ZEKI
Zentrum für erlebbare
Künstliche Intelligenz
und Digitalisierung e.V.

2023 Internship Group Presentations

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Smart Fridge - Object Detection

Group members:

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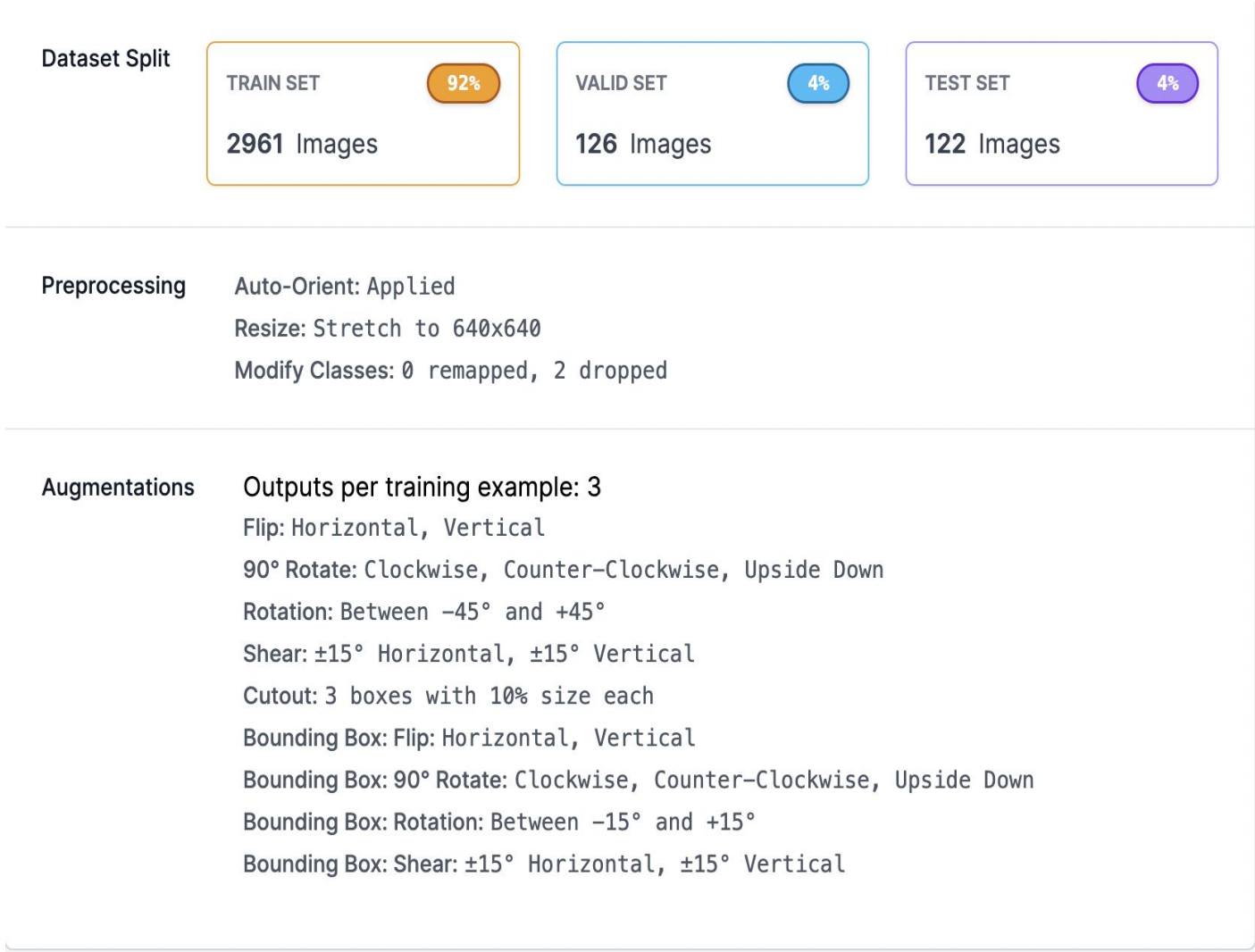
Description:

- Live multiclass object detection for market products
- Text recognition with OCR

Data

- Freiburg University Groceries Dataset (Flour, Coffee, Tea, Water, Milk)
- Add person class for detection but eliminated for the livecam
- Annotated 1235 images in Roboflow
- After augmentations ⟶ Total 3503 images



Object Detection

- Model: YOLOv8 with custom dataset ⟶ 120 epoch, 0.85 accuracy

	Real Classes	Predictions
0	[Wasser-Water]	[(Wasser-Water, 0.915167)]
1	[Wasser-Water]	[(Wasser-Water, 0.920039)]
2	[Tee/Tea]	[(Tee/Tea, 0.872797)]
3	[Mehl/Flour]	[(Tee/Tea, 0.92071)]
4	[Kaffee/Coffee]	[(Kaffee/Coffee, 0.945804)]
5	[Milch/Milk]	[(Milch/Milk, 0.898215)]
6	[Kaffee/Coffee]	[(Kaffee/Coffee, 0.926029)]
7	[Wasser-Water]	[(Wasser-Water, 0.923966)]
8	[Wasser-Water]	[(Wasser-Water, 0.908117)]
9	[Tee/Tea]	[(Tee/Tea, 0.845792)]
10	[Milch/Milk]	[(Milch/Milk, 0.798314)]
11	[Kaffee/Coffee]	[(Kaffee/Coffee, 0.837296)]
12	[Wasser-Water]	[(Wasser-Water, 0.91891)]
13	[Wasser-Water]	[(Wasser-Water, 0.878262)]
14	[Mehl/Flour]	[(Mehl/Flour, 0.915716)]
15	[Kaffee/Coffee]	[(Kaffee/Coffee, 0.876418)]
16	[Wasser-Water]	[(Wasser-Water, 0.882628)]
17	[Milch/Milk]	[(Milch/Milk, 0.940181)]
18	[Kaffee/Coffee]	[(Kaffee/Coffee, 0.728006), (Tee/Tea, 0.561747)]
19	[Kaffee/Coffee]	[(Kaffee/Coffee, 0.864749)]
20	[Tee/Tea]	[(Tee/Tea, 0.909276)]

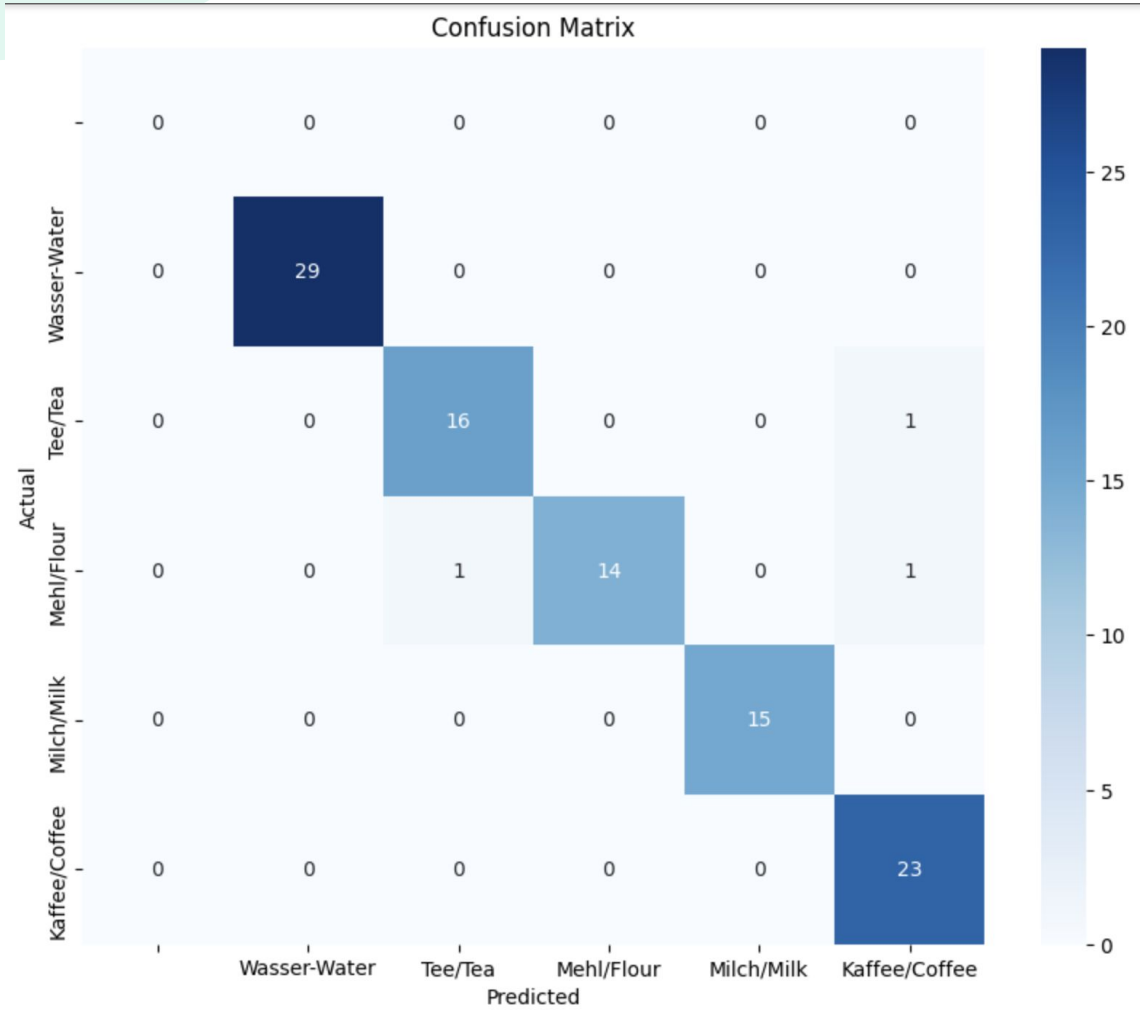
OCR

- Model: Keras OCR
  - Better with images, low qualities, complicated and colorful images
  - Perfectly rotated images, single product

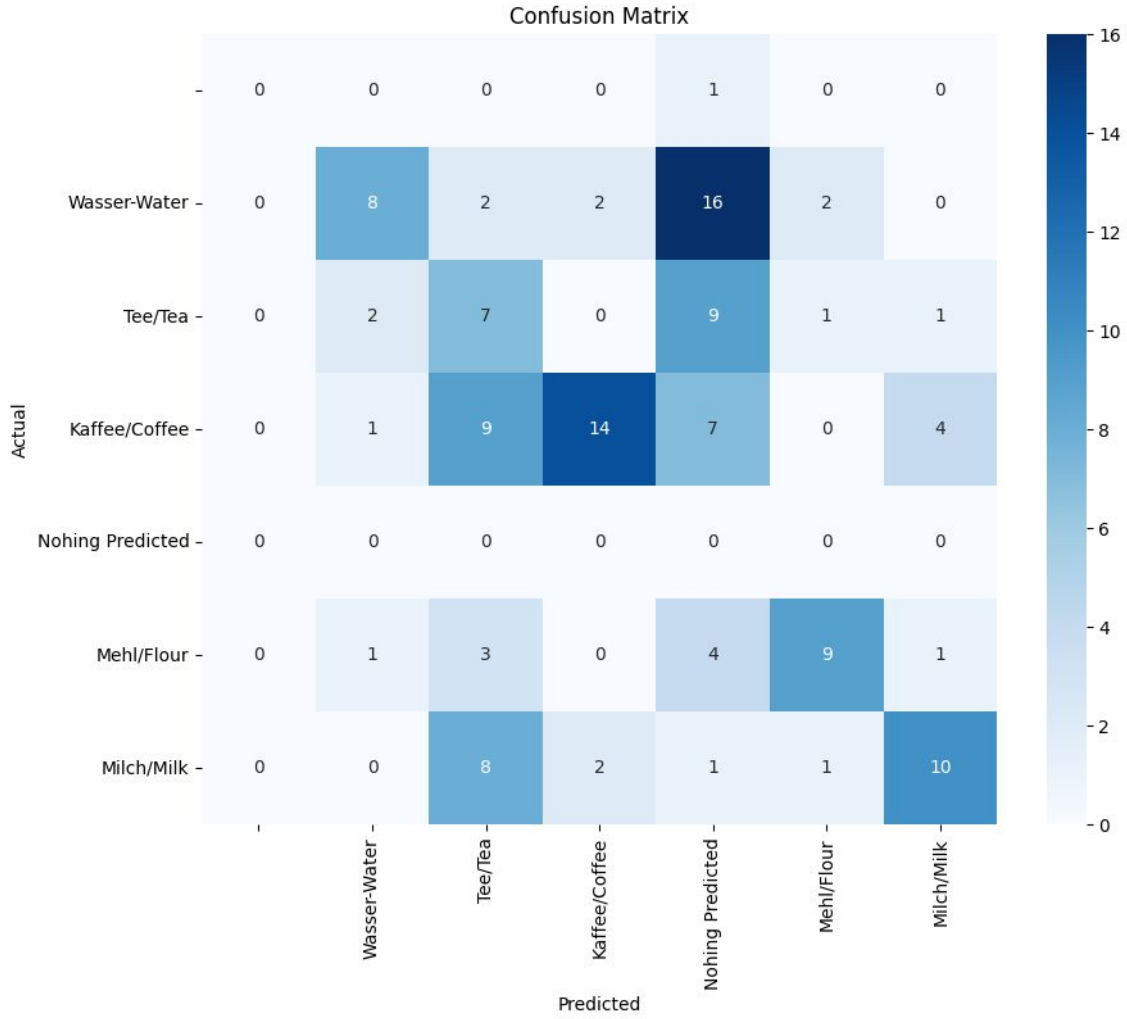
- Get the word if it's in the dictionary
- Get the word if it's in the word in dictionary
- Get the word if the dictionary word is in the word
- Get the closest word to the word
- If nothing found, split the word with wordninja and get the closest word from the splitted words

Results

Object Detection Confusion Matrix:



OCR Confusion Matrix:



Limitations and Further Work

Description:

- There are no enough datasets for the product detection
- Data annotation must be done
- Empty background
- Hyper parameter tuning
- OCR:
  - The product alignments should be perfect for the right prediction
  - One product per image would be better
  - Brands can be detected as a future work
- Object Detection:
  - Model can predict some of the unknown classes
  - Lots of classes should be added for reaching enough products
- Future work:
  - Both models can be applied for smart kitchen and fridge
  - It can also be applied for automatic check out and inventory systems

References

- http://aisdatasets.informatik.uni-freiburg.de/freiburg_groceries_dataset/
- https://roboflow.com/
- https://www.youtube.com/watch?v=QV85eYOb7gk