Aerial Imagery Object Detection

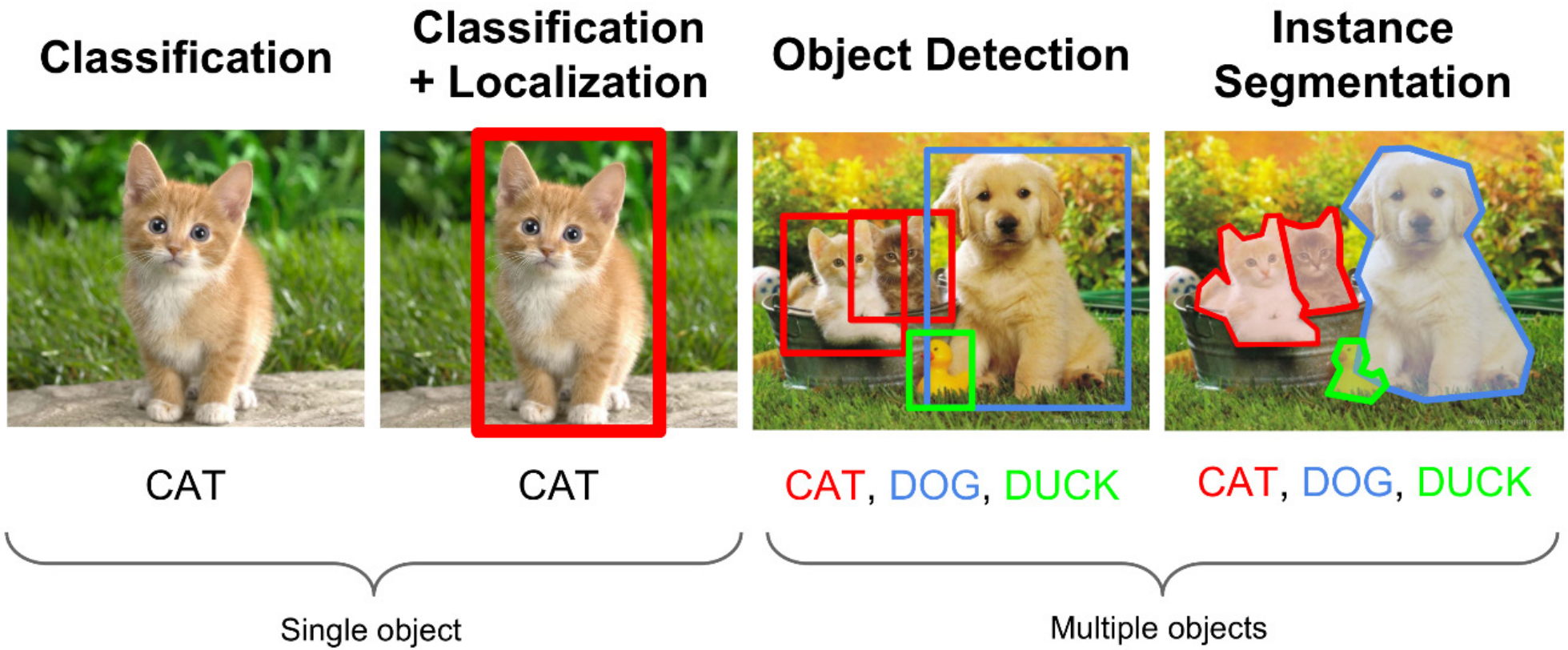
A Tensorflow / Faster-RCNN
Transfer Learning Tutorial

GeoPython 2019

Adrian Meyer

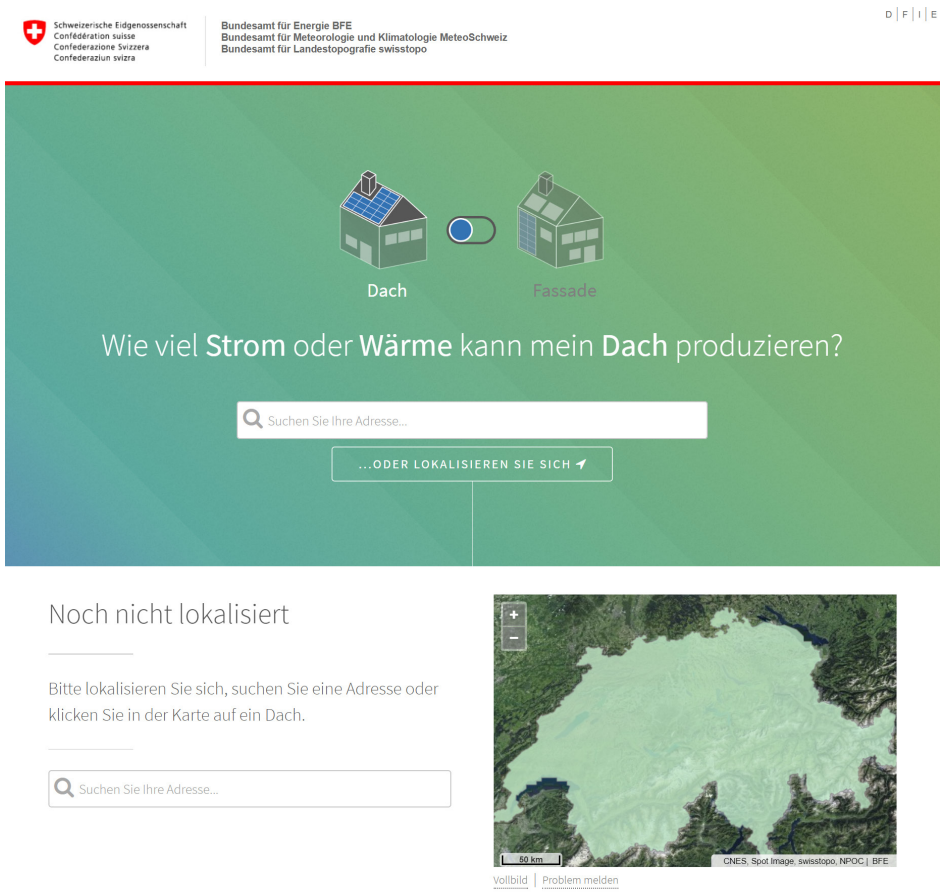
Data Scientist
FHNW

Image Classification Typology



SolAI – Detection of Solar Systems

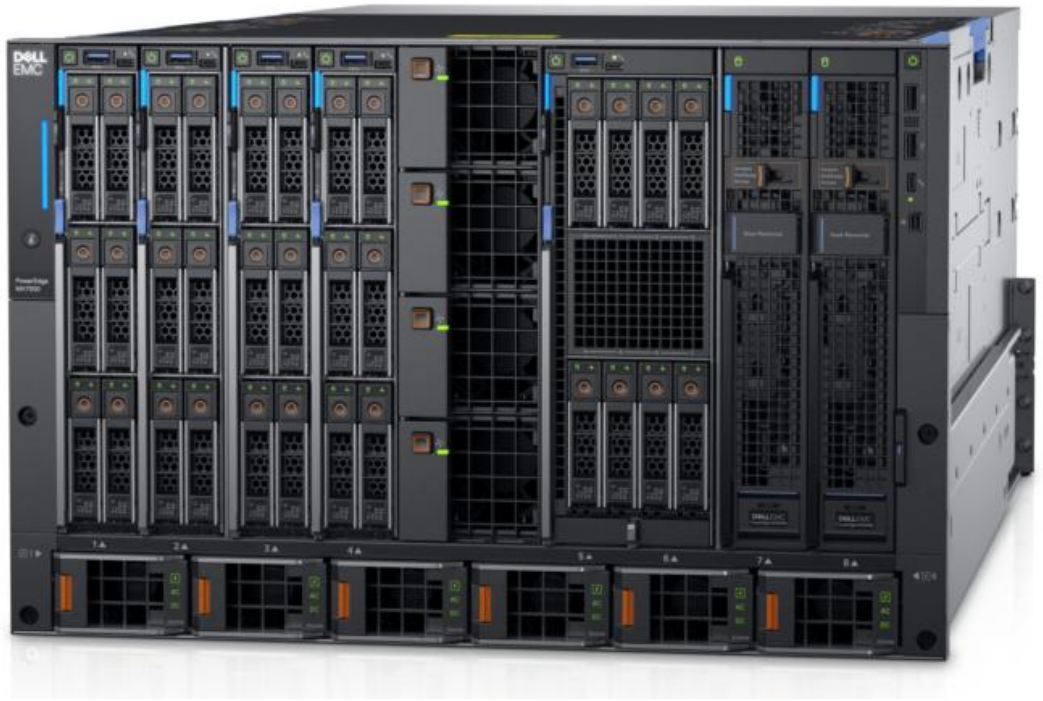
IGEO/FHNW and Federal Office for Energy (BFE)



SolAI – Detektion von Solaranlagen

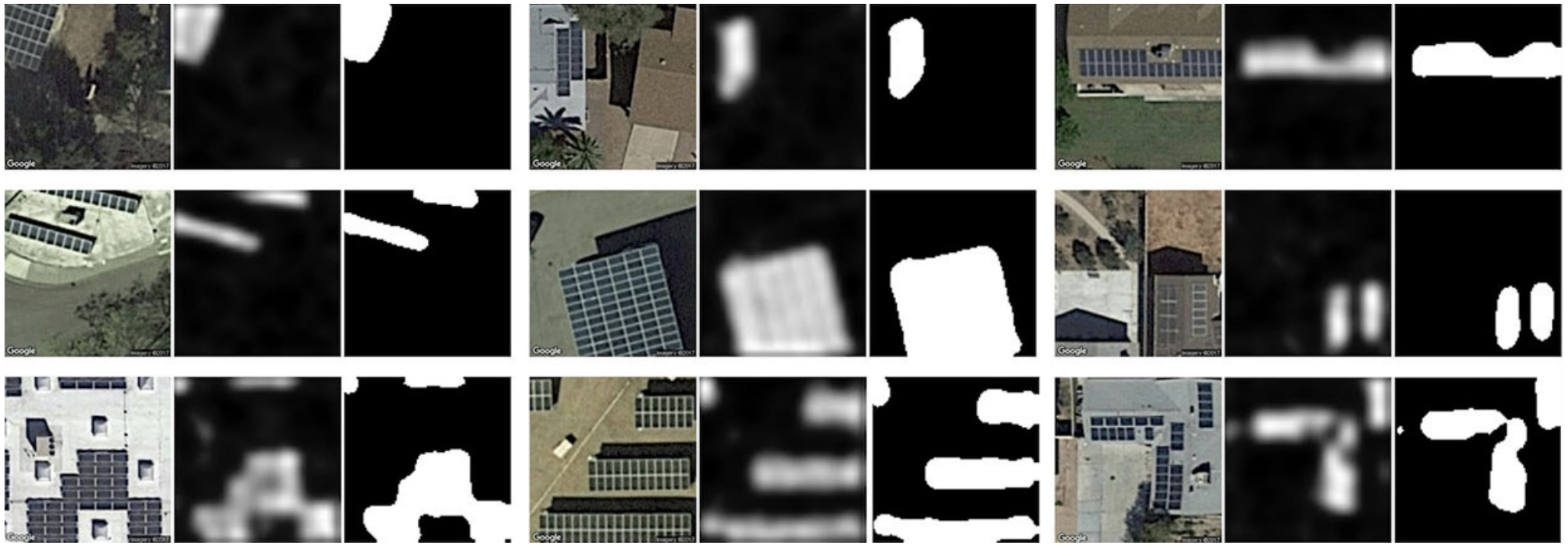
IGEO/FHNW und Bundesamt für Energie (BFE)

Images: DeepSolar/Stanford

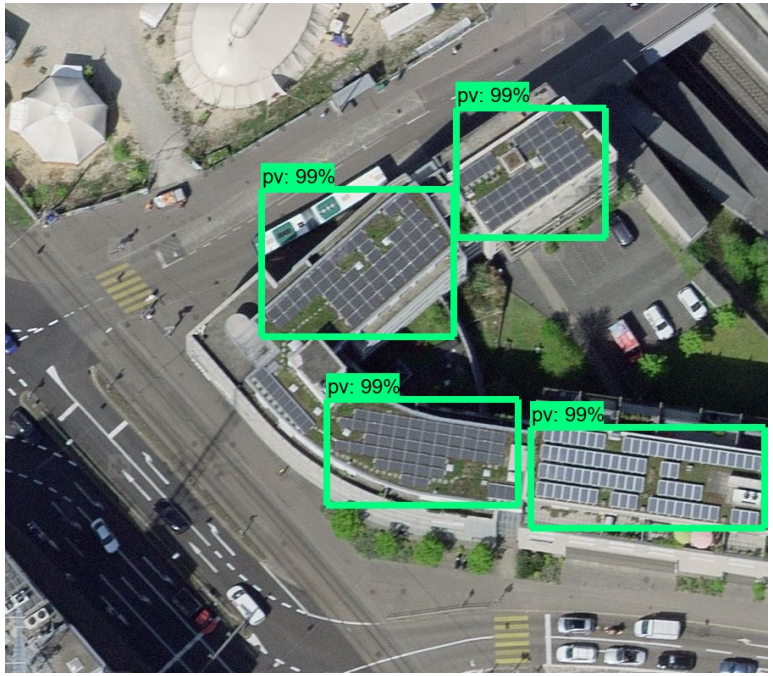


SolAI – Detektion von Solaranlagen

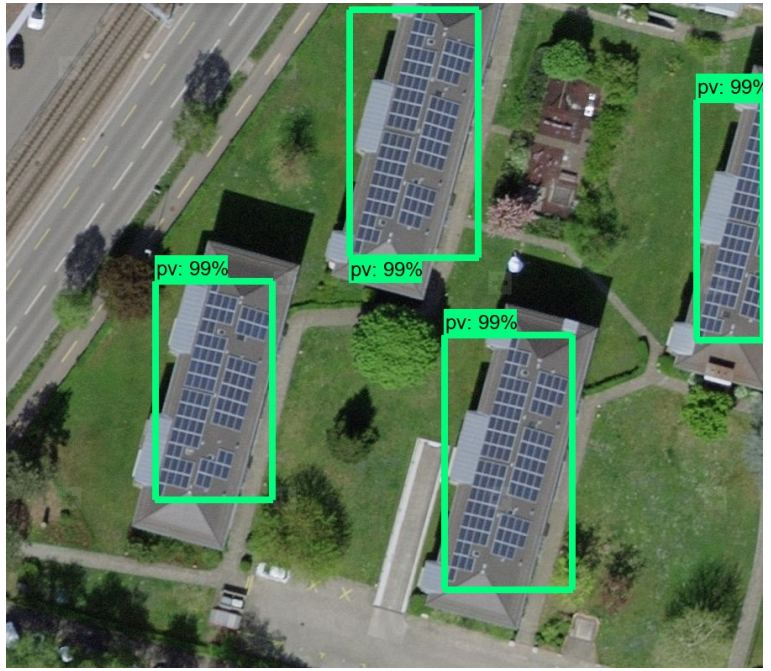
IGEO/FHNW und Bundesamt für Energie (BFE)



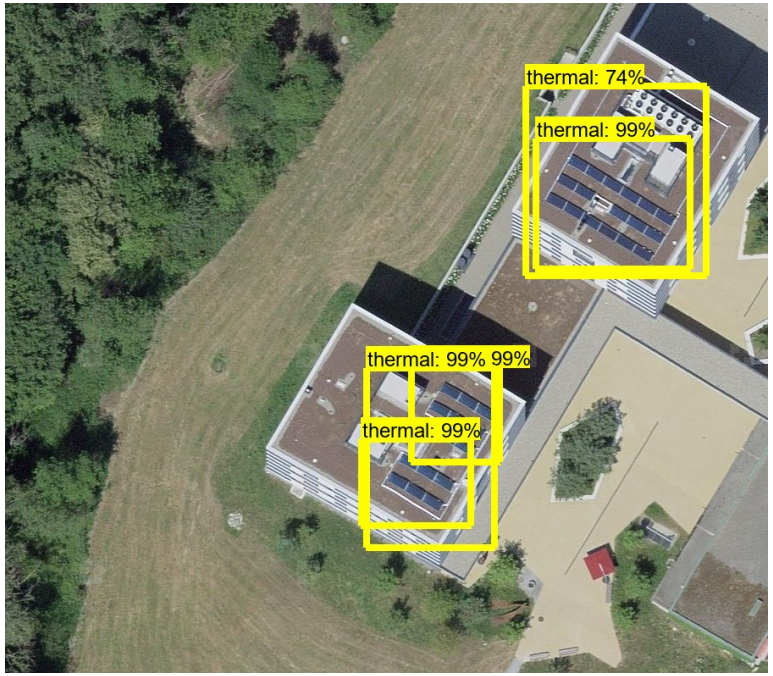
Images: DeepSolar/Stanford

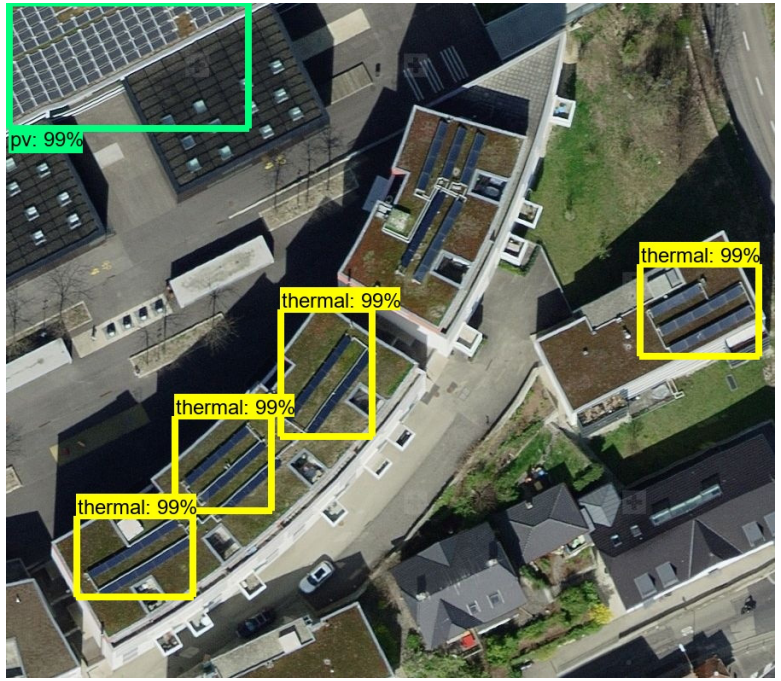

pv: 99%
pv: 99%
pv: 99%
pv: 99%


pv: 99%


pv: 99%
pv: 99%
pv: 99%
pv: 99%


thermal: 99%
thermal: 99%
pv: 99%


thermal: 74%
thermal: 99%
thermal: 99% 99%
thermal: 99%


pv: 99%
thermal: 99%
thermal: 99%
thermal: 99%
thermal: 99%

Download Tutorial Files

Go to https://colab.research.google.com

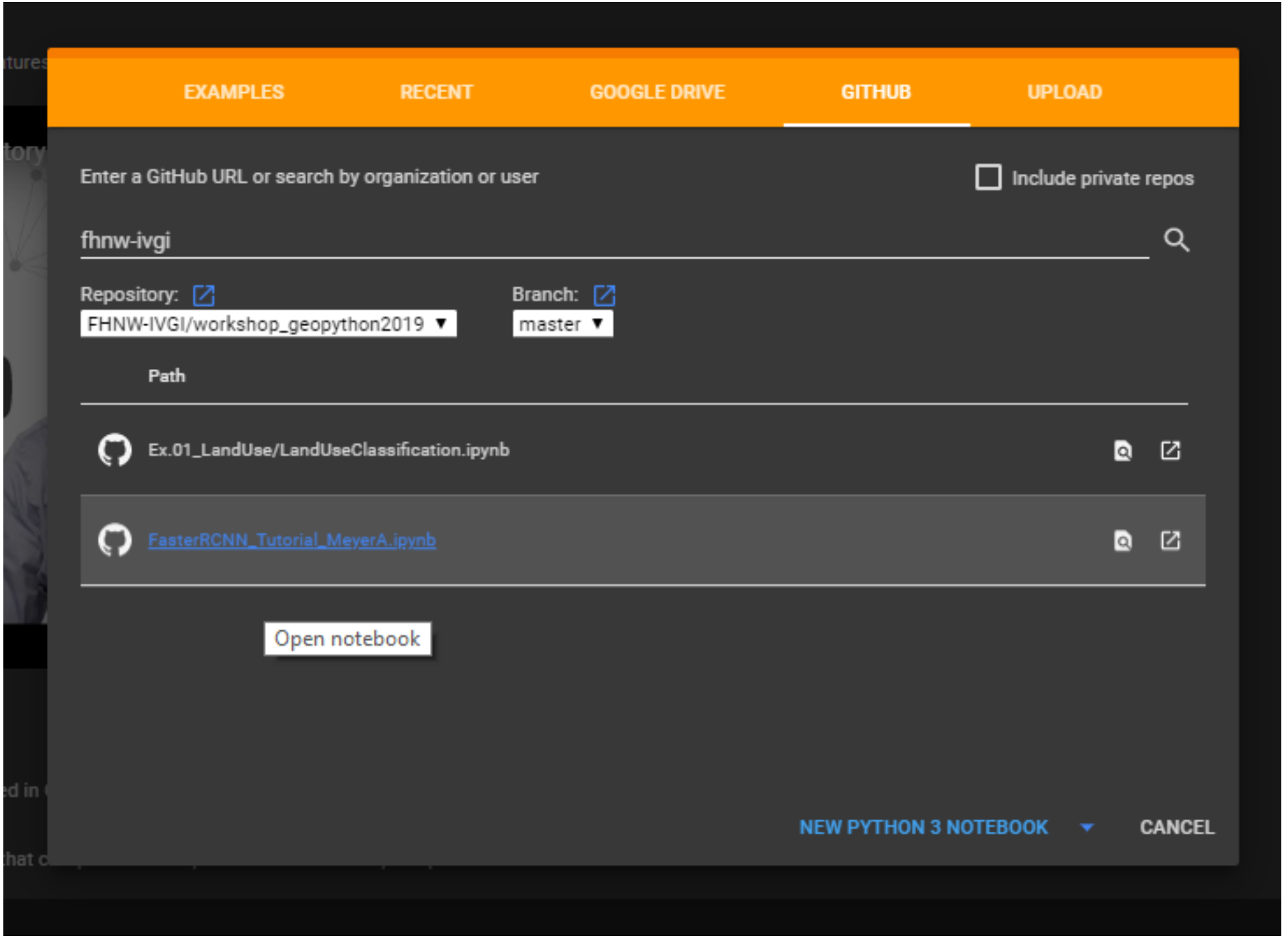
Use **Github** > Enter organization: **`fhnw-ivgi`**

Checkout the Faster-RCNN Tutorial notebook from the master branch by clicking on it.

Alternative Links:

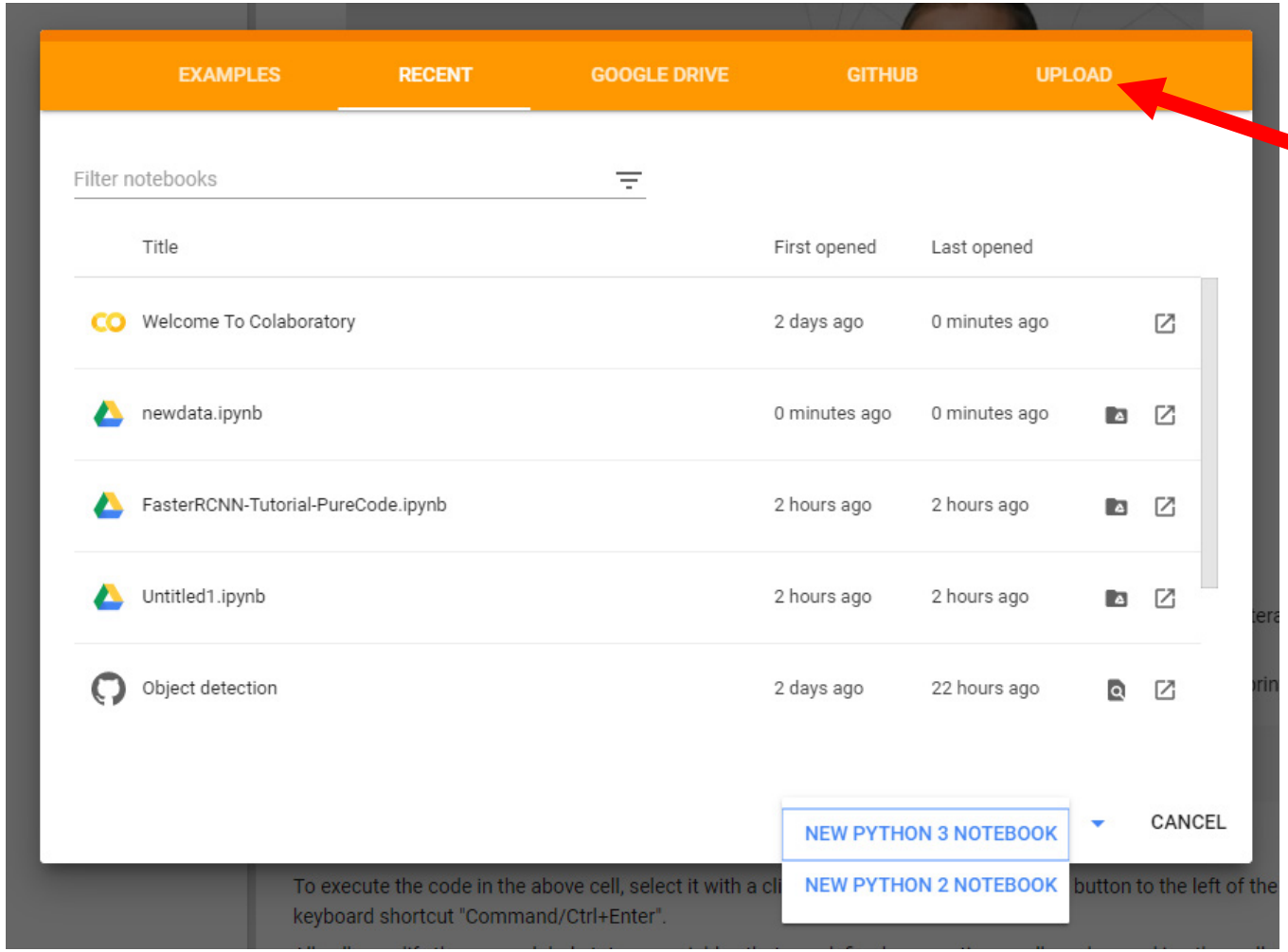
- Notebook (ipynb)
  https://tinyurl.com/**solardetect**

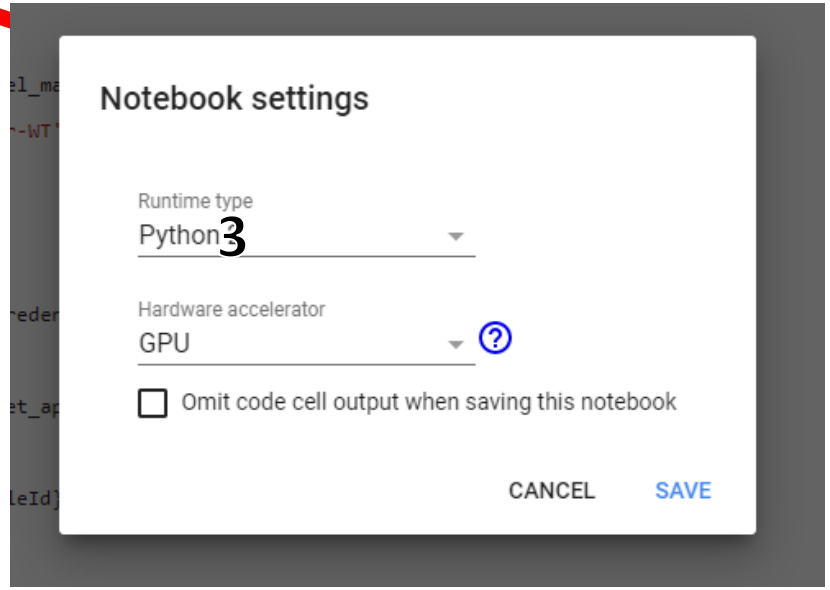
- Dataset (JPG Tiles and Annotations)
  https://tinyurl.com/**solardataset**


EXAMPLES
RECENT
GOOGLE DRIVE
GITHUB
UPLOAD
Enter a GitHub URL or search by organization or user
Include private repos
fhnw-ivgi
Repository:
FHNW-IVGI/workshop_geopython2019
Branch:
master
Path
Ex.01_LandUse/LandUseClassification.ipynb
FasterRCNN_Tutorial_MeyerA.ipynb
Open notebook
NEW PYTHON 3 NOTEBOOK
CANCEL

Alternative: Upload **ipynb** Notebook on Google Colab

https://colab.research.google.com/

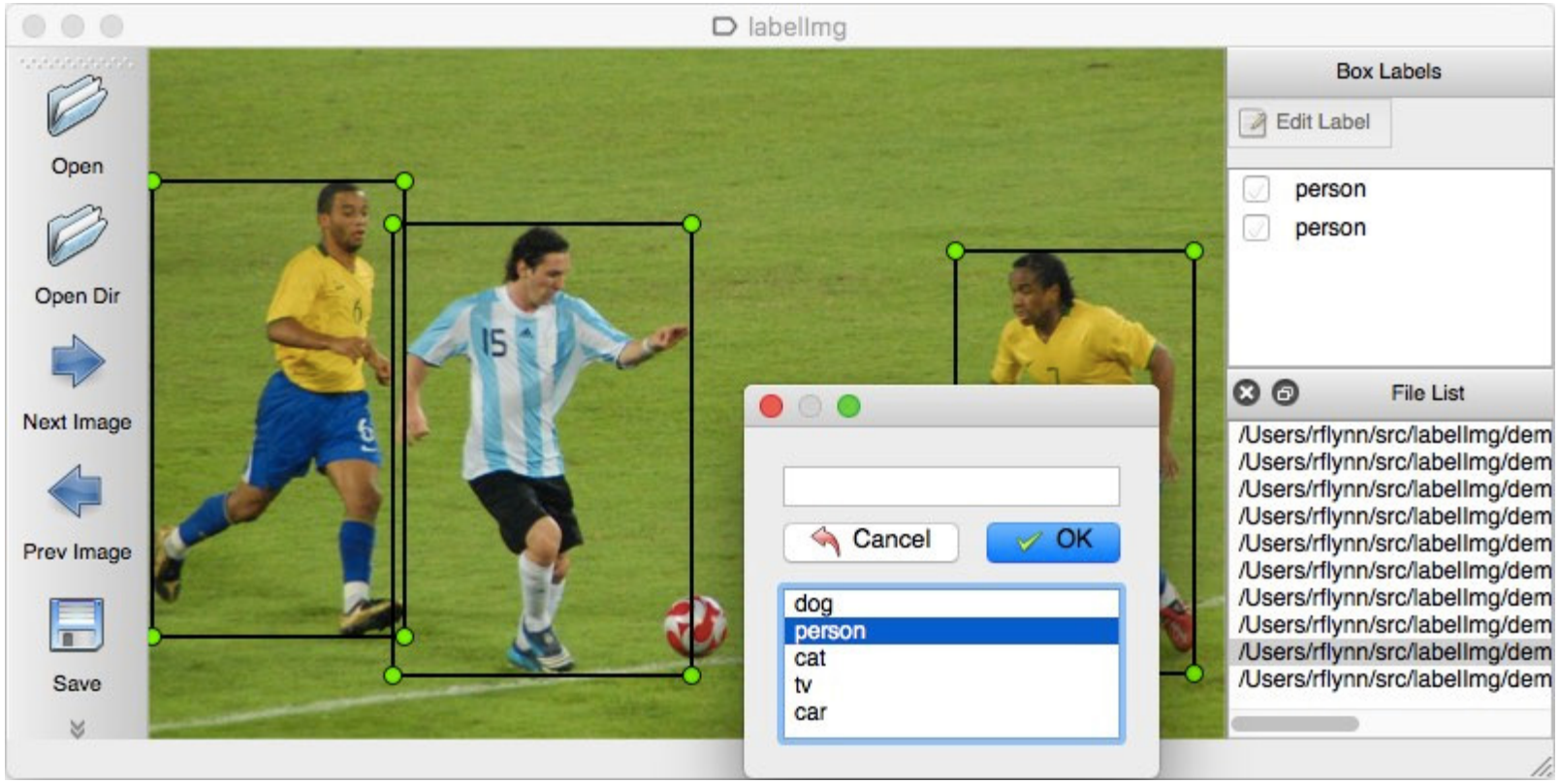




Demo

https://colab.research.google.com/

Annotations with Label IMG

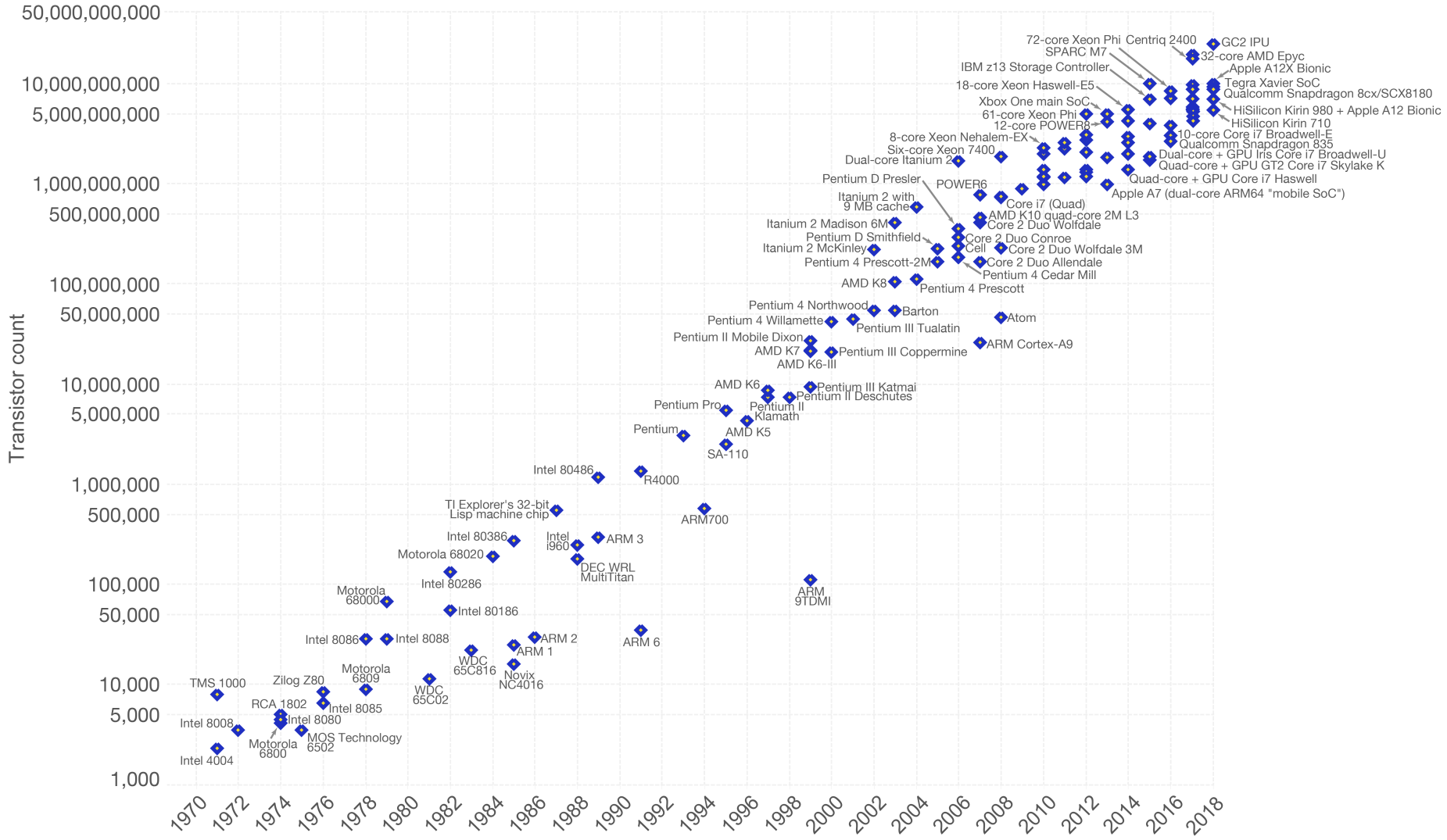


- https://github.com/tzutalin/labelImg

Moore's Law – The number of transistors on integrated circuit chips (1971-2018)

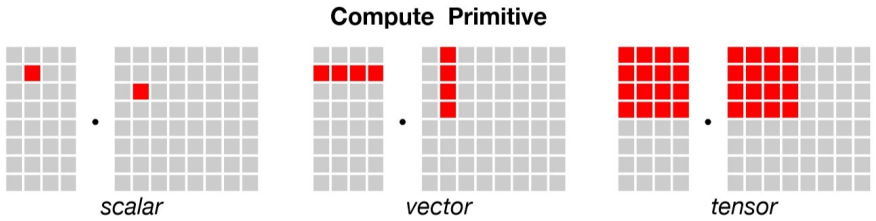
Moore's law describes the empirical regularity that the number of transistors on integrated circuits doubles approximately every two years. This advancement is important as other aspects of technological progress – such as processing speed or the price of electronic products – are linked to Moore's law.

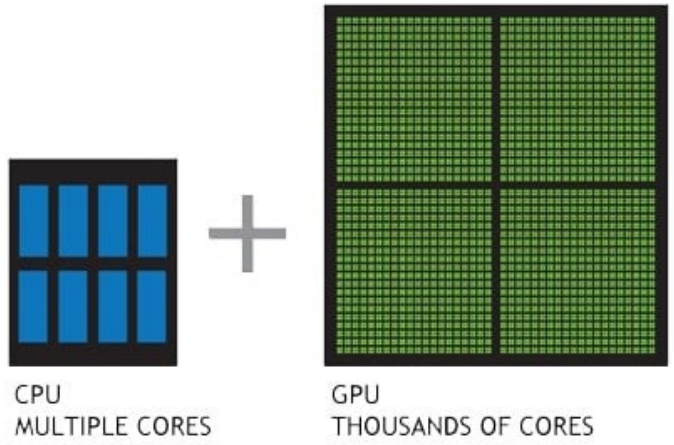
Our World in Data

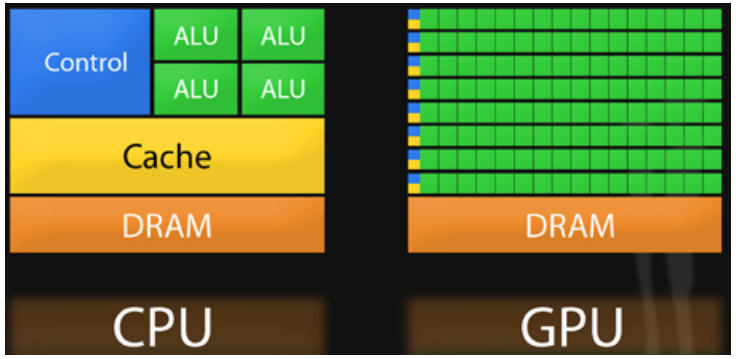


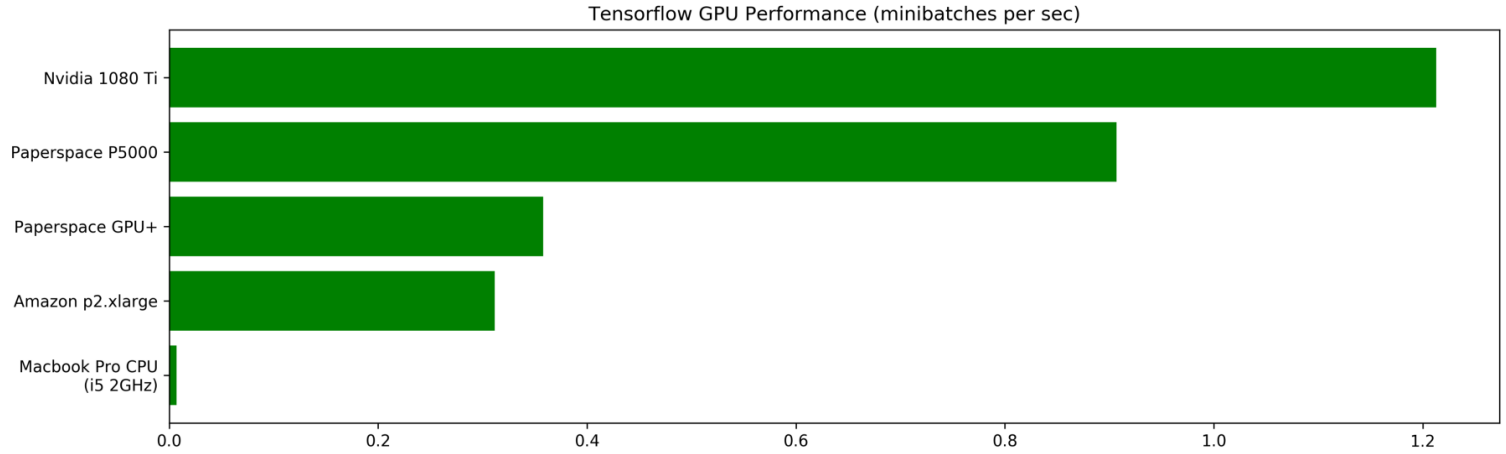
Data source: Wikipedia (https://en.wikipedia.org/wiki/Transistor_count)
The data visualization is available at OurWorldinData.org. There you find more visualizations and research on this topic.

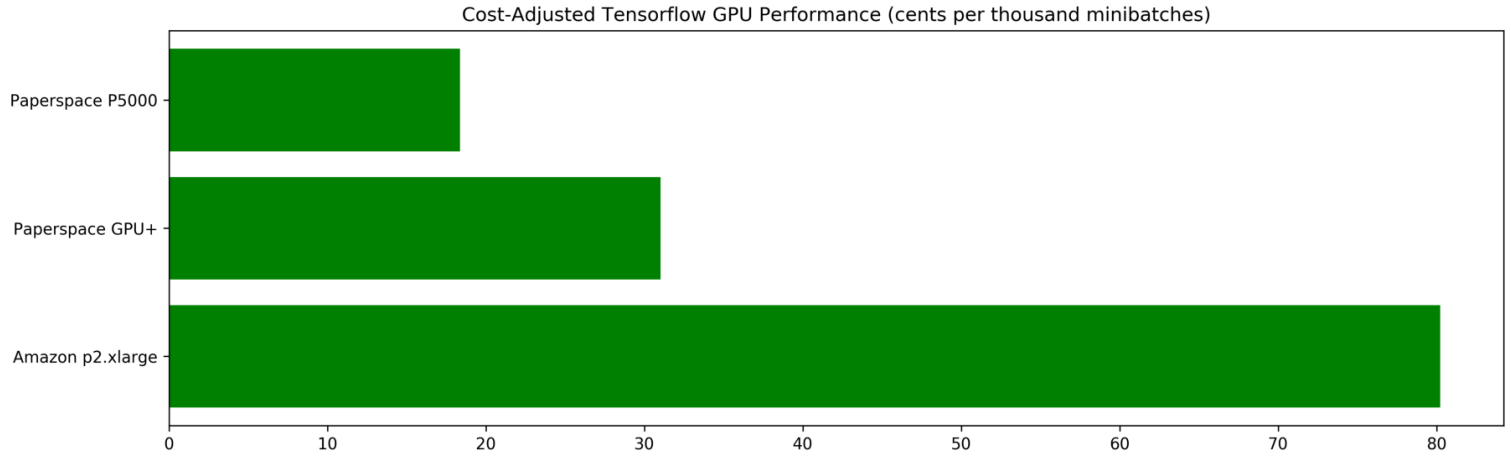
Hardware

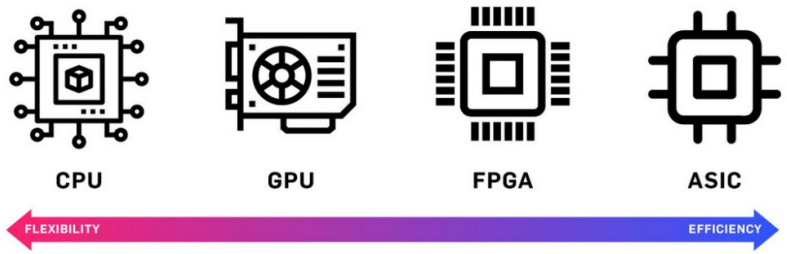

Compute Primitive
scalar
vector
tensor


CPU
MULTIPLE CORES
GPU
THOUSANDS OF CORES


Control
ALU
ALU
ALU
ALU
Cache
DRAM
DRAM
CPU
GPU


Tensorflow GPU Performance (minibatches per sec)
Nvidia 1080 Ti
Paperspace P5000
Paperspace GPU+
Amazon p2.xlarge
Macbook Pro CPU
(i5 2GHz)
0.0
0.2
0.4
0.6
0.8
1.0
1.2


Cost-Adjusted Tensorflow GPU Performance (cents per thousand minibatches)
Paperspace P5000
Paperspace GPU+
Amazon p2.xlarge
0
10
20
30
40
50
60
70
80

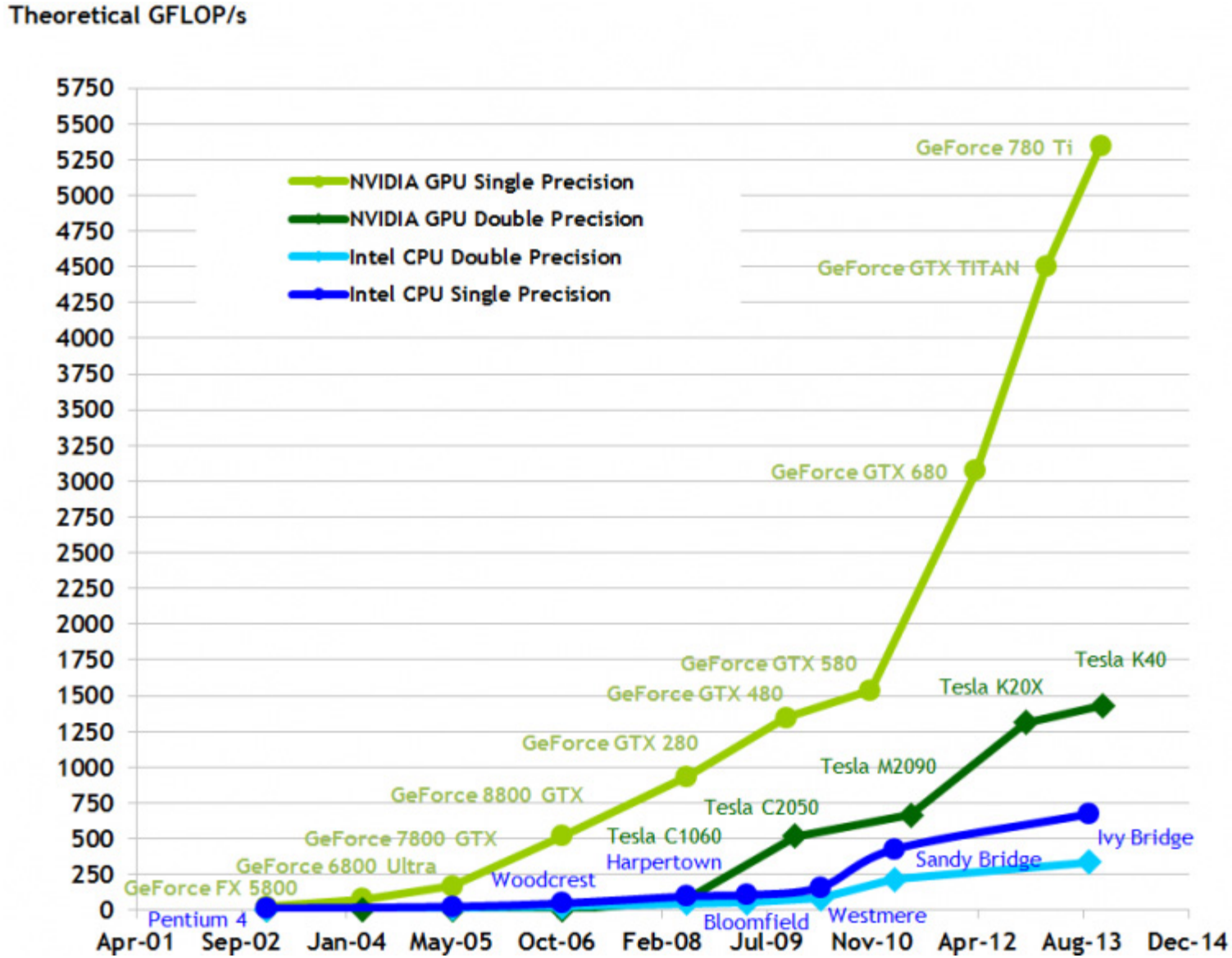


CPU
- Small models
- Small datasets
- Useful for design space exploration

GPU
- Medium-to-large models, datasets
- Image, video processing
- Application on CUDA or OpenCL

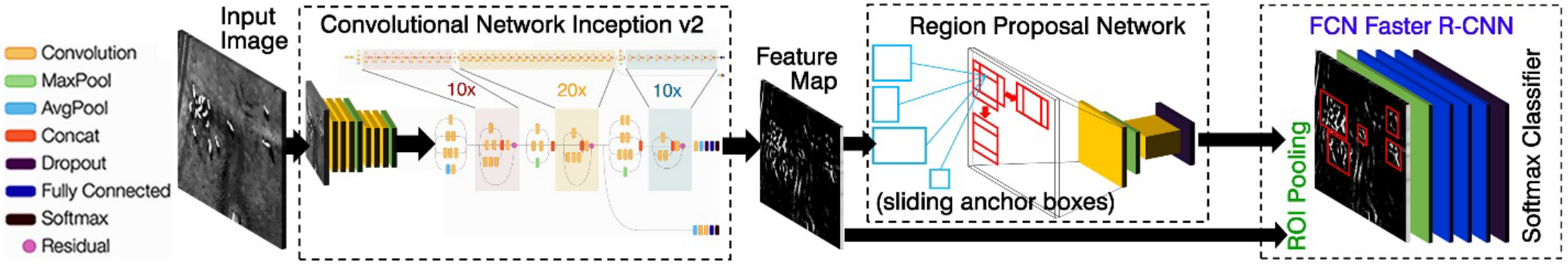
TPU
- Matrix computations
- Dense vector processing
- No custom TensorFlow operations

FPGA
- Large datasets, models
- Compute intensive applications
- High performance, high perf./cost ratio



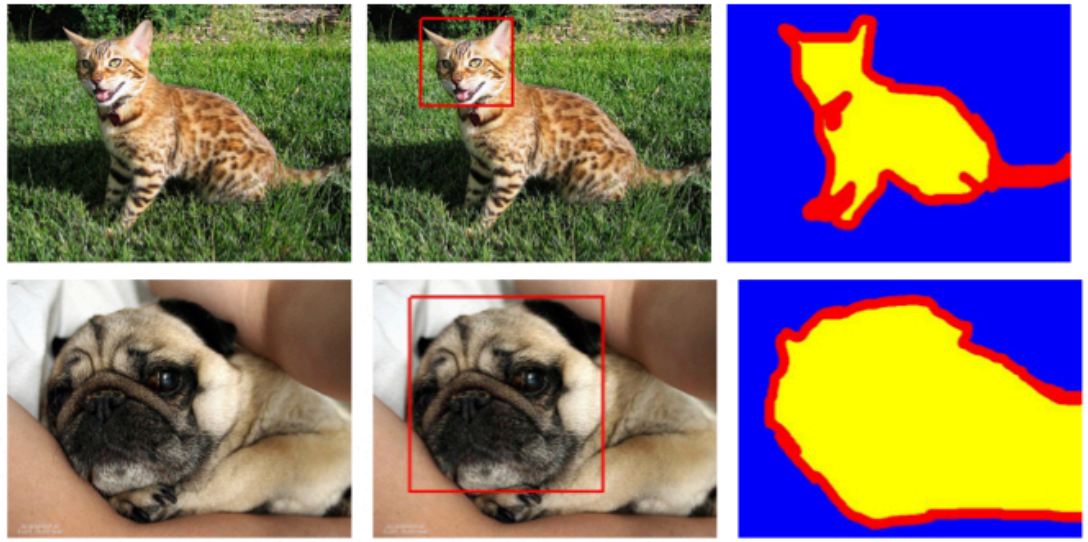
https://venturebeat.com/2018/08/16/how-ai-is-decommoditizing-the-chip-industry/
https://www.inaccel.com/cpu-gpu-fpga-or-tpu-which-one-to-choose-for-my-machine-learning-training/

Faster R-CNN

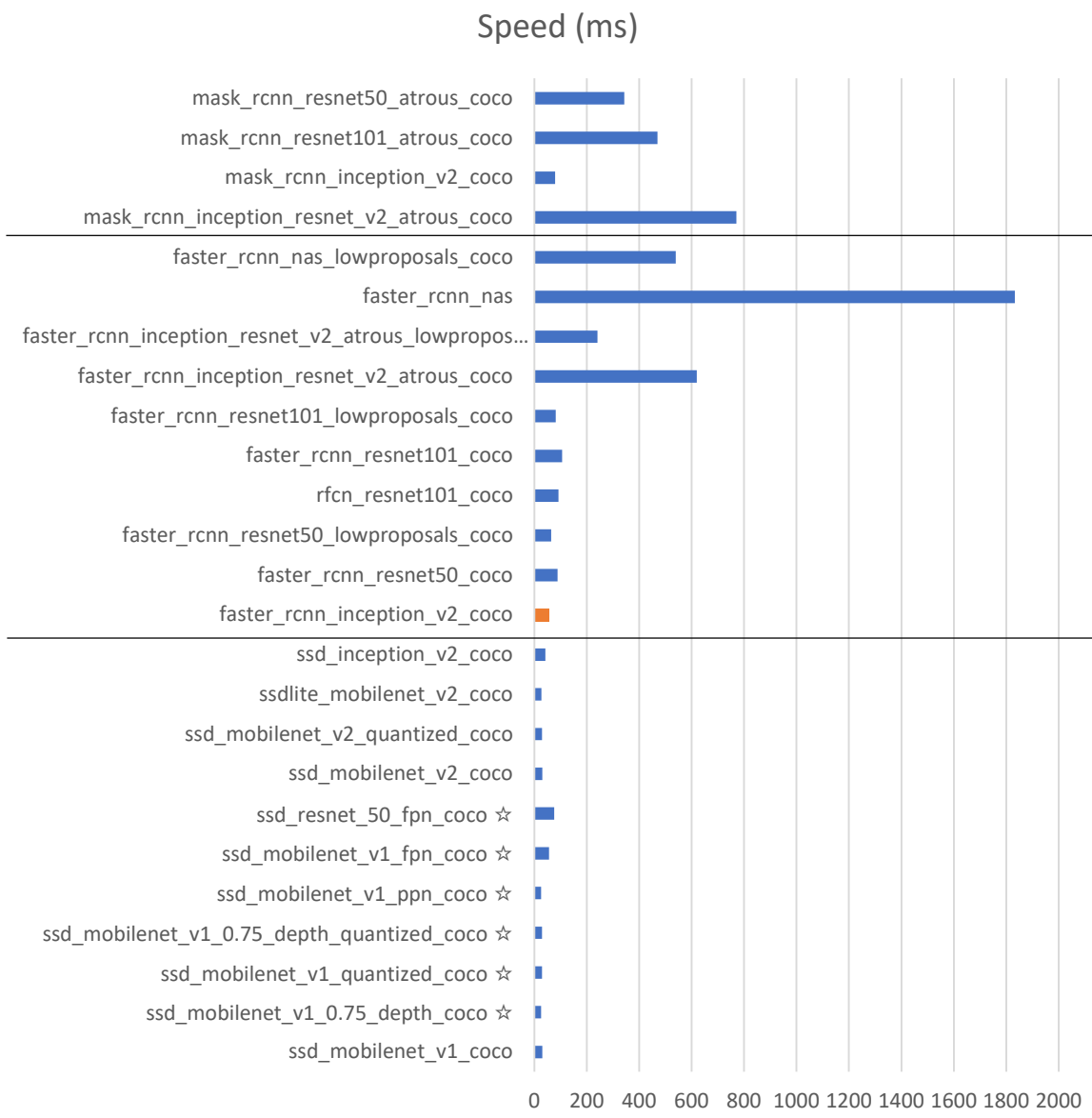


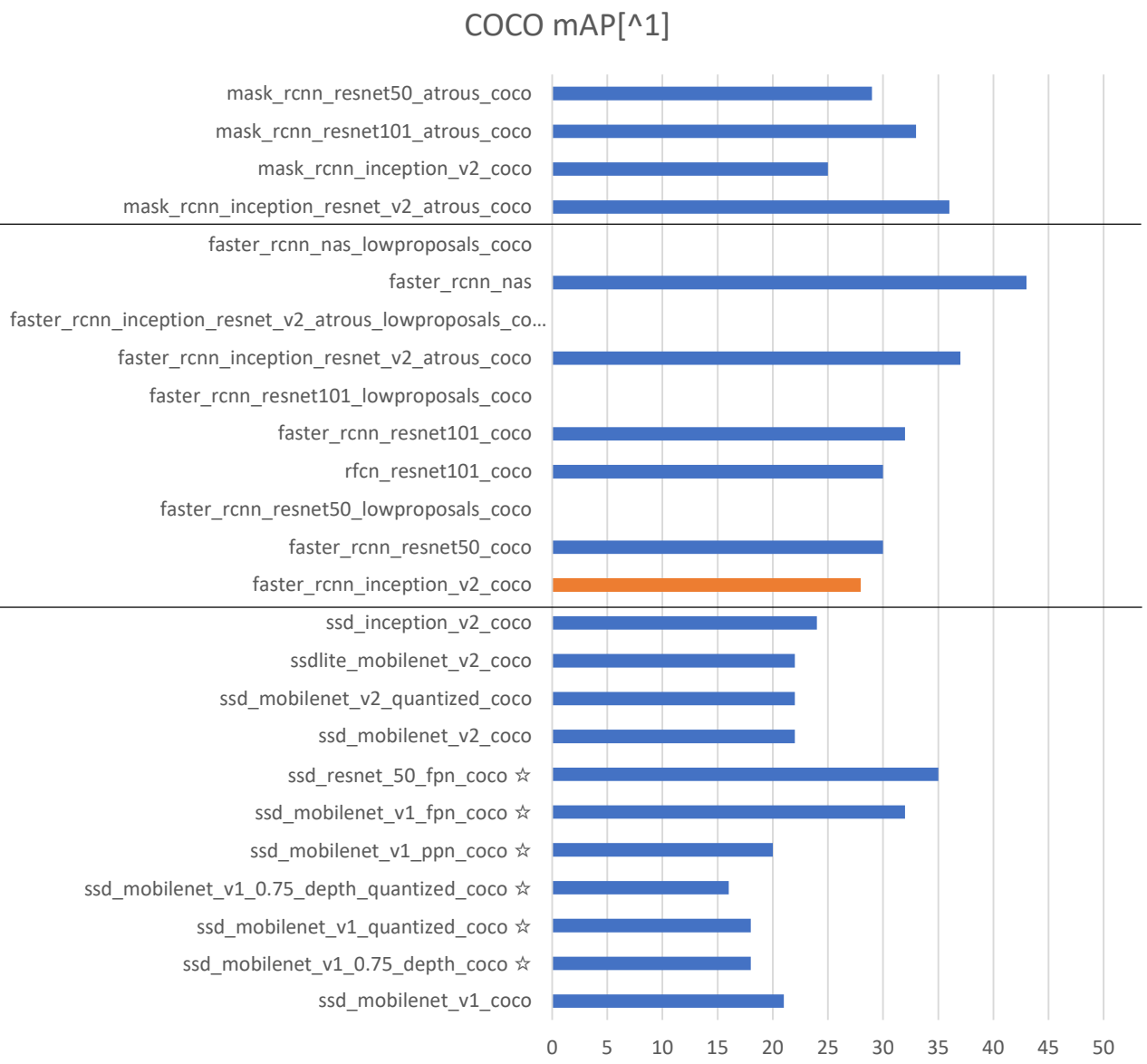
https://www.youtube.com/watch?v=llBhBSgoWPs

MS COCO / Oxford Pets



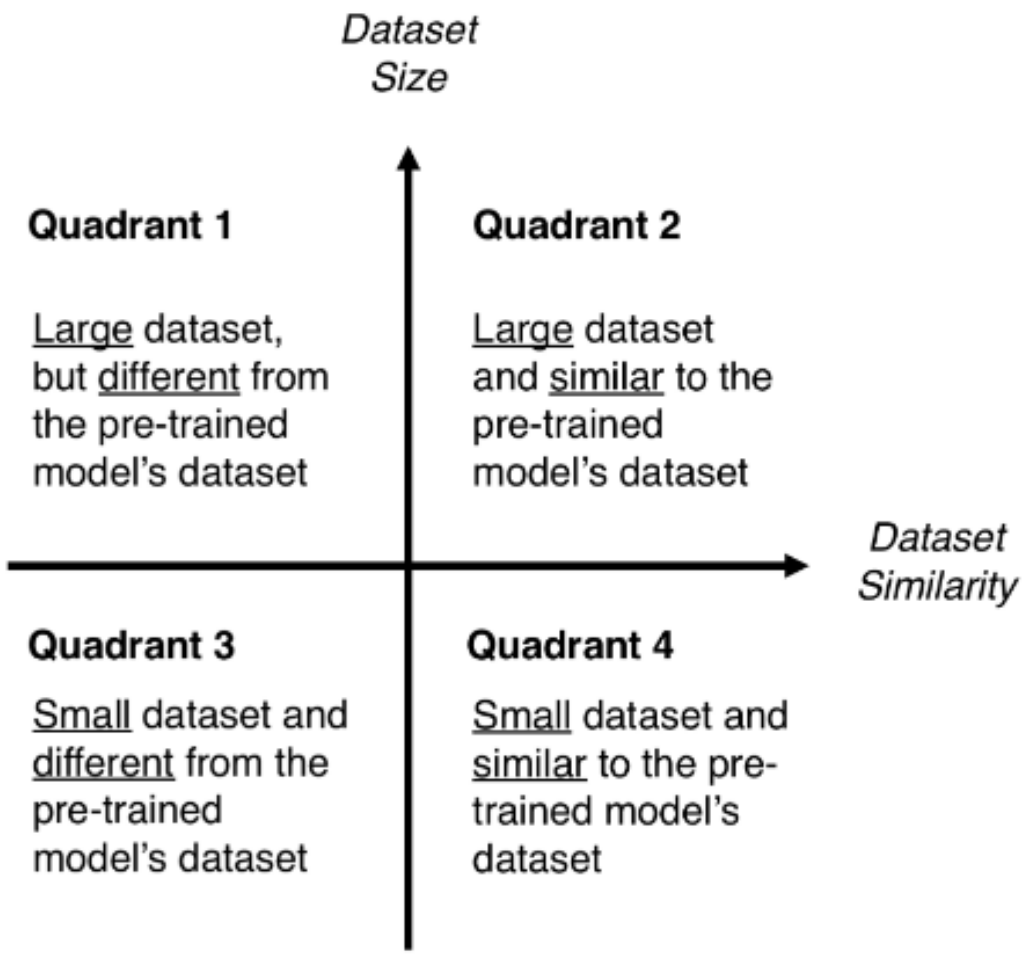
Tensorflow Object Detection Model Zoo

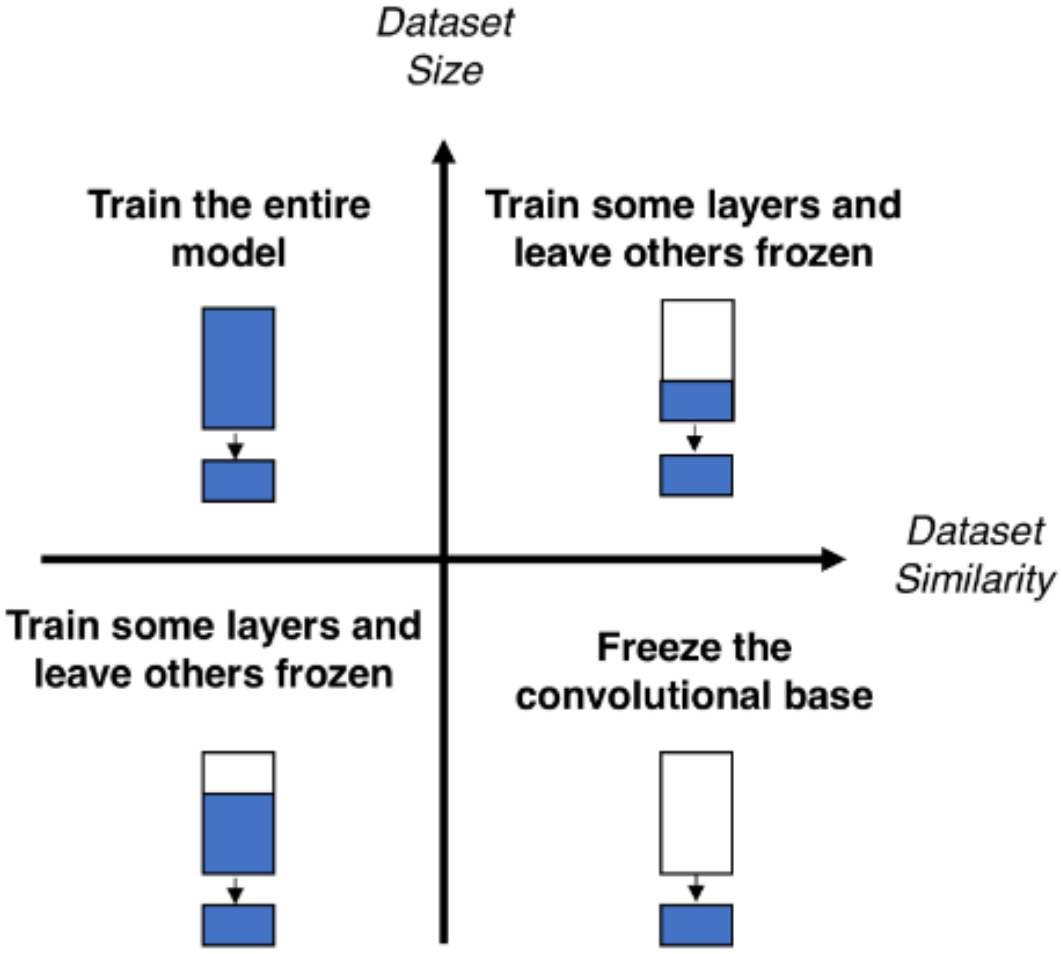




Pretrained Models

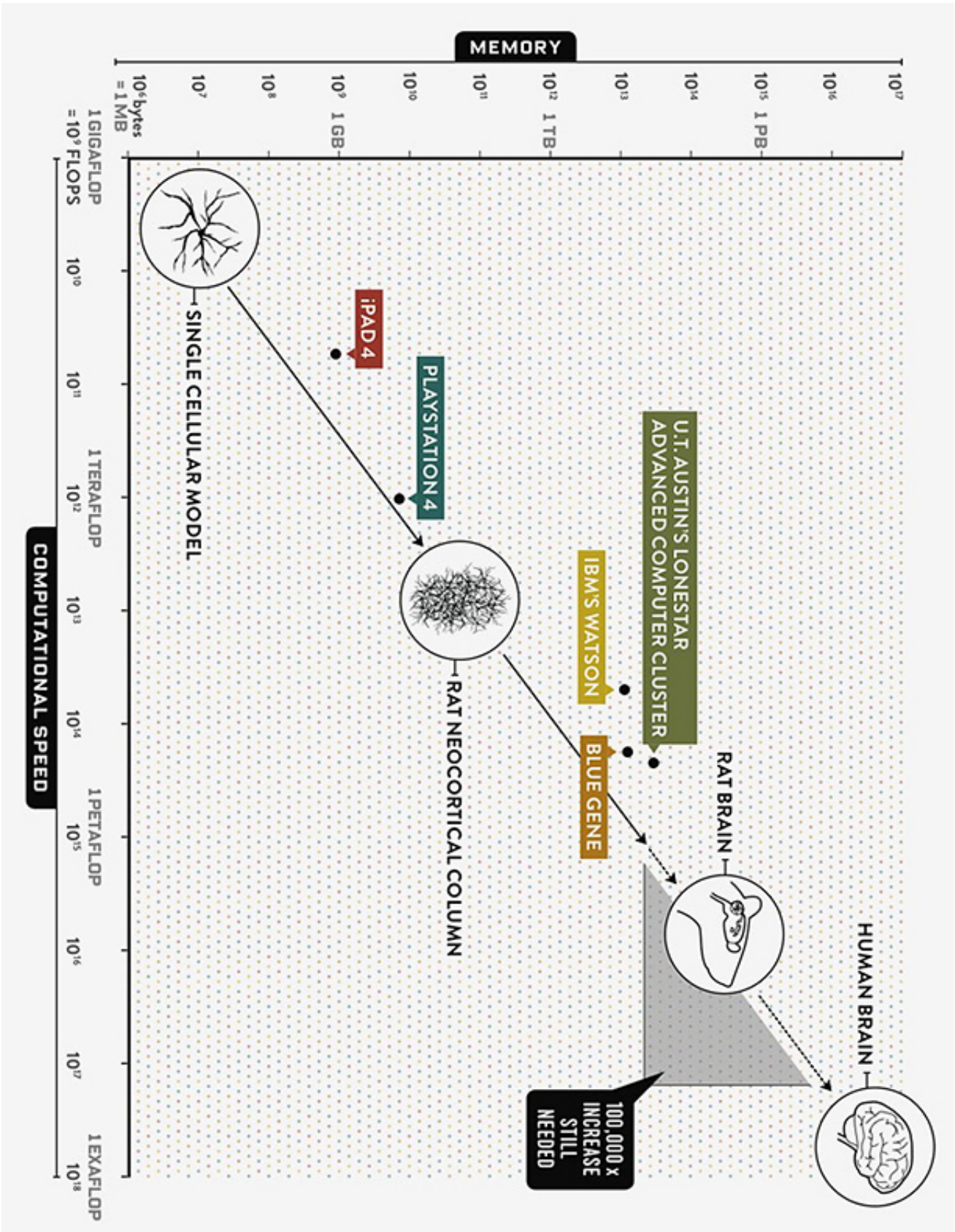
https://towardsdatascience.com/transfer-learning-from-pre-trained-models-f2393f124751
Marcelino, P.; 2018



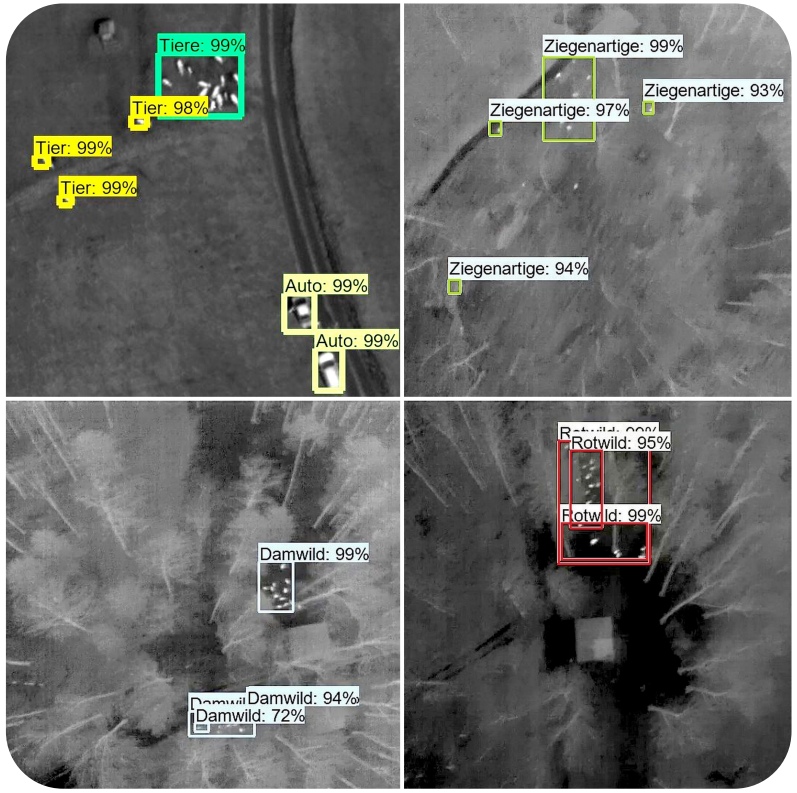


Computing Power

https://www.visualcapitalist.com/visualizing-trillion-fold-increase-computing-power/



Use Case: Wildlife Monitoring



June 26, 2019

	Auditorium / other	Room 1	Room 2
09:00		**Accelerating distances calculations using GPU** (Serhii Hulko)	**Getting Data out of CAD and into Python** (Joseph Kaelin, Martin Pike)
		Spatial data in real-time apps with Python (Dmitry Karpov)	**Geomapping with Pyecharts(Echarts.js)** (Chenfu Wang)
10:00	**Coffee Break**		
		Automated and reproducible object	**Sporty Python** (Hans-Jörg Stark)
11:00		**Working with 3D city models in Python** (Balázs Dukai)	**Raspberry Pi & Camera** (Hans-Jörg Stark)
		Site planning with Geopandas and CARTO (Giulia Carella)	**Analyzing geospatial data using GeoPandas** (Marvin Bensch)
12:00	**Lightning Talks**		
13:00	**Lunch**		
14:00		**Open source web-based tool for quality**	**PyViz for Mapping Global Shipping**
		Using Tensorflow for Infrared UAV-based Wildlife Detection (Adrian Meyer)	**ipyleaflet - A Jupyter-Leaflet bridge enabling interactive maps in Jupyter**
		Digital Farming: Fertilise Variably Based on Satellite Data (Aragats)	**PySnooper - Never use print for debugging again** (Ram Rachum)
15:00	**Closing Session & Raffle** (Martin Christen)		

Thank you!