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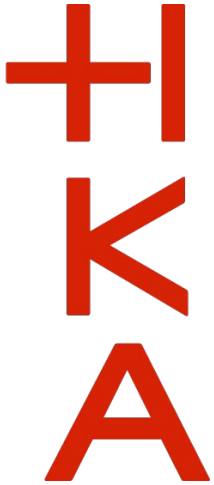

KI Labor - Sommersemester 2022

Computer Vision 2

Robin Baumann, Sven Müller, Maximilian Blanck,
Matthias Richter, Tim Bossenmaier, Pascal Fecht

Karlsruhe, 01. Apr. 2022

Schedule

Datum	Thema	Inhalt	Präsenz
18.03.22	**Allg.**	**Organisation, Teamfindung, Vorstellung CV**	**Ja**
25.03.22	CV	Q&A Sessions	Nein
01.04.22	**CV**	**Sprintwechsel, Vorstellung Assignment**	**Ja**
08.04.22	CV	Q&A Sessions	Nein
15.04.22	Ostern		
22.04.22	**CV / NLP**	**Abgabe CV, Vorstellung NLP**	**Ja**
29.04.22	NLP	Q&A Sessions	Nein
06.05.22	NLP	Sprintwechsel, Vorstellung Assignment	Ja
13.05.22	NLP	Q&A Sessions	Nein
20.05.22	**NLP / RL**	**Abgabe NLP, Vorstellung RL**	**Ja**
27.05.22	RL	Sprintwechsel, Vorstellung Assignment	Ja
03.06.22	Sommerplenum		
10.06.22	Pfingsten (H-KA zu)		
17.06.22	RL	Q&A Sessions (Brückentag)	Nein
24.06.22	**RL**	**Abgabe RL, Abschluss KI Labor**	**Ja**
01.07.22		Puffer	

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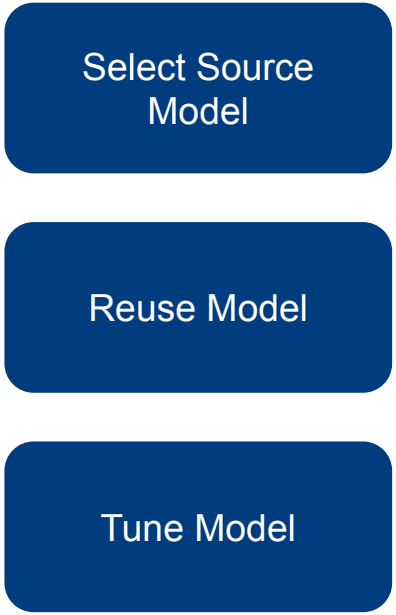
Agenda for today

1. Transfer learning
2. Assignment
3. Assignment ideas

Transfer learning

Transfer learning is the idea to utilize knowledge acquired for one task to solve related ones

Transfer learning differs from traditional ML in that it draws on previously learned tasks

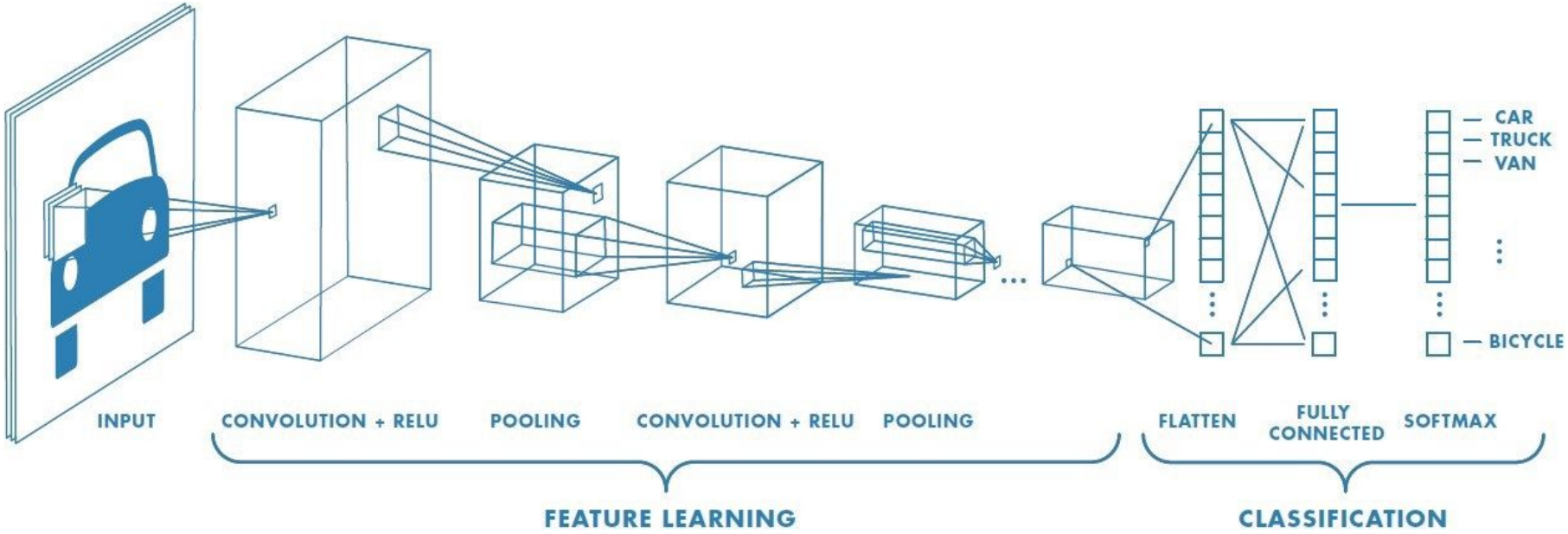


Choose a pre-trained source model from available models released by research institutions that is suitable for the task of interest

Use the pre-trained model as a starting point and leverage the model knowledge for the task of interest

Refine the model on data that is available for the task of interest

We can apply this idea to CNNs by freezing parts of the network and fine-tune the rest



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Assignment

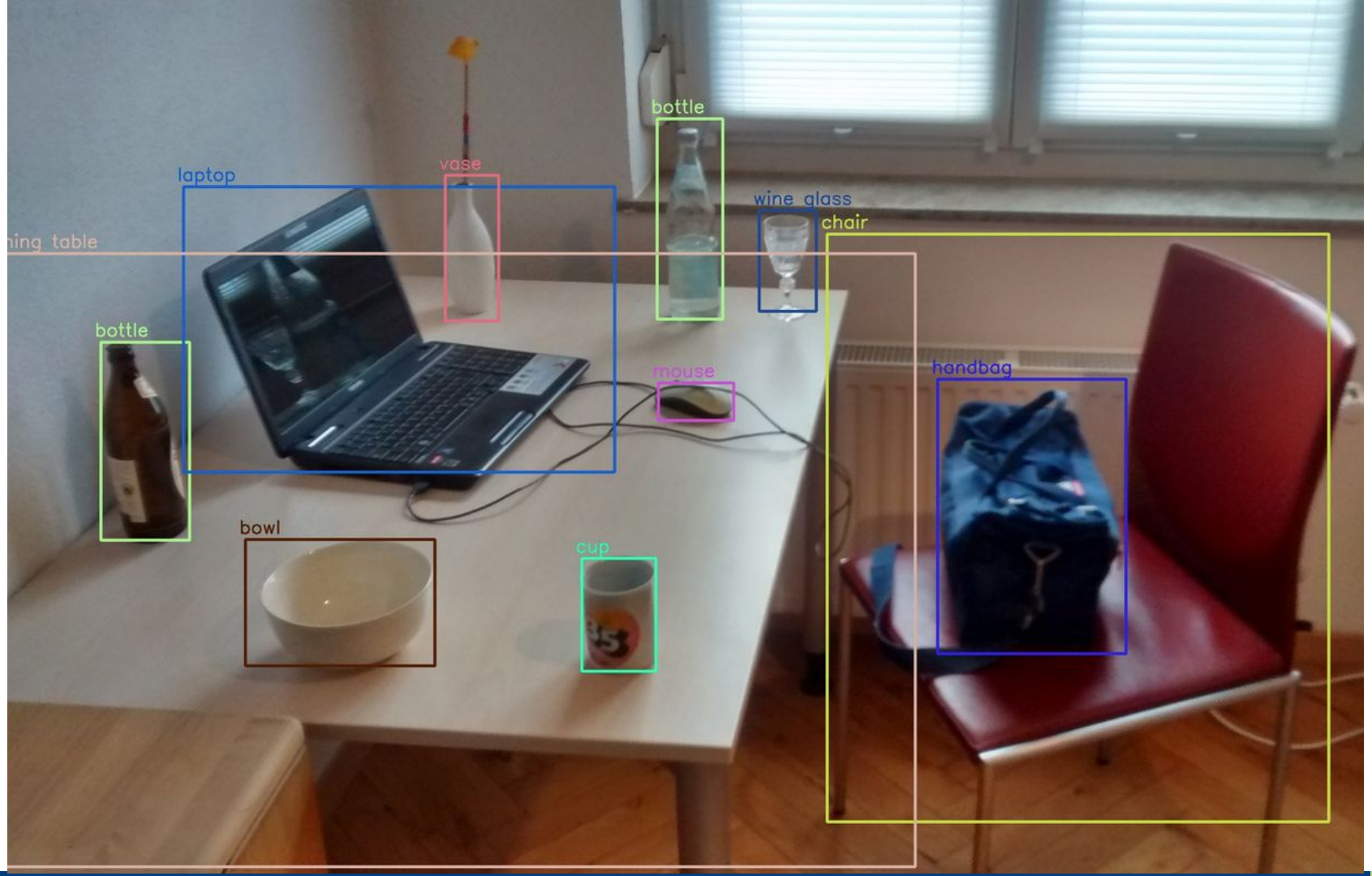
Assignment

- Topic: Transfer Learning
- Open Ended Assignment
- Minimum requirements
  - Choose a CV Dataset for fine-tuning
    - fine-tuning datasets have to be different from the dataset used for pretraining the model
  - Compare “pre-trained and fine-tuned” vs “training from scratch”
  - Understand and explain
    - the datasets used
    - the network architecture
    - results

Assignment

- Many methods available
  - Image classification
  - Object detection
  - Object segmentation
  - Depth Estimation
  - etc.
- Many datasets available
  - TensorFlow Datasets
  - PyTorch vision Datasets

Transfer learning for object detection


bottle
vase
laptop
wine glass
chair
ning table
bottle
mouse
handbag
bowl
cup

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YOLO - You Only Look Once

- by Joseph Chet Redmon (2016)
- fun paper: https://arxiv.org/abs/1612.08242

- originally implemented in Darknet
  - an open source deep learning framework written in C and CUDA

- YOLO v4 and v5 available in PyTorch & TensorFlow

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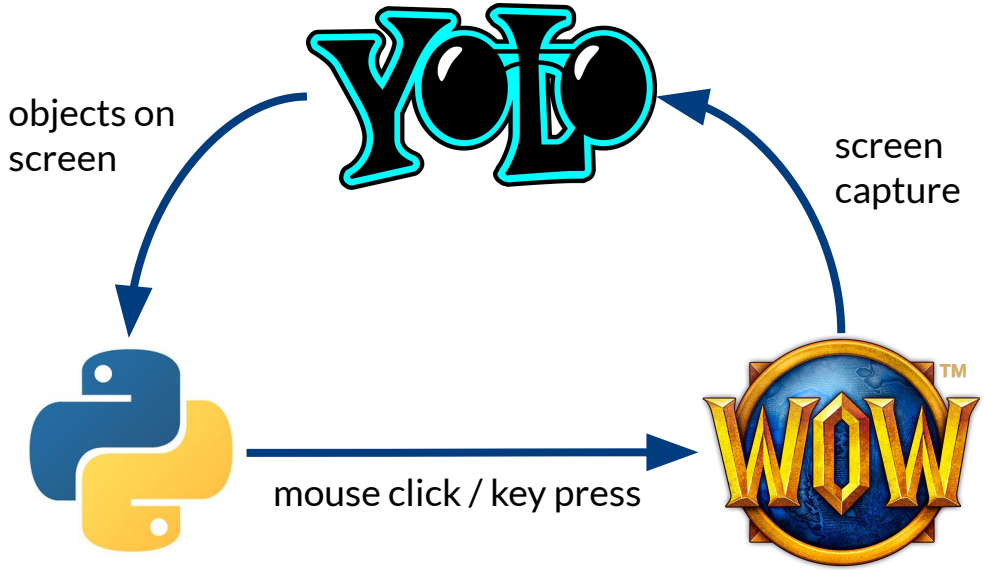
Possibilities

- Use pre-trained YOLO model of appropriate size (s,m,l,x)
- Fine-tune on a custom generated dataset
  - 💡 Google Open Images Dataset V6
- Generate your own mini test set!
  - Test how it works with your phone camera
  - Take ~50 photos that contain the target object
  - Annotate the photos with
    - CVAT - web interface - cloud version is ok for a small test set
    - LabelImg - python & Qt - offline only
  - Export in appropriate YOLO format and use in notebook

Even more fun! 🤩

- For synthetic environments where the variability of object is low you can even make your own training set in < 1 hour!
  - 🤖 for cheating in video games (many examples on youtube)
- Example:



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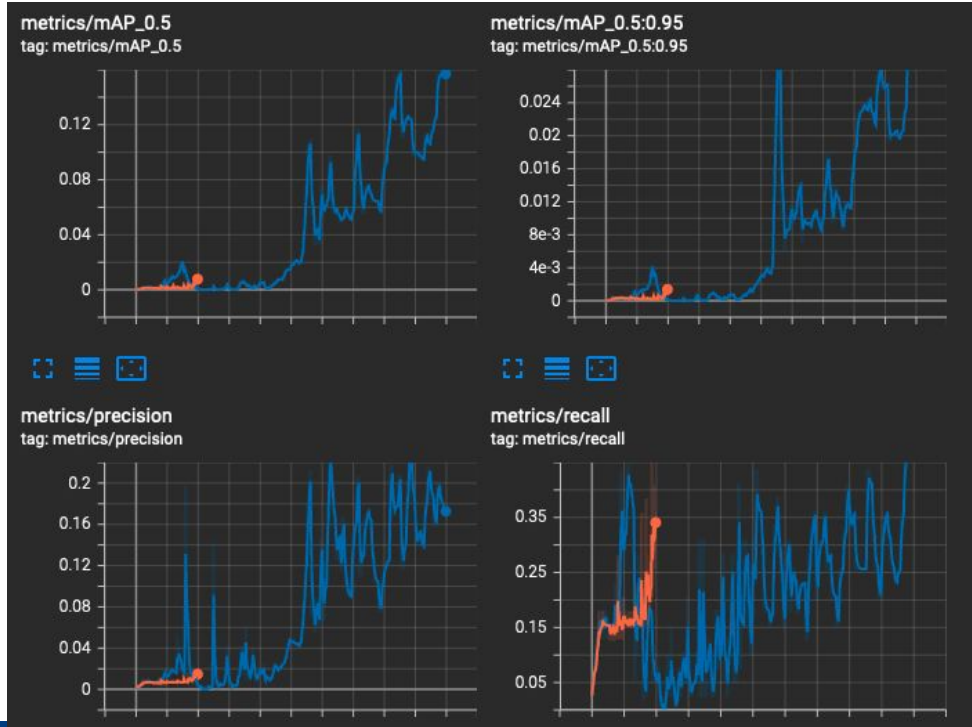
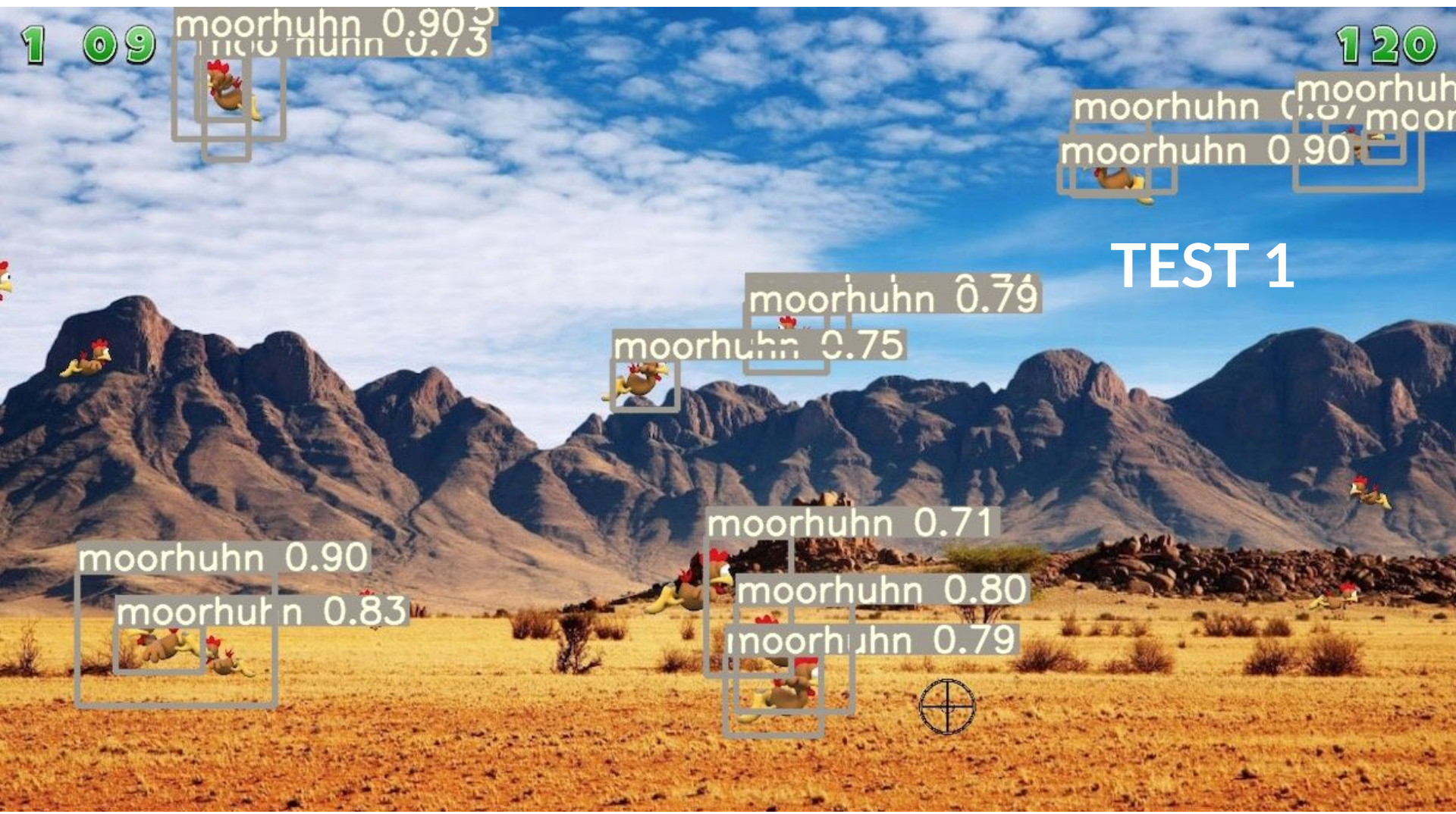
A colleagues attempt with

- train: 11 screenshots
- val: 3 screenshots
- Data engineering 90% of effort
- Labeling was fast <20min
- YOLOv5
- Relatively low precision and recall due to only 11 training images



Labeled images


1 09
120
moorhuhn 0.90
moorhuhn 0.90
TEST 1
moorhuhn 0.79
moorhuhn 0.75
moorhuhn 0.71
moorhuhn 0.90
moorhuhn 0.80
moorhuhn 0.83
moorhuhn 0.79

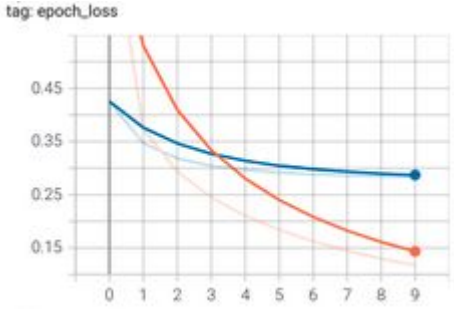

1 17
moorhuhn 0.84
moorhuhn 0.74
moorhuhn 0.84
TEST 2
moorhuhn 0.71
moorhuhn 0.72
moorhuhn 0.70


0 00
130
moorhuhn 0.87
moorhuhn 0.79
moorhuhn 0.73
MOORHUHN TEXAS
moorhuhn 0.90
moorhuhn 0.93
moorhuhn 0.88
moorhuhn 0.94
TEST 3
SCORE: 130
CONTINUE

Transfer learning for image classification

A simpler alternative

- TensorFlow Hub contains many datasets and pretrained models for different tasks
- TF Hub Tutorial
  - MobileNetV2 pre-trained on ImageNet
  - Fine tuned on flower_photos



- PyTorch Tutorial
  - ResNet18 pre-trained on ImageNet
  - Fine tuned on ImageNet subset of ants and bees

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Be creative and have fun!

- Generally, feel free to incorporate your own ideas!
- Some more inspiration
  - count your returnable bottles and calculate total amount
  - refrigerator / pantry inventory (Do I have enough beer?)
  - count cash
  - document plant growth
  - …
- However, make sure that you can collect and annotate enough data!

Vielen Dank

inovex GmbH
Ludwig-Erhard-Allee 6
76131 Karlsruhe