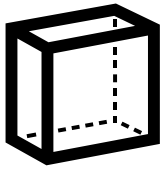
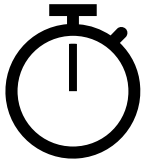
# Coin Detector

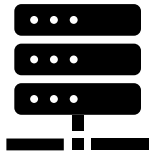
# Technical Motivation for the Project



**Object recognition as an interesting field**



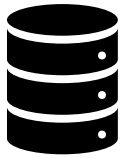
**Time intensive training & prediction**



**Computationally intensive**

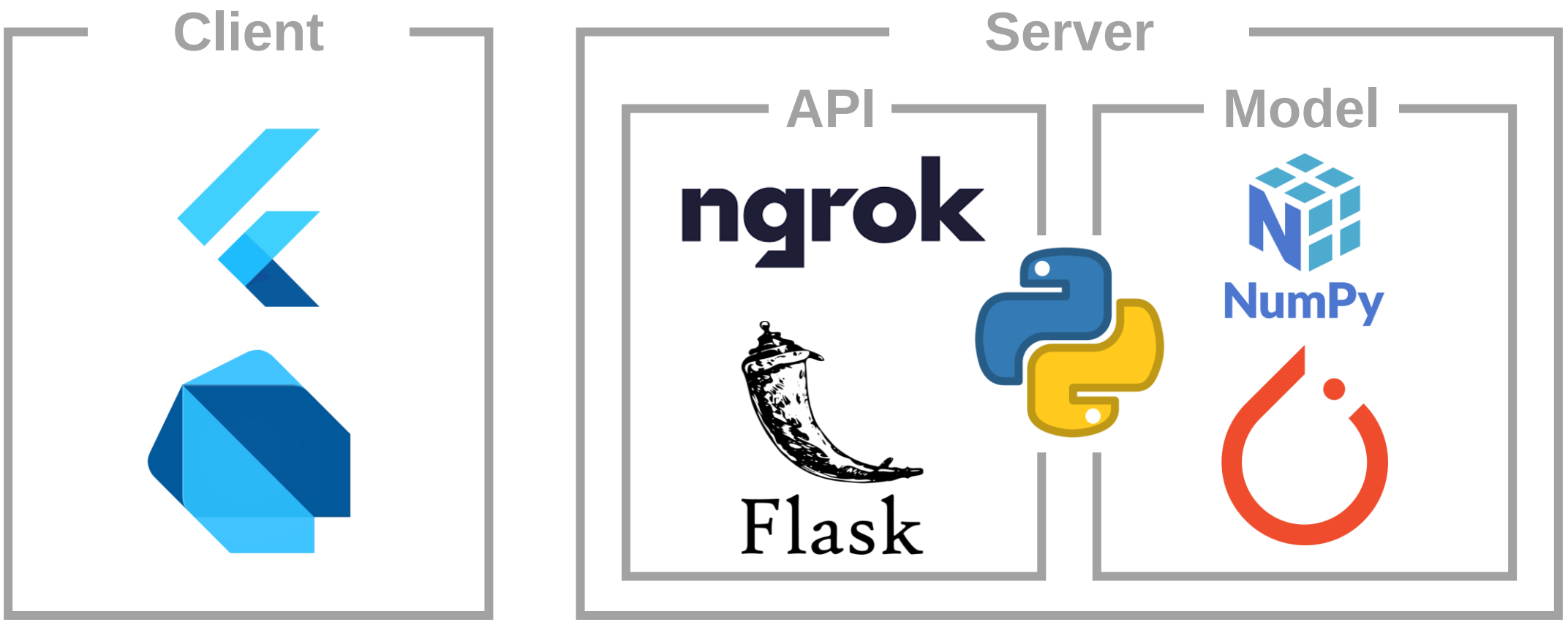
**Performing multiple tasks**

**Communication between client & server**

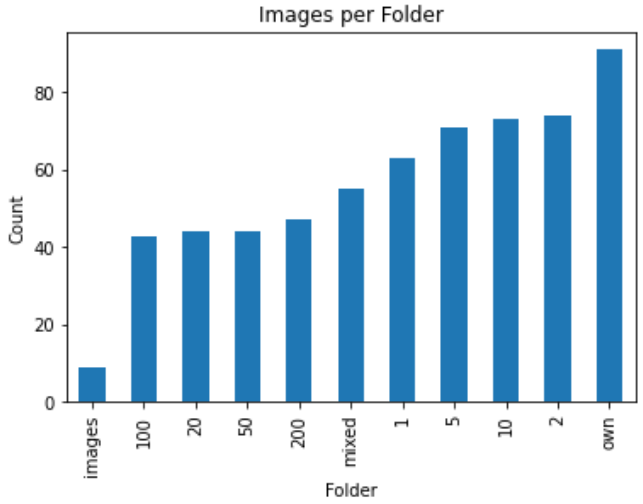


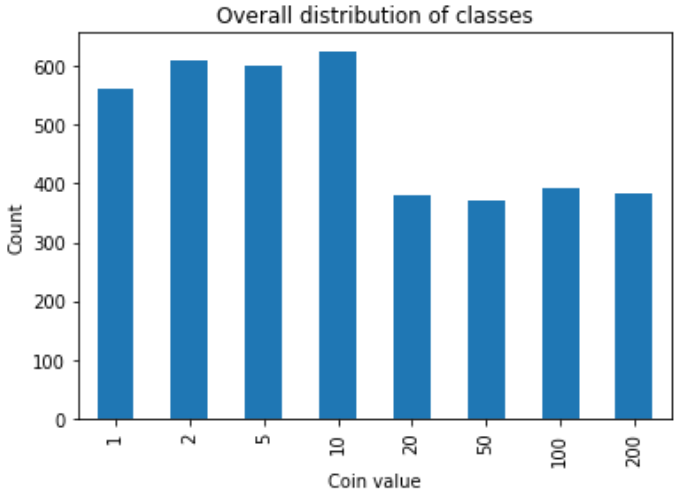
**Data poses a challenge**

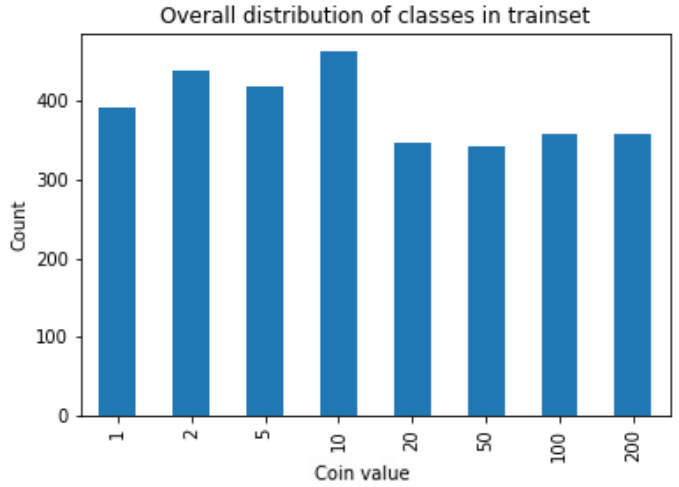
# Technology Stack

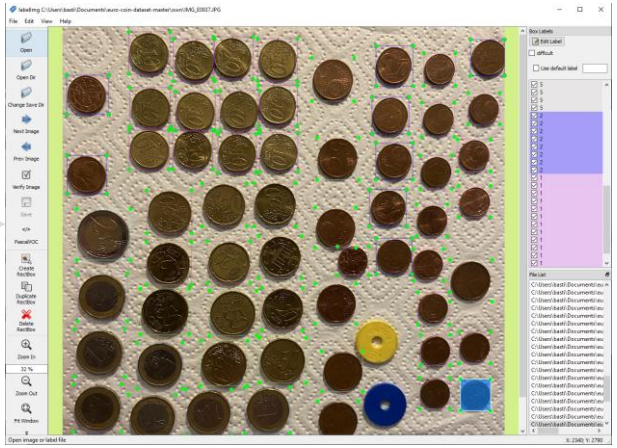


# Data



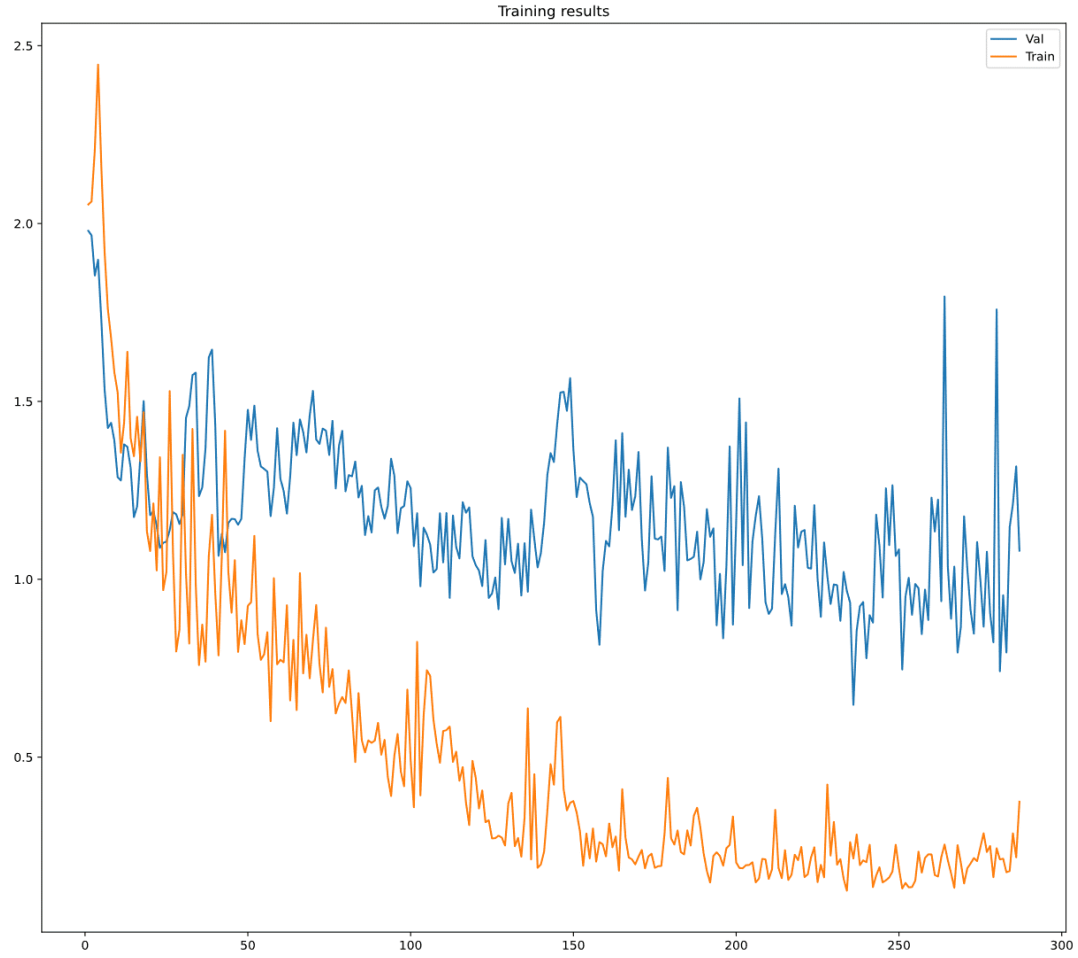



- In addition to public dataset, other images were self-labeled
- Training data is comparatively similarly distributed → Test data is less similarly distributed
- Images are challenging
  → Even a person does not recognize all coins
  → Head side is barely distinguishable

# Model Selection & Training

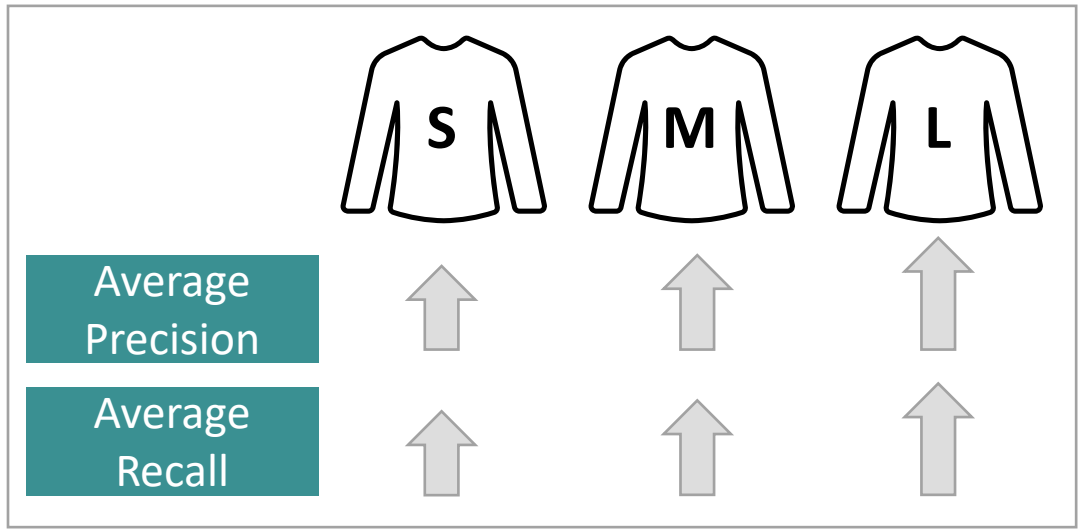
**Faster R-CNN**
**MobileNet v3**

PyTorch
Epochs: 287
Batch Size: 4
Pretrained: COCO
Graphics Card: P100



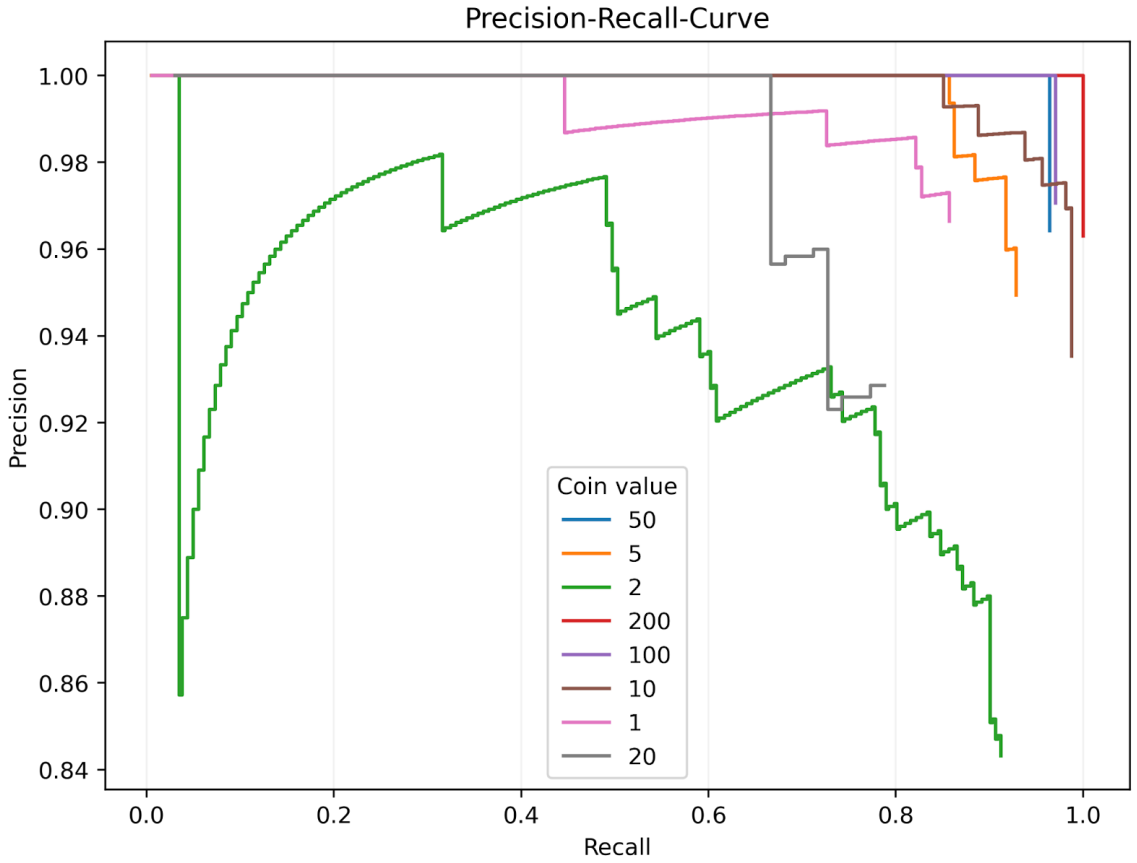

Fewer parameters than ResNet-50 or VGG-16, thus:
faster & less expensive training faster predictions
→ faster & cheaper training
→ faster predictions

# Model Evaluation

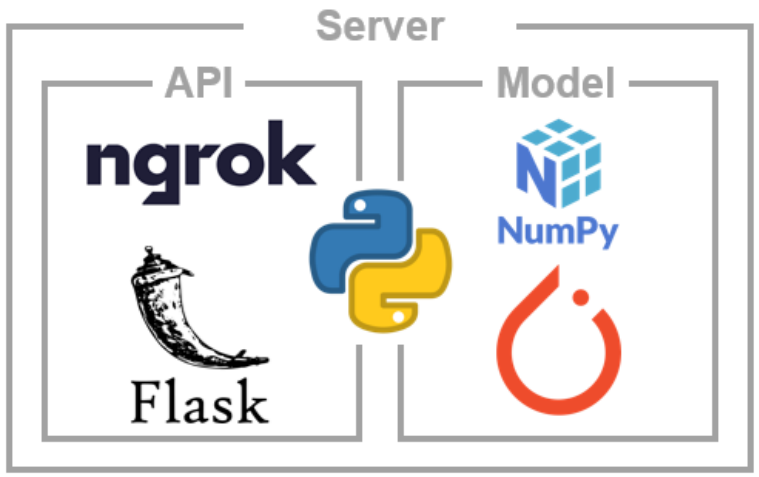



**Findings:**

- Average Precision of 0.79
- No large jumps between object sizes
- Big problems with 1 and 2 cent coins → Why?



# Server




- The model is in the backend for several reasons:
  - Easy change
  - Performance → long inference time on cpu
  - Memory size of the model

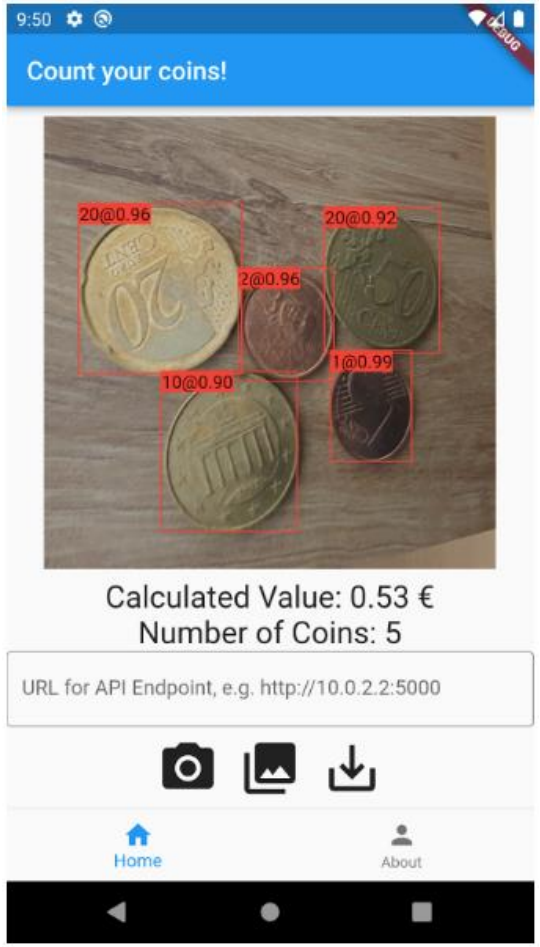
- Returned values :
  - Accumulated value of coins
  - Bounding boxes of recognized coins
  - Labels of recognized coins
  - Confidences for recognized coins

→ Why not a fully rendered image?

# App


- Take photo from gallery
- Take new photo
- Photos are allowed only in rectangular format

- Send image to backend
- Coordinates of bounding boxes, labels and confidences are sent back to the app
- Information displayed in app on image
- Save image with new info



# Outlook

- Model deployment on the client device
- Host server on cloud instance
- Label new images
- iOS support
- Differentiation of the training data in head or number
- Publish app