clip-vit-large-patch14

Updated Oct 4 • ↓ 10.3M • ♥ 65

roberta-base

Updated Sep 29 • ↓ 7.33M • ♥ 77

allennai/specter

Updated Jun 25 • ↓ 7.21M • ♥ 19

Jean-Baptiste/camembert-ner

Updated 26 days ago • ↓ 7.17M • ♥ 38

bert-base-cased

Updated Sep 6, 2021 • ↓ 6.53M • ♥ 54

<https://huggingface.co/>

AWS SAGEMAKER

Pre-trained machine learning models available in AWS Marketplace

Build AI and ML powered solutions faster.

What are pre-trained machine learning models?

Pre-trained Machine Learning (ML) models are ready-to-use models that can be quickly deployed on [Amazon SageMaker](#), a fully managed cloud machine learning platform. By pre-training the ML models for you, solutions in AWS Marketplace take care of the heavy lifting, helping you deliver AI and ML powered features faster and at a lower cost.

Explore featured products below ▾

View all Amazon SageMaker models >



Benefits of using pre-trained models in AWS Marketplace

Faster AI/ML solution development

- ▶ AWS Marketplace offers hundreds of pre-trained models for tasks like object detection, buyer propensity, natural language processing, data extraction, and feature engineering.

Enhanced security & data privacy

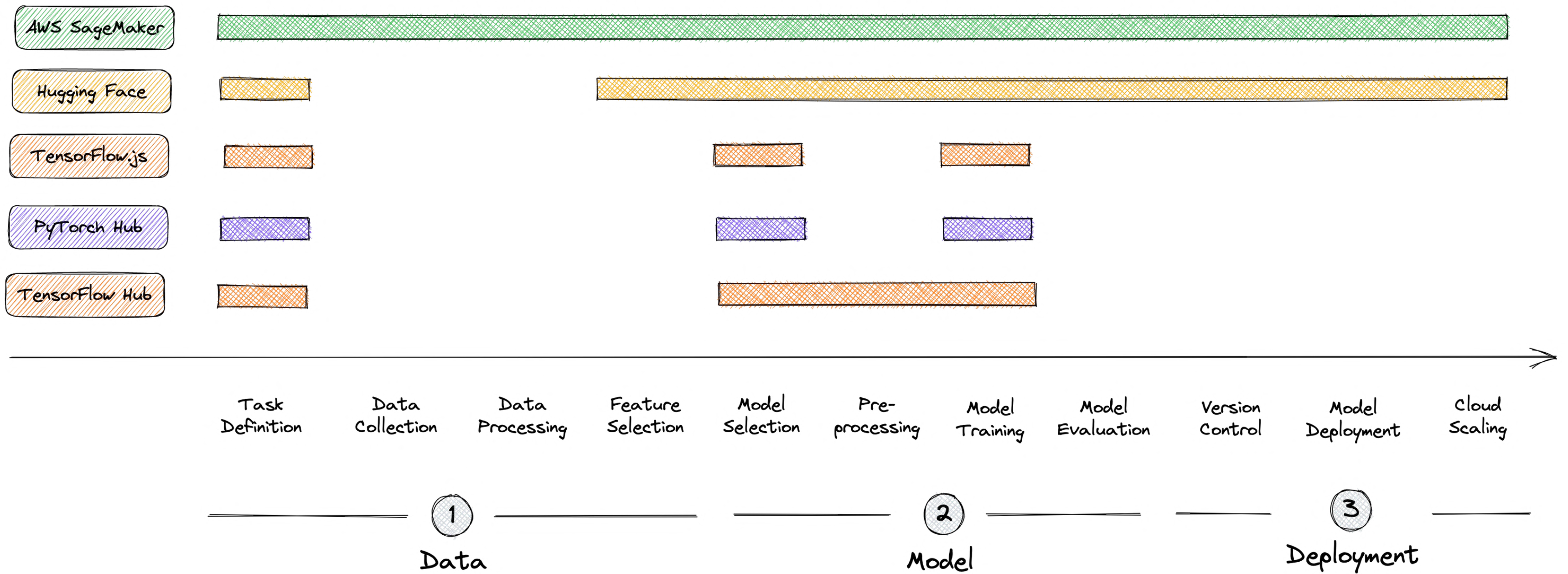
- ▶ [Scanned for security vulnerabilities](#), pre-trained models in AWS Marketplace help you gain control over your data and enhance security.
- ▶ Models are always deployed in [network](#)

Flexible evaluation & pricing options

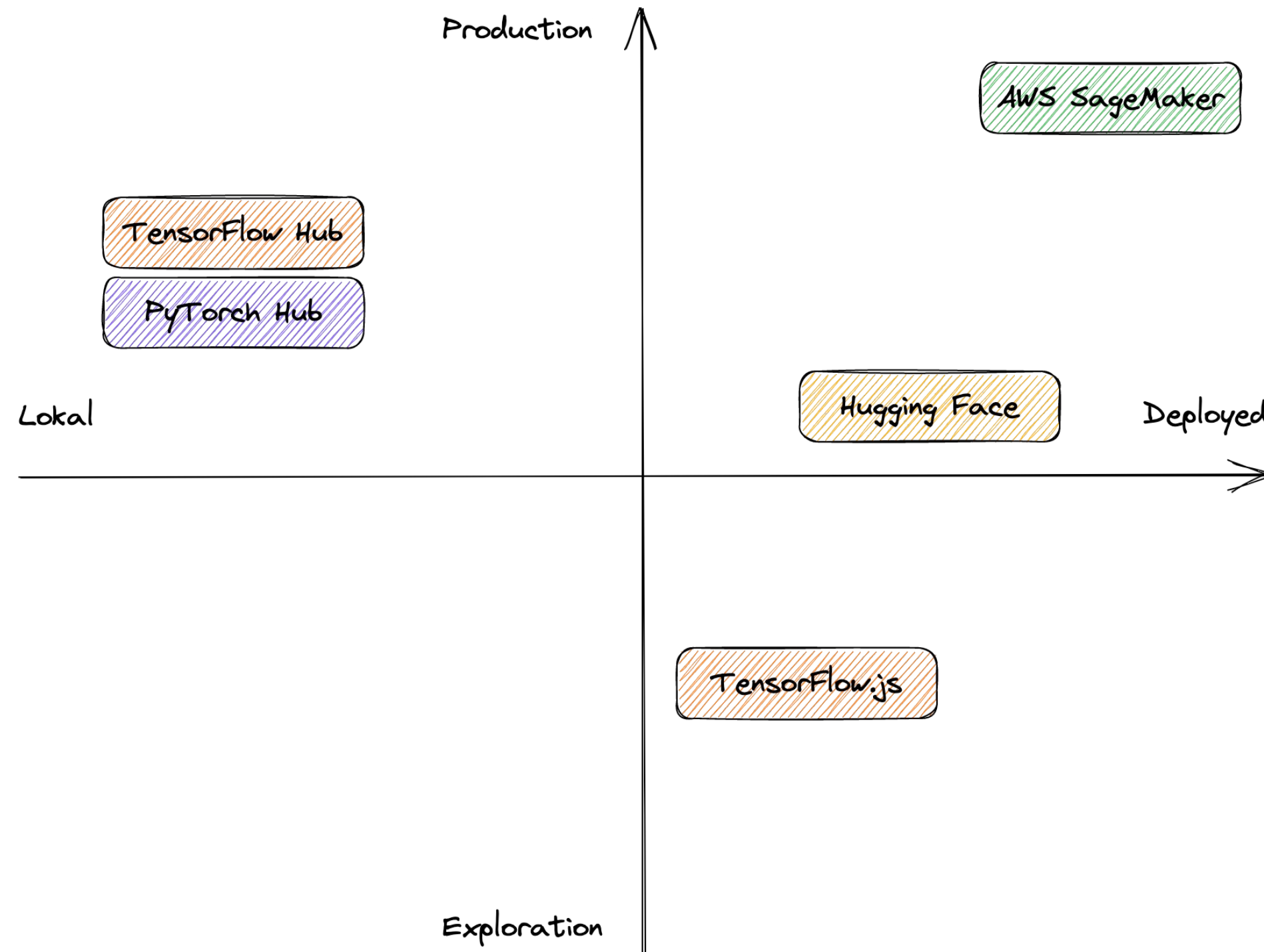
- ▶ Evaluate solutions at your own pace with try-before-you-buy options and [interactive demo features](#).
- ▶ Pricing options like pay-as-you-go and annual

<https://aws.amazon.com/marketplace/solutions/machine-learning/pre-trained-models>


PTM PLATTFORMEN - FEATURES





PTM PLATTFORMEN - MATRIX



PAPERS WITH CODE



[Browse State-of-the-Art](#) [Datasets](#) [Methods](#) [More](#)

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Browse State-of-the-Art

9,718 benchmarks 3,803 tasks 83,080 papers with code

Computer Vision



Semantic Segmentation

173 benchmarks
3319 papers with code



Image Classification

386 benchmarks
2722 papers with code



Object Detection

259 benchmarks
2482 papers with code



Image Generation

198 benchmarks
1055 papers with code



Contrastive Learning

2 benchmarks
1047 papers with code

[See all 1383 tasks](#)

Natural Language Processing



Language Modelling

409 benchmarks
2194 papers with code



Question Answering

161 benchmarks
1774 papers with code



Machine Translation

78 benchmarks
1698 papers with code



Sentiment Analysis

85 benchmarks
1029 papers with code



Text Generation

237 benchmarks
908 papers with code

[See all 654 tasks](#)

Medical

<https://paperswithcode.com/>

<CHAPTER 4 />

It's PTM time!

HUMAN ACTION RECOGNITION & SENTIMENT ANALYSIS

AUSBLICK



Effizienz

Mixed Precision Training



Neue Architekturen

Neural Architecture Search



Auto Training

Hilfe beim Modelltraining



Metamodelle

Breiteres Verständnis

Bildquellen

<https://waitbutwhy.com/2017/04/neuralink.html>

<https://unsplash.com/photos/n6B49lTx7NM>

<https://www.v7labs.com/blog/transfer-learning-guide>

<https://unsplash.com/photos/M5tzZtFCOfs>

<https://unsplash.com/photos/qwtCeJ5cLYs>

<https://unsplash.com/photos/U3sOwViXhkY>

<https://stanford.edu/~shervine/teaching/cs-230/cheatsheet-deep-learning-tips-and-tricks>

<https://unsplash.com/photos/uPuh-VwJRM0>

<https://www.youtube.com/watch?v=SZorAJ4I-sA>

<https://www.kaggle.com/code/meetnagadia/har-vgg>

<https://absurd.design/chapter/3/illustration/187>