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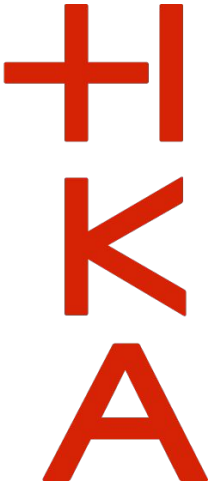


KI Labor - Wintersemester 2021

Computer Vision 2

Darjan Salaj, Sven Müller, Maximilian Blanck,
Sebastian Blank, Frederik Martin, Pascal Fecht

Karlsruhe, 22. Okt. 2021

Schedule

Datum	Thema	Inhalt	Präsenz
01.10.21	**Allg.**	**Organisation, Teamfindung**	Nein
08.10.21	CV	Vorstellung CV	Nein
15.10.21	CV	Q&A Sessions	Nein
22.10.21	**CV**	**Sprintwechsel, Vorstellung Assignment**	**Ja**
29.10.21	CV	Q&A Sessions	Nein
05.11.21	**CV / NLP**	**Abgabe CV, Vorstellung NLP**	**Ja**
12.11.21	NLP	Q&A Sessions	Nein
19.11.21	NLP	Sprintwechsel, Vorstellung Assignment	Ja
26.11.21	NLP	Q&A Sessions	Nein
03.12.21	NLP	Q&A Sessions	Nein
10.12.21	**NLP / RL**	**Abgabe NLP, Vorstellung RL**	**Ja**
17.12.21	RL	Q&A Sessions	Nein
14.01.22	RL	Sprintwechsel, Vorstellung Assignment	Ja
21.01.22	RL	Q&A Sessions	Nein
28.01.22	**RL**	**Abgabe RL, Abschluss KI Labor**	**Ja**

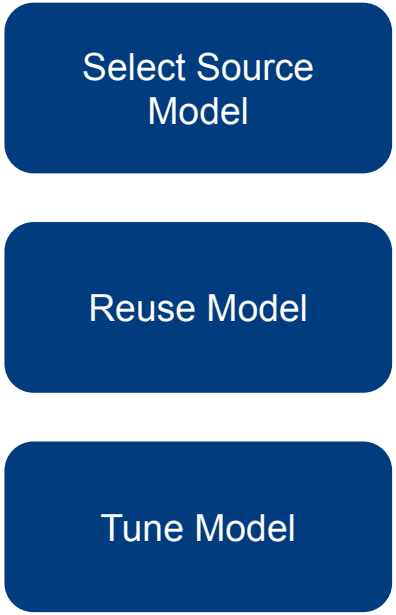
Agenda for today

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

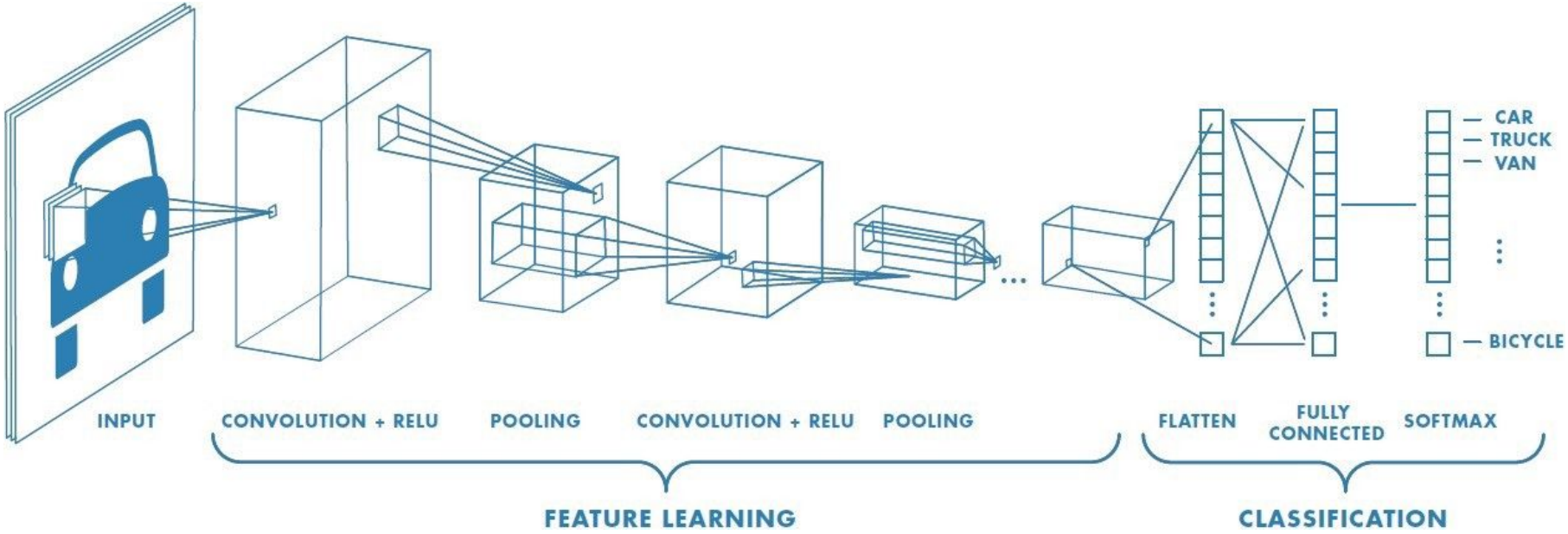


Choose a pre-trained source model from available models released by research institutions that is suitable for the task of interest

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

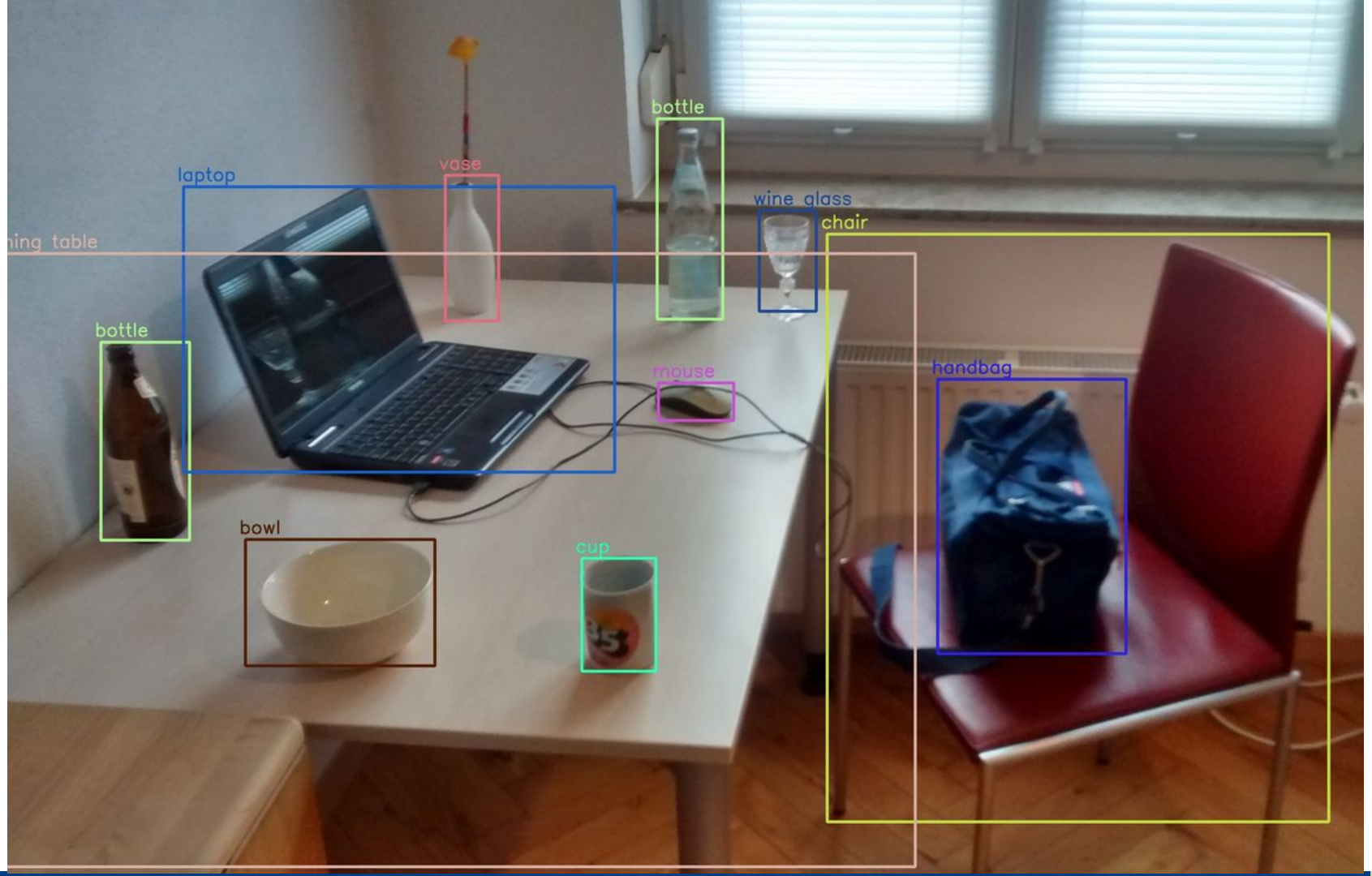
Assignment

- 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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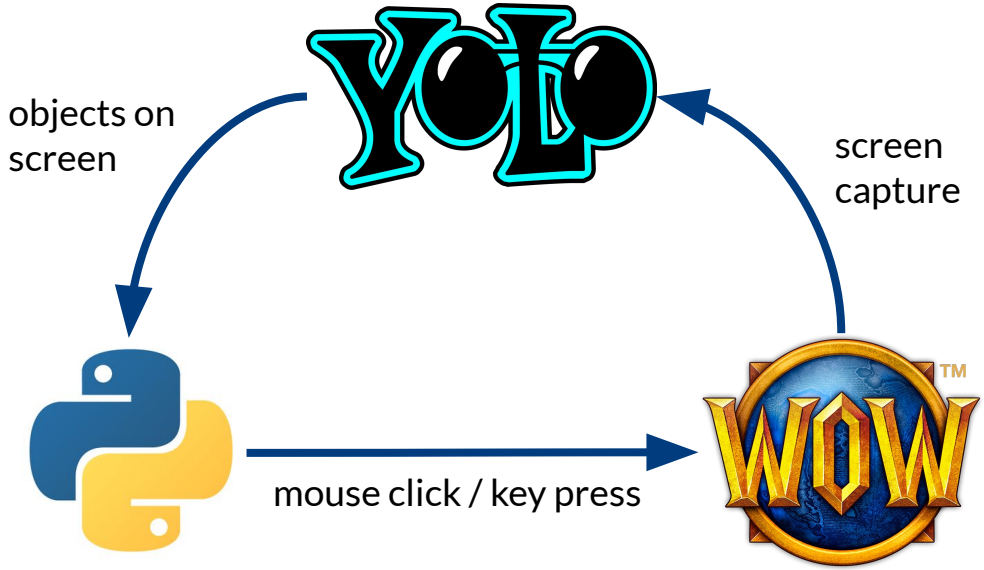
Possibilities

- 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 you 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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Even more fun! 🤩

full video [link]

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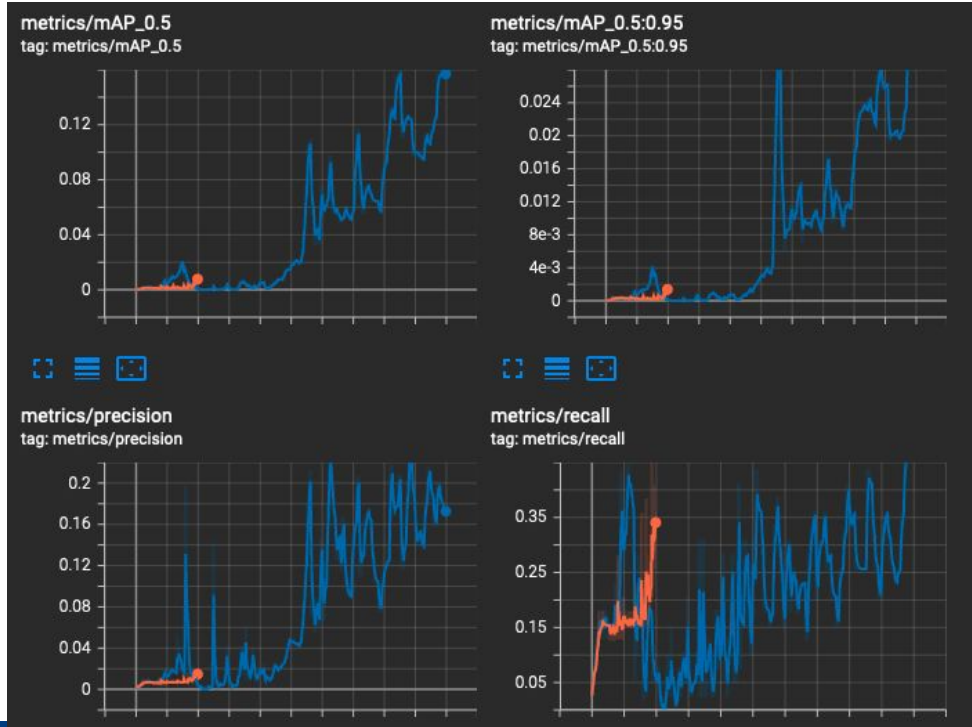
But it’s not so easy 😆

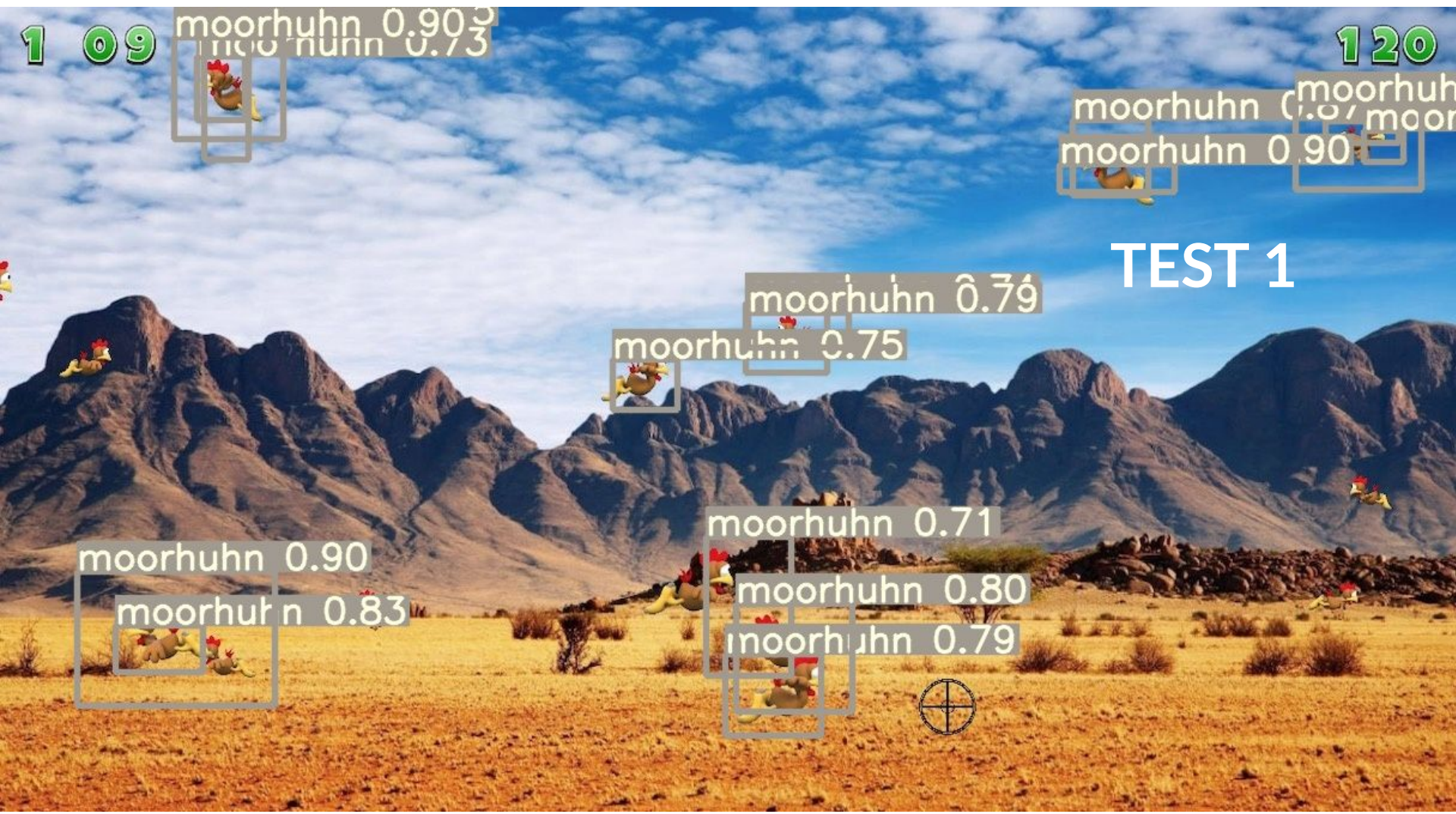
full video [link]

My attempt with Moorhuhn

- 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

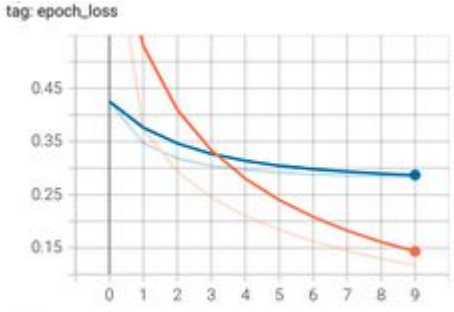

1 17
moorhuhn 0.84
moorhuhn 0.74
moorhuhn 0.84
TEST 2
moorhuhn 0.71
moorhuhn 0.72
moorhuhn 0.70


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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Vielen Dank

inovex GmbH
Ludwig-Erhard-Allee 6
76131 Karlsruhe