ON THE RIGHT FOOD

Image-based Food Recognition

to Help you Track your Food Intake

Capstone Project

Neuefische Data Science Bootcamp

2nd May, 2023

Our Team

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Biophysics

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Transaction Management

Image-based Food Recognition

Practical Use-cases for Food Recognition from Images:

Personal Diet

- Tracking food by simply taking a picture.
- Follow your diet.

Healthcare

- Monitoring food classes, amounts, nutrients.
- Assist doctors to make diagnosis.

Environmental Research

- Analysing food-related environmental impacts.
- Support scientists for environmental research.

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¼ Global Gas Emission coming from Food!

Our Targets

Build and train a neural network model to detect different foods from an image.
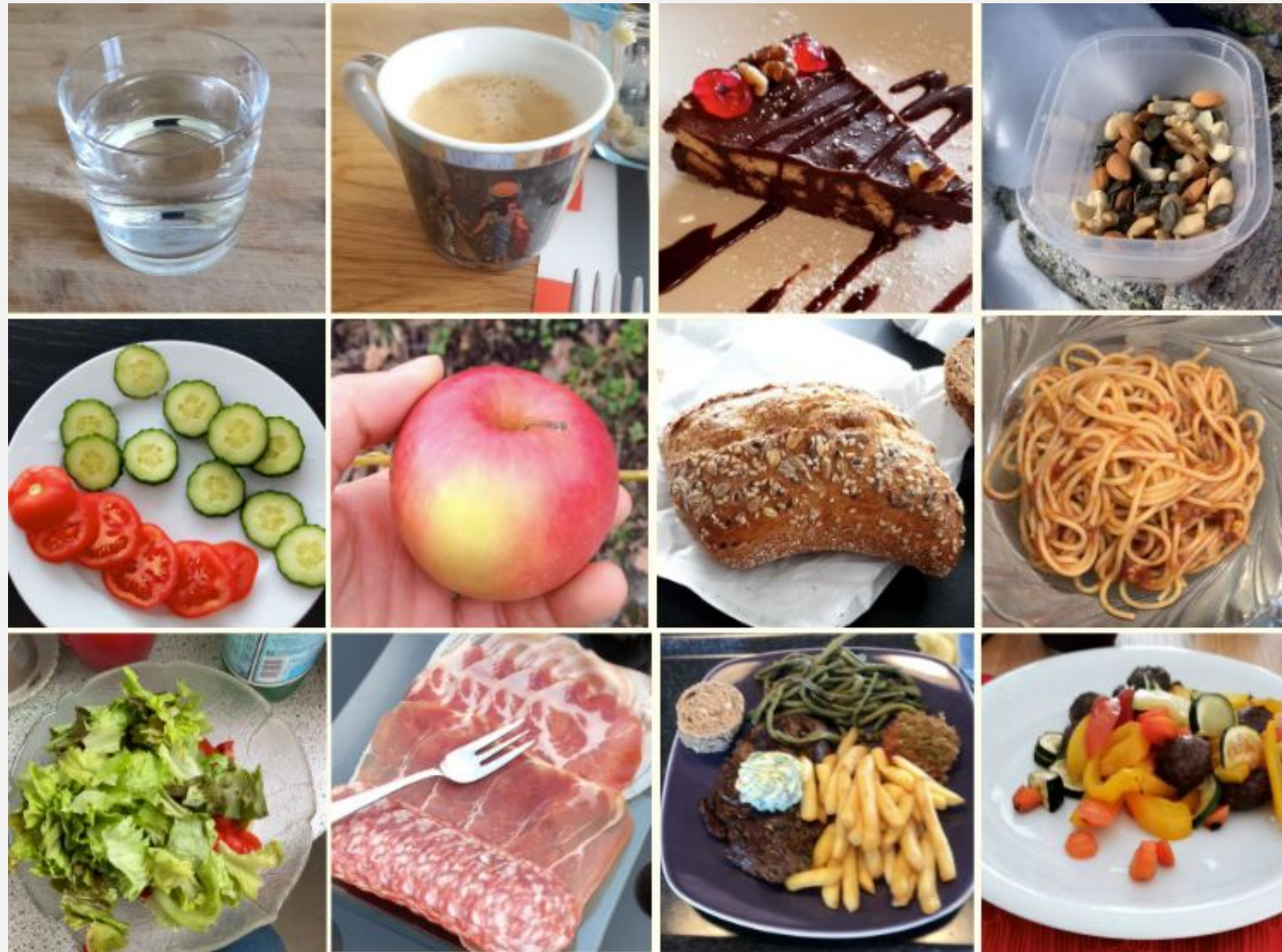
Output segmentations for the foods in the image, estimate amount of food, connect result to nutrition information.

Real–World Images

Image Data Source: MyFoodRepo APP

Different backgrounds, brightness.

Various in shapes, amounts, combinitions.

Foods could be mixed or overlapped.

Dataset Overview

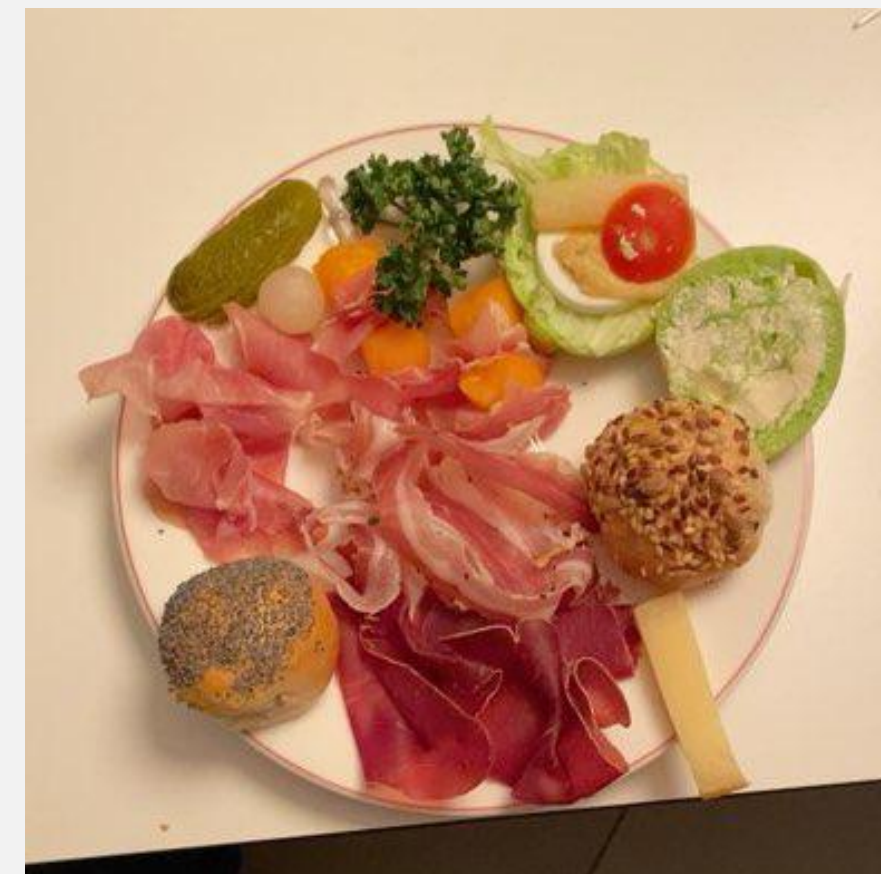40,962 Images

78,321 Annotations
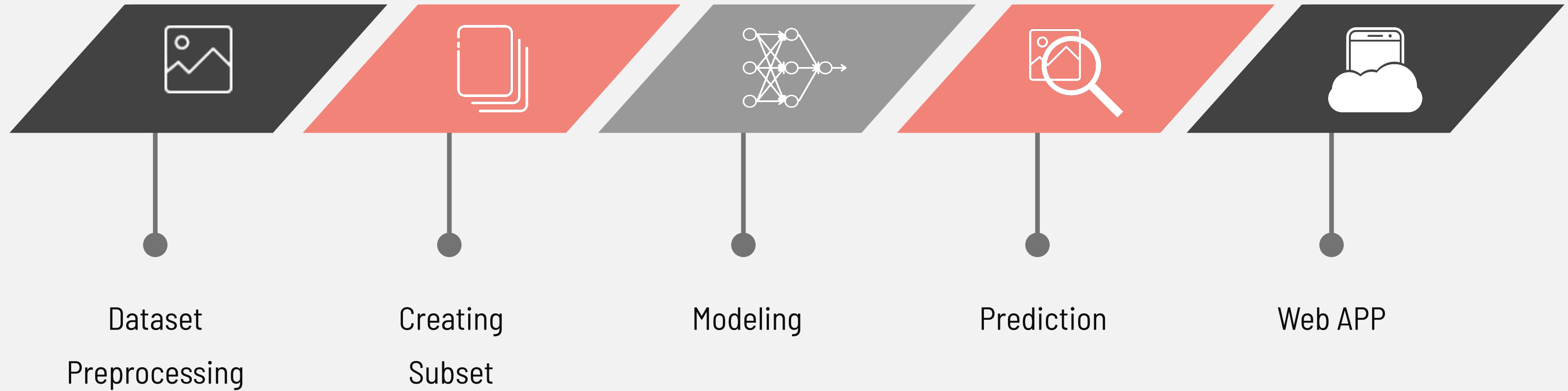
498 Food Classes

Imbalanced Dataset:

12 ~ 2928 Images for each Food Class.

1 ~ 13 Food Class Annotations in each Image.

Example: Image with **13** food class annotations

Workflow

Dataset Preprocessing

Creating Subset

Modeling

Prediction

Web APP

Fixing Dataset

Before preprocessing:
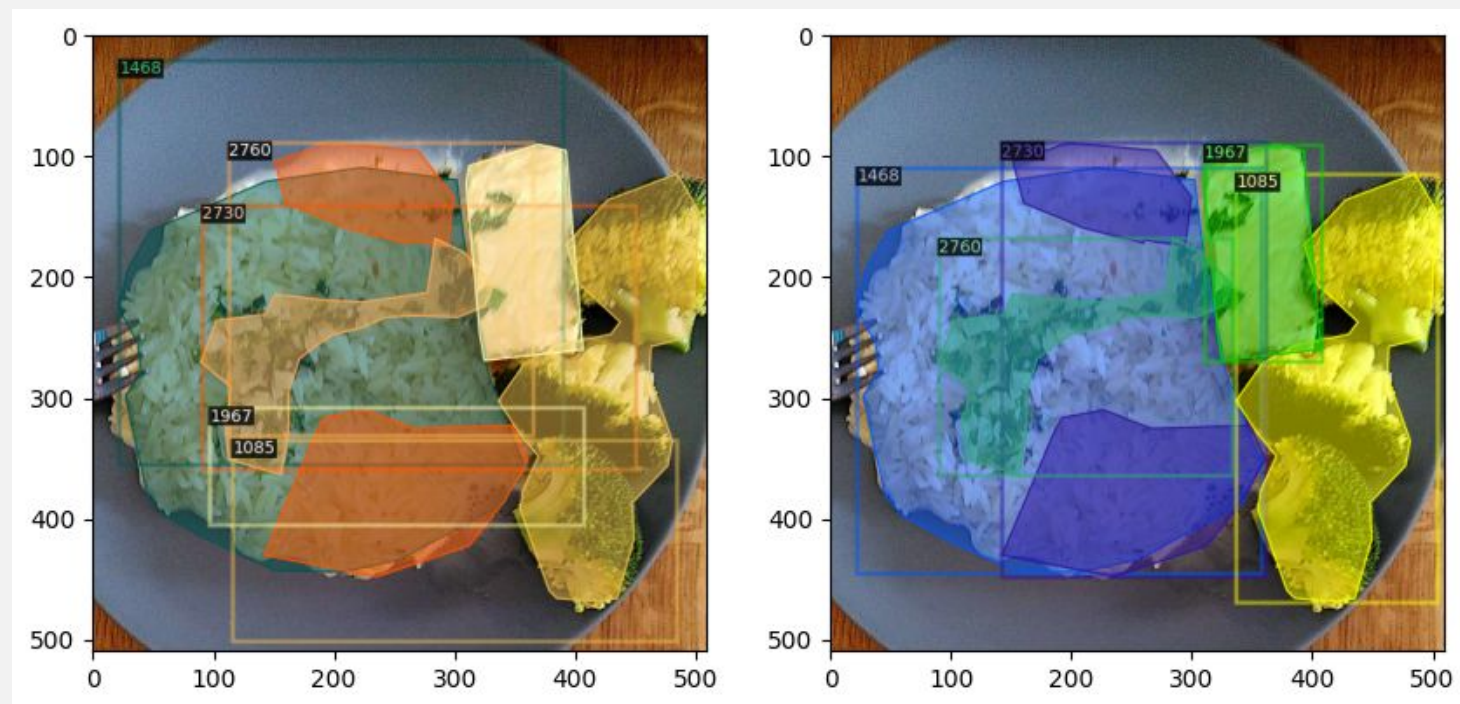
Real-World
Images

- Inaccurate Labels/Annotations

- Incorrect Metadata

- Imbalanced classes

- Mislabelling and Outliers

Fixing Dataset

Our automated preprocessing:

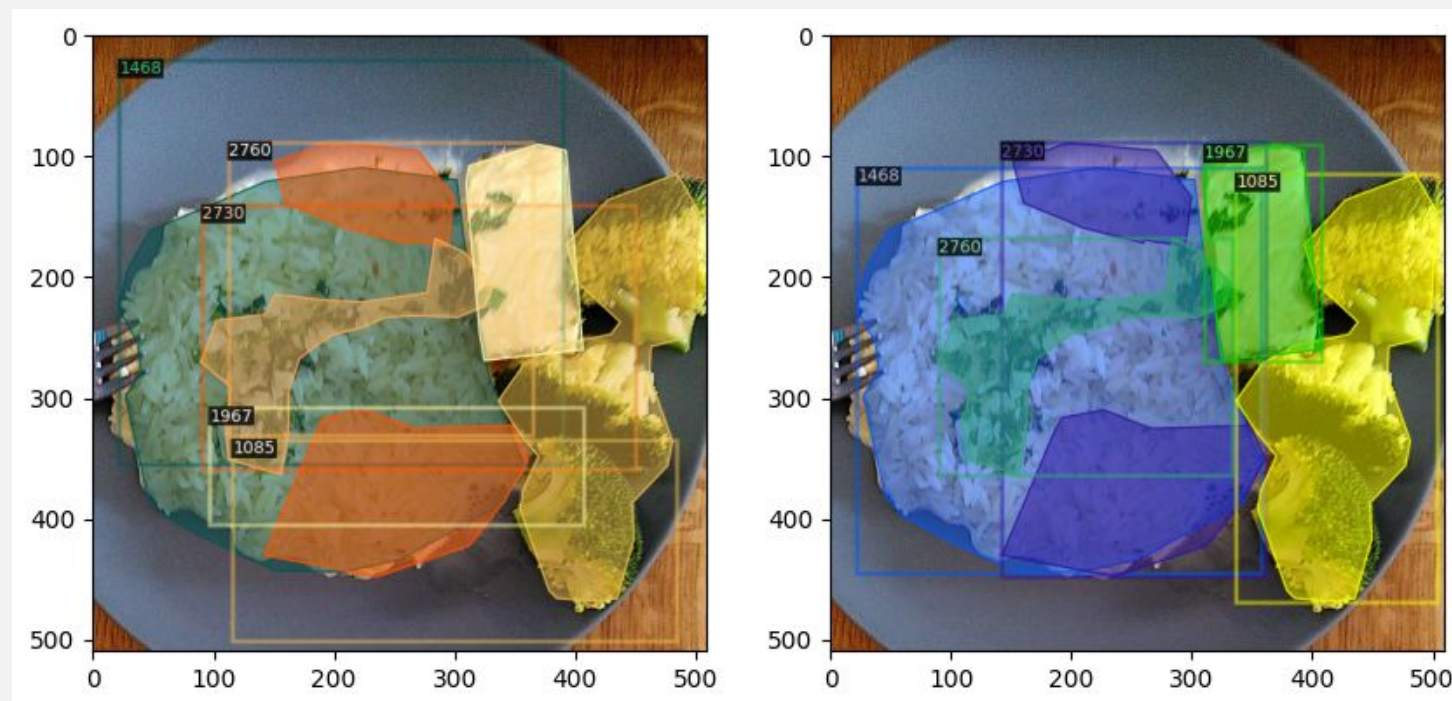- Creating new boundary boxes for each image
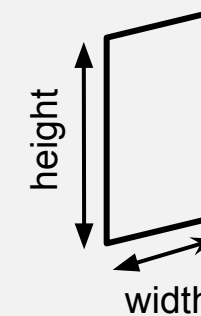
Fixing Dataset

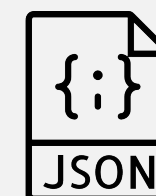*Our automated preprocessing:*

- Creating new boundary boxes for each image

- Reading and saving real image information
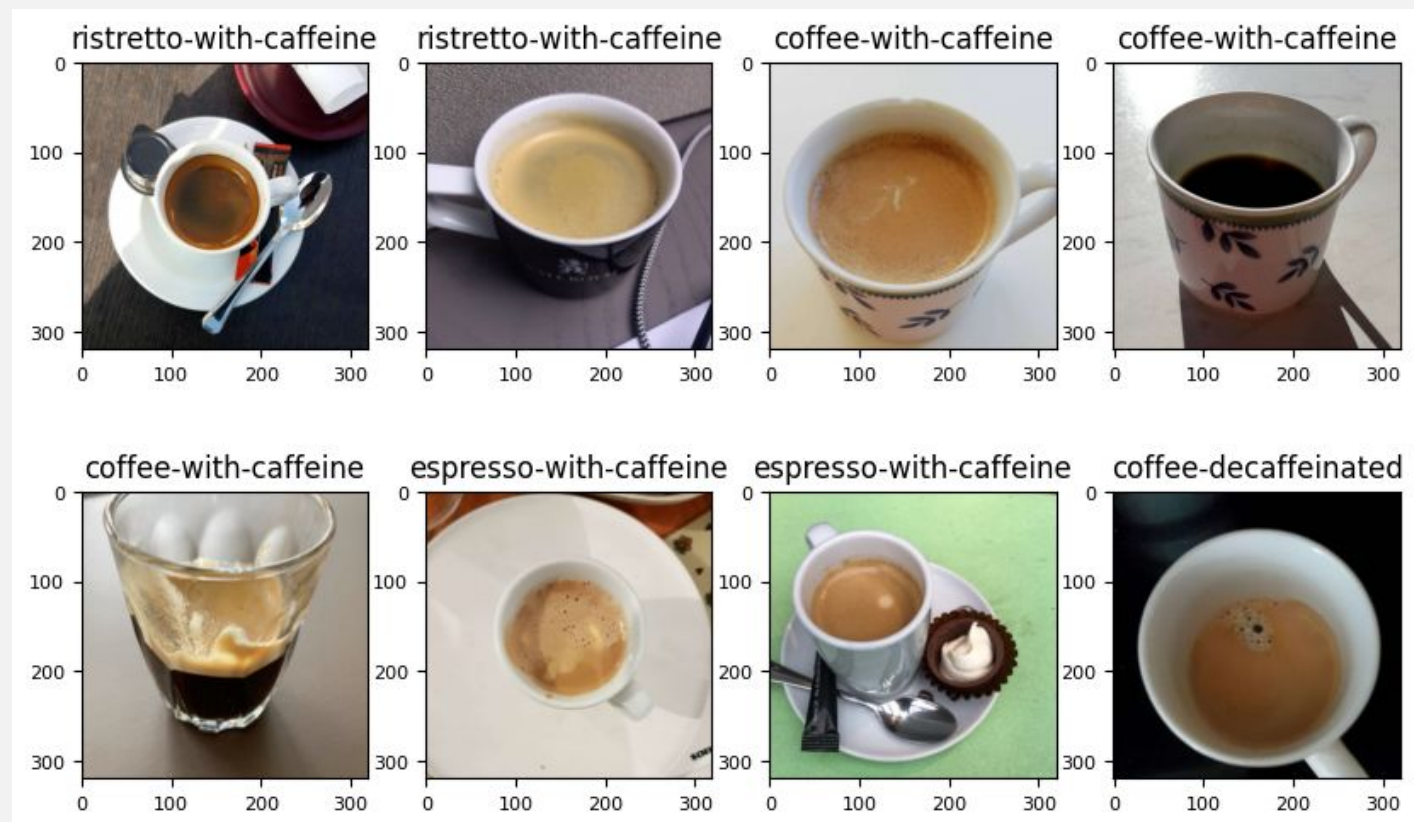

Correcting metadata of the images

Creating annotations file **every time** we make a subset of the training data

Fixing Dataset

Our automated preprocessing:

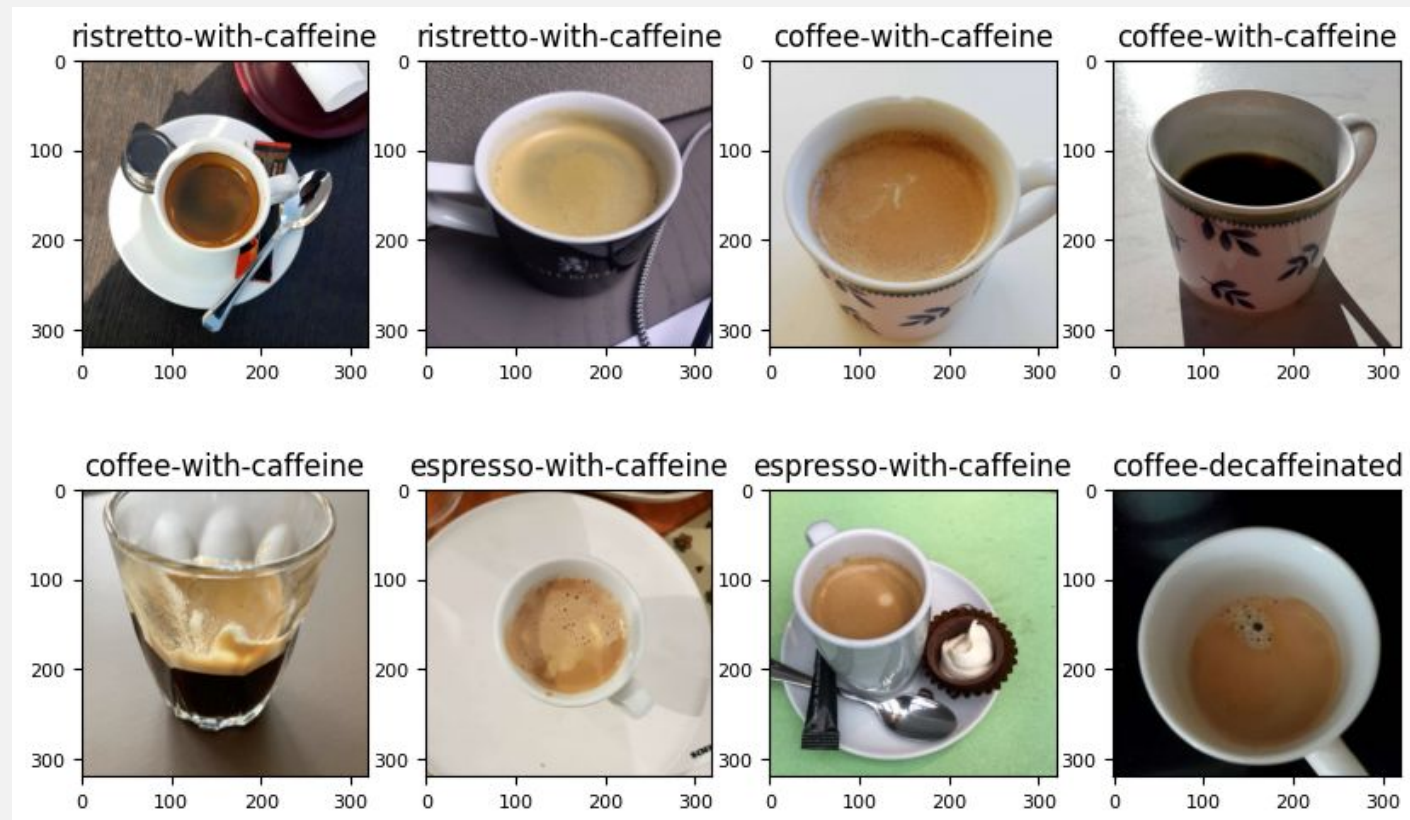- Grouping similar labels/annotations in one class

new class: "coffee"

Fixing Dataset

Our automated preprocessing:

- Grouping similar labels/annotations in one class

new class: "coffee"

- Downsampling of overrepresented classes:

  - From 498 classes reduced to 350 classes

  - From each class randomly selected 200 images

Training

Preprocessing:

Creating Data Subset:

Modelling:

Training:

Original images

Data Augmentation

Model Selection

Model Training
on a
Virtual Machine

- Correcting BBoxes
- Correcting Metadata
- Relabelling

Small subset

Detectron2
R50+FPN(ResNET50+FPN)

ultralytics
YOLO5n, YOLO5s, YOLO4tiny

Model performance and evaluation

fg_cls_accuracy
tag: fast_rcnn/fg_cls_accuracy

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Applying The Model

Cloud

Local

Web application

create_annotations.py
training.py

Training

annotations.json
training.py

model.pth
annotations.json

Model
transfer
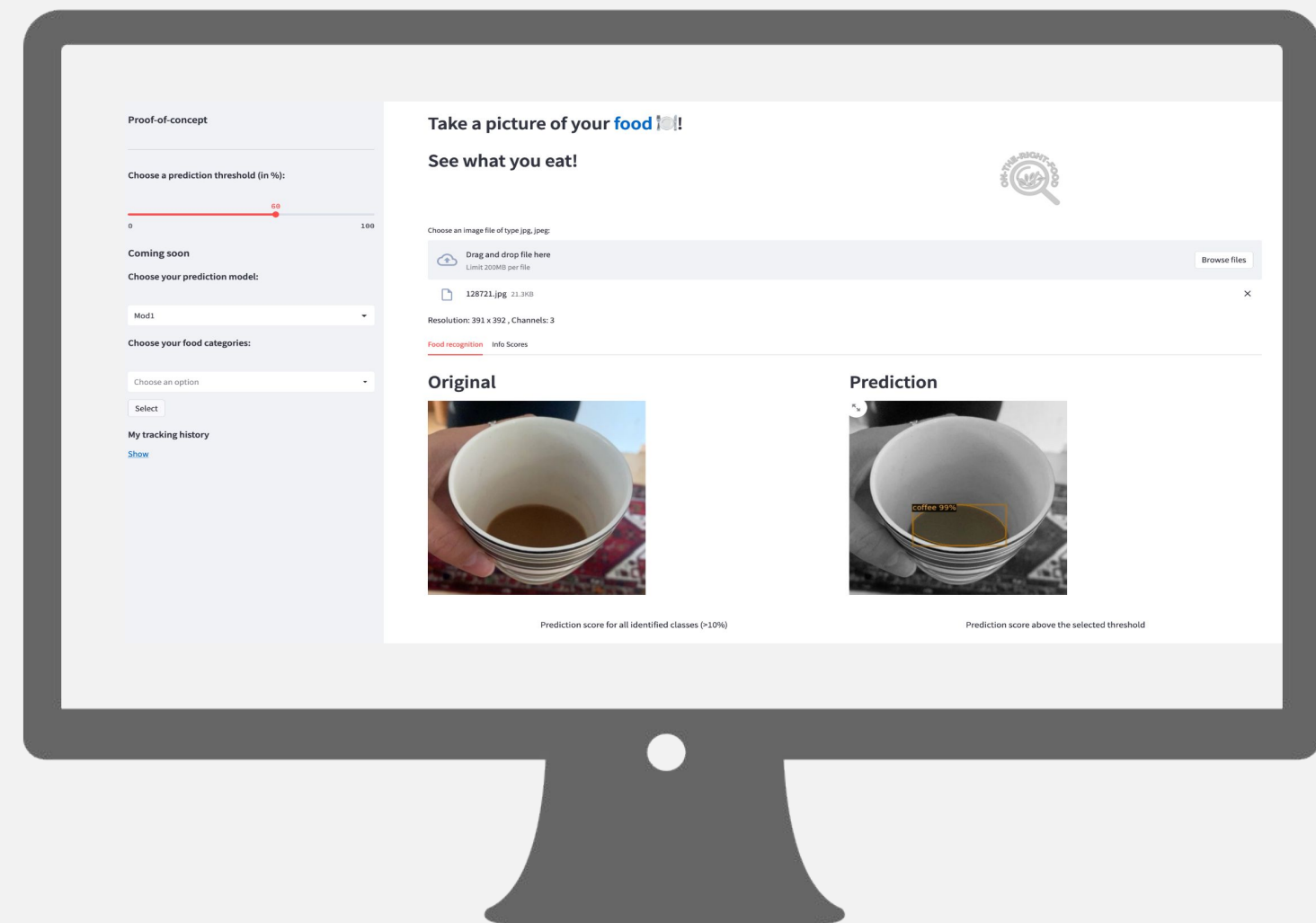
model.pth
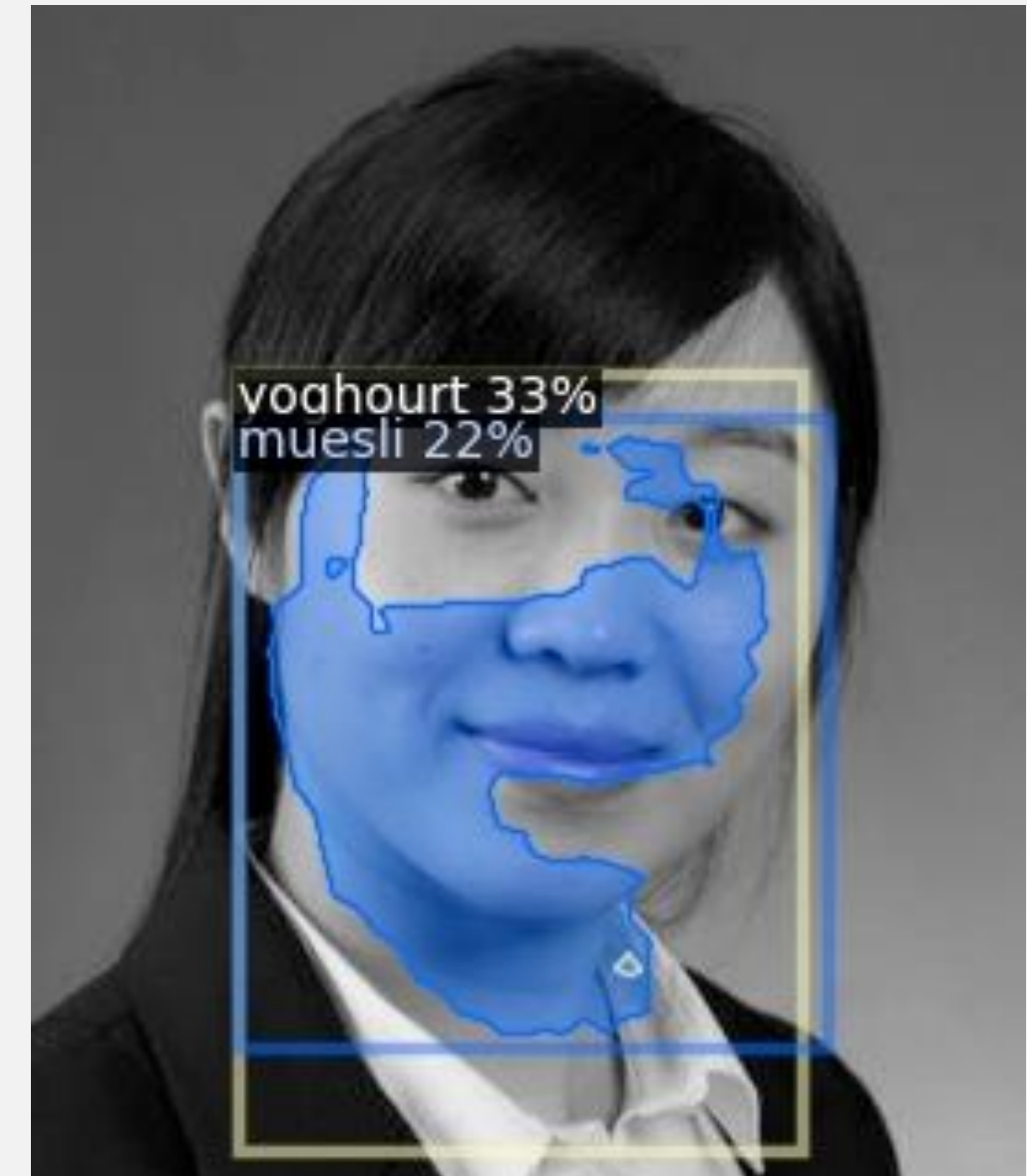annotations.json
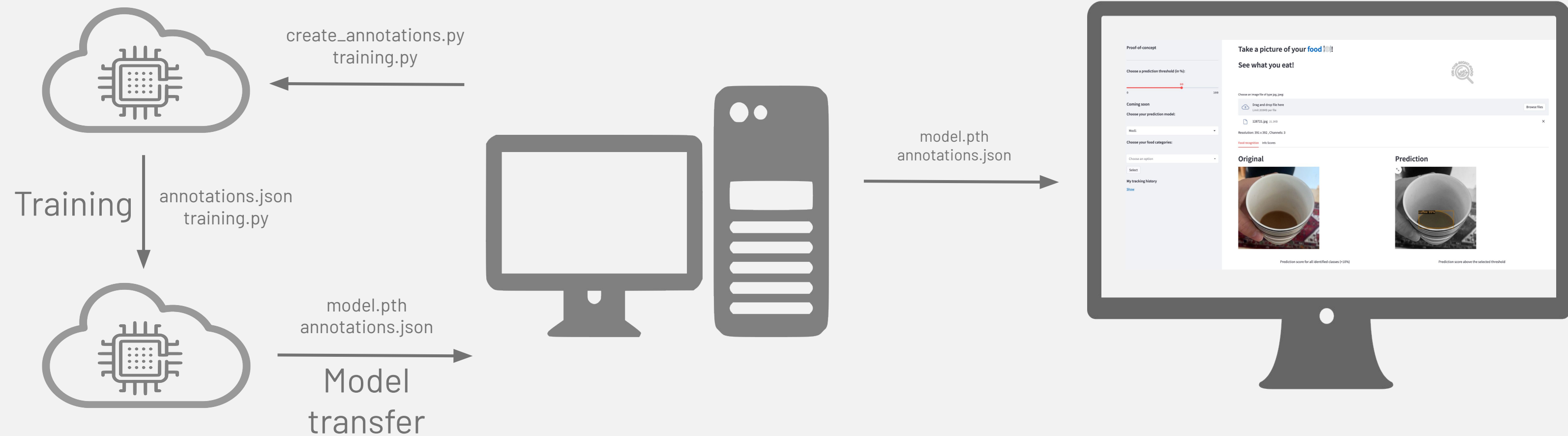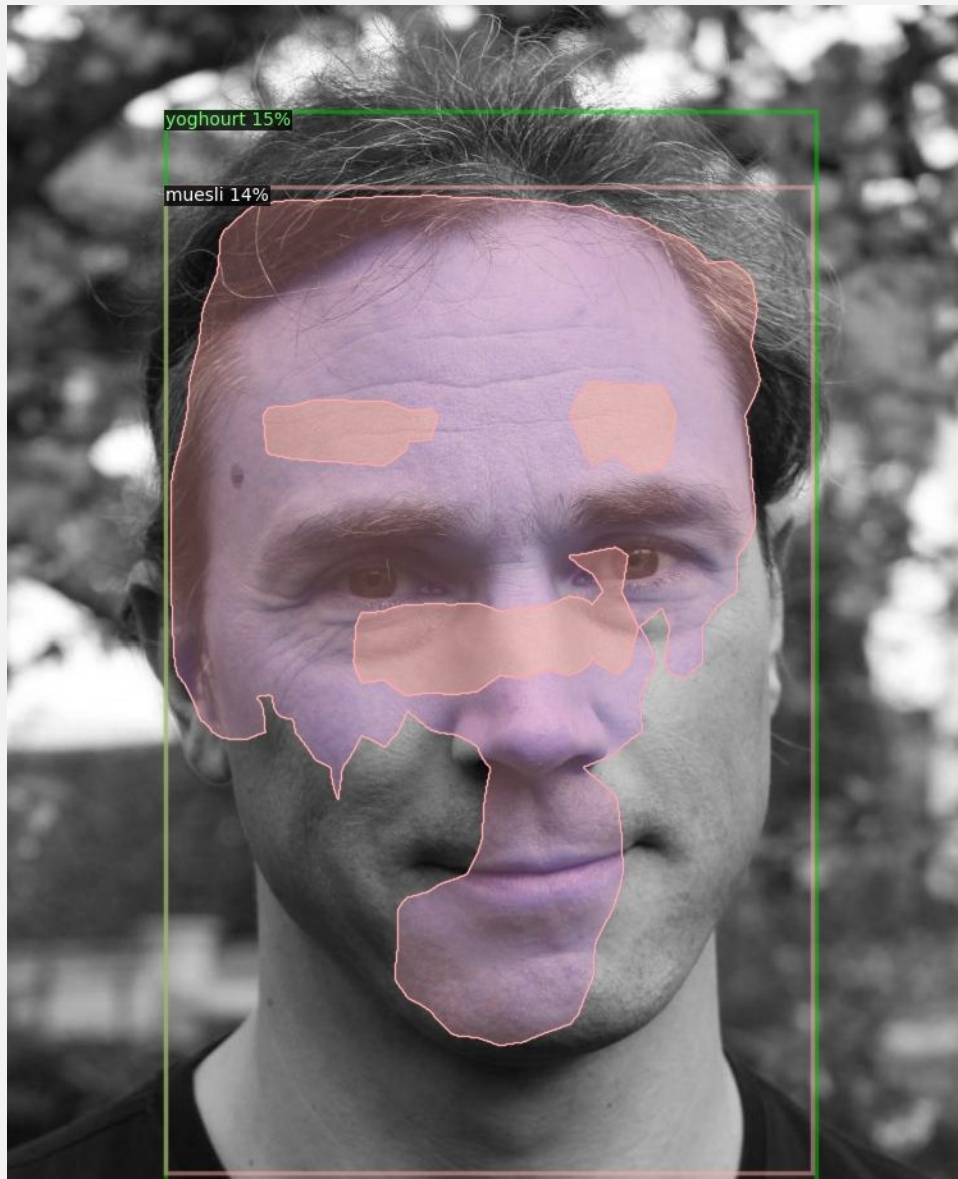
On-The-Right-Food Web Application

For the proof-of-concept, we set up an interactive demo web application locally.

[On the right food](#)

You Are What You Eat!

Outlook

Improve the accuracy of the model.

Implement the calculation of the absolute area for each segment.

Link our estimation to dataset for nutrition and environment impact scores.

Further development of the app to implement the new functions.

THANK YOU!

Do you have any questions?

We are looking forward to meeting you in our breakout room!

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