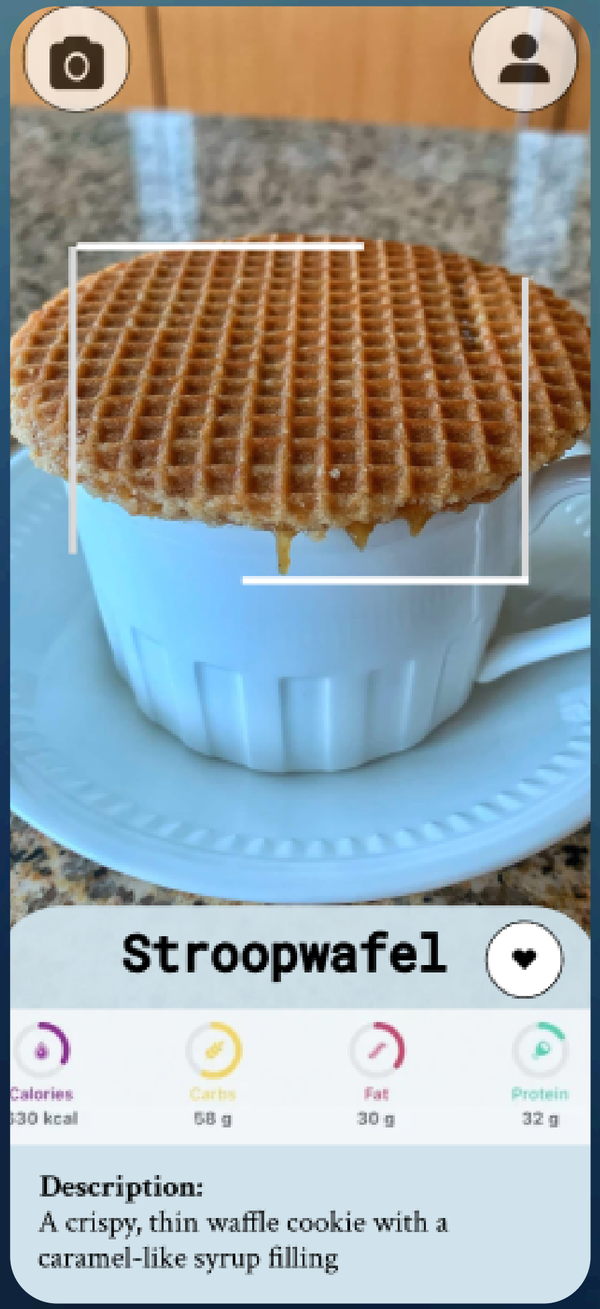


AI-POWERED FOOD RECOGNITION APP

ZOFIA PILITOWSKA

PROJECT PITCH

Problem

Imagine a tourist trying to track their calories using an app, but the app can't recognize the local cuisine. How can they be sure about the nutritional content in the unfamiliar dishes?

Solution

An AI-driven food classification app that accurately detects regional foods like **kroket, poffertjes, bitterballen, herring, or stroopwafel** and other lesser-known items.

Impact

Empowers users to make informed dietary choices, helps tourists and expatriates identify unfamiliar foods, and fills a gap in the market for accurate multi-cuisine recognition.

PROBLEM OVERVIEW

Key Issues:

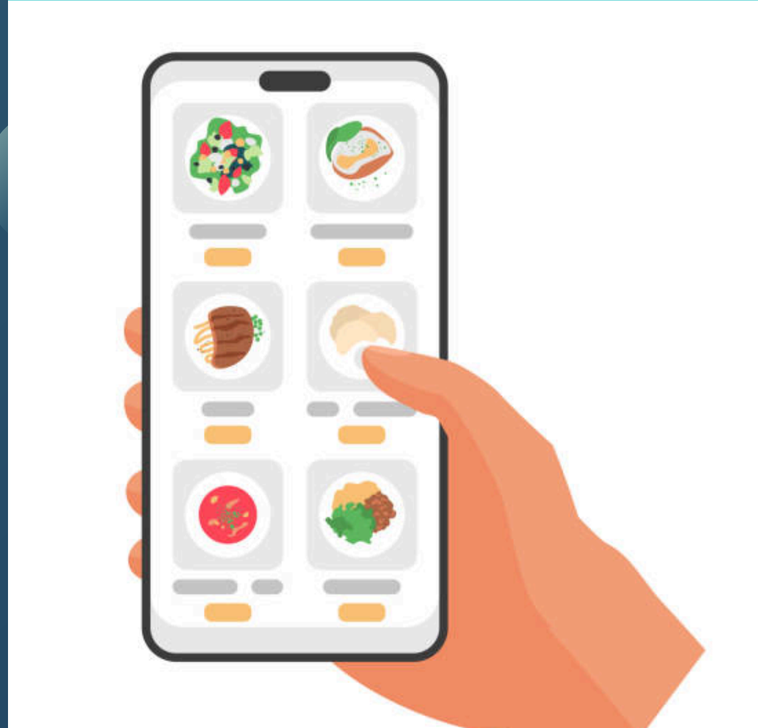
- Existing apps struggle to accurately detect dishes from different cuisine, lack allergen information and fail to provide detailed nutritional tracking.
- Hidden ingredients in traditional dishes make accurate tracking difficult.

Target Users:

- Health-conscious consumers
- Tourists and expatriates
- Dietitians, nutritionists, and researchers

Market Gap - Current apps do not support:

- Multi-cuisine detection,
- Allergen information,
- Effective calorie tracking



MODEL OVERVIEW

01 Creating dataset

AI GENERATED

REAL PHOTHOS

02 Iterations

Iteration 1 – Basic CNN:
Started with a simple CNN to classify Dutch food images. This helped establish a performance baseline.

Iteration 2 – Data Augmentation:
Applied data augmentation techniques (rotation, zoom, flip, etc.).

Iteration 3 – Transfer Learning:
Used pre-trained model EfficientNetB0 to leverage existing features and improve accuracy on limited data.

Iteration 4 – Transfer Learning, improved dataset:
Returned to a custom CNN with a refined dataset.

03 Best model

Final Architecture :

Input shape: (256, 256, 3)
Conv2D (16 filters) → BatchNorm → MaxPooling
Conv2D (64 filters) → BatchNorm → MaxPooling
Conv2D (128 filters) → BatchNorm → MaxPooling
Fully connected layers followed for classification

RESULTS

- I displayed misclassified images from iteration 3 and 4 to identify model weaknesses.

In iteration 3 - main issues:

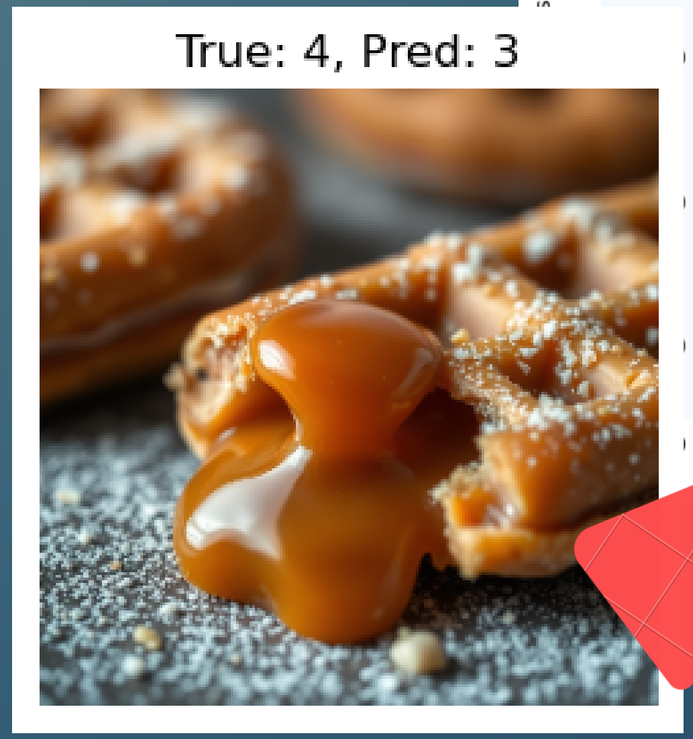
- similar-looking classes
- unrepresentative images
- color variation

In iteration 4:

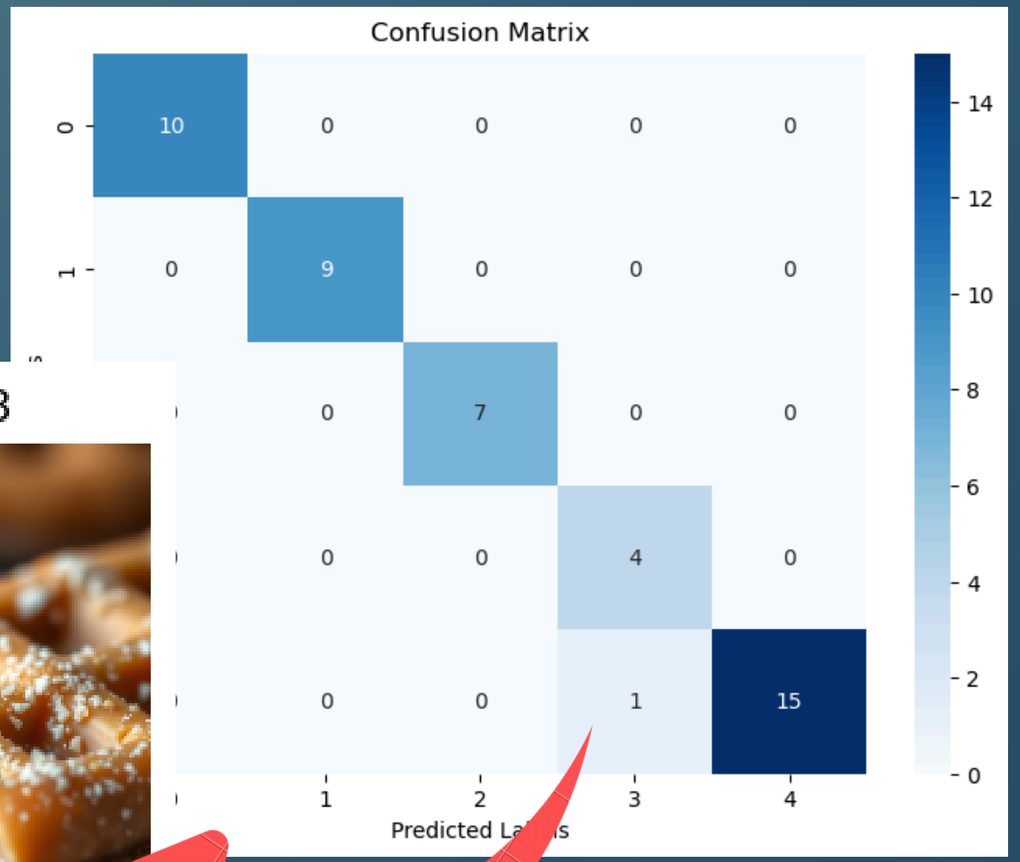
- inter-class similarity

METRICS:

- an accuracy of 0.9783,
- a precision of 0.9826,
- a recall of 0.9783,
- an F1 score of 0.9791



MISCLASSIFIED IMAGE



Canva

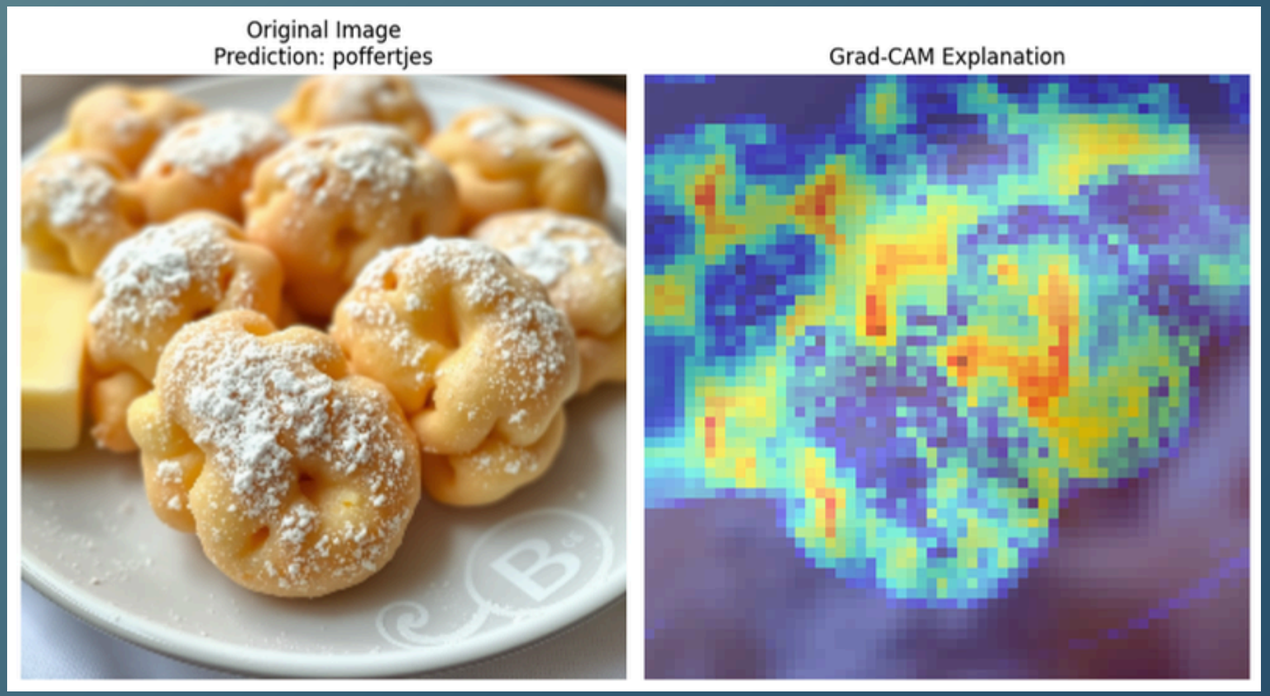
EXPLAINABLE AI

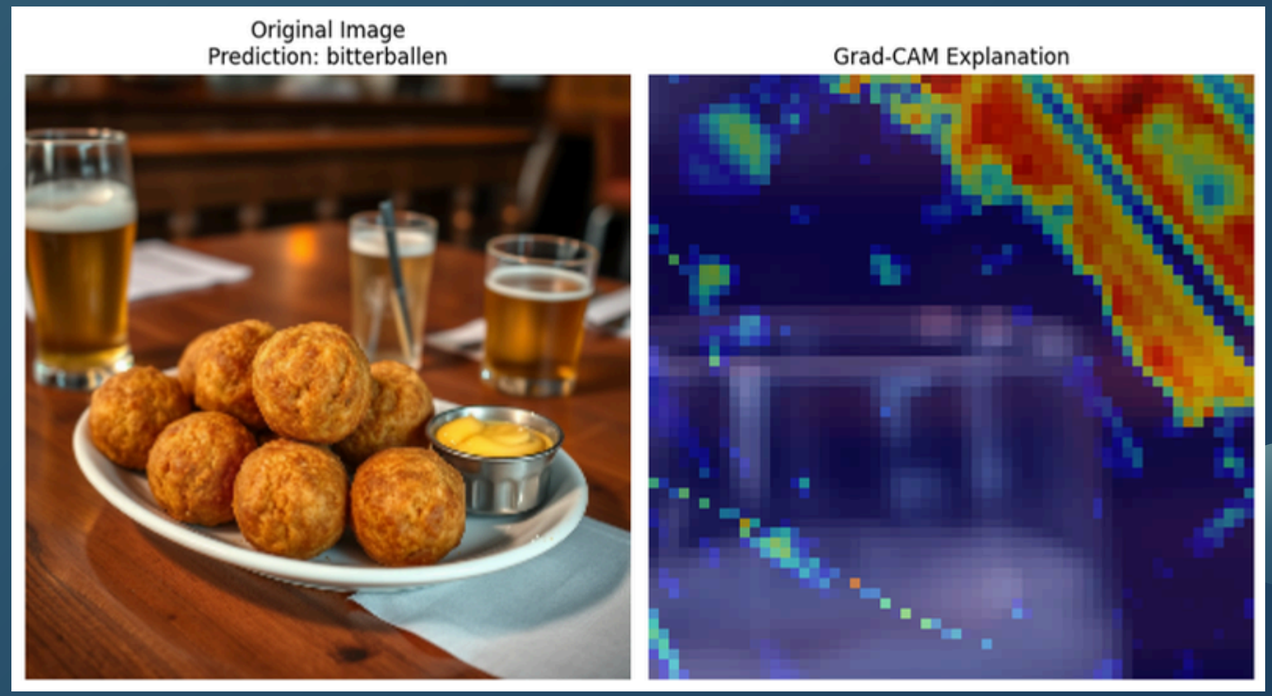
Why Grad-CAM?

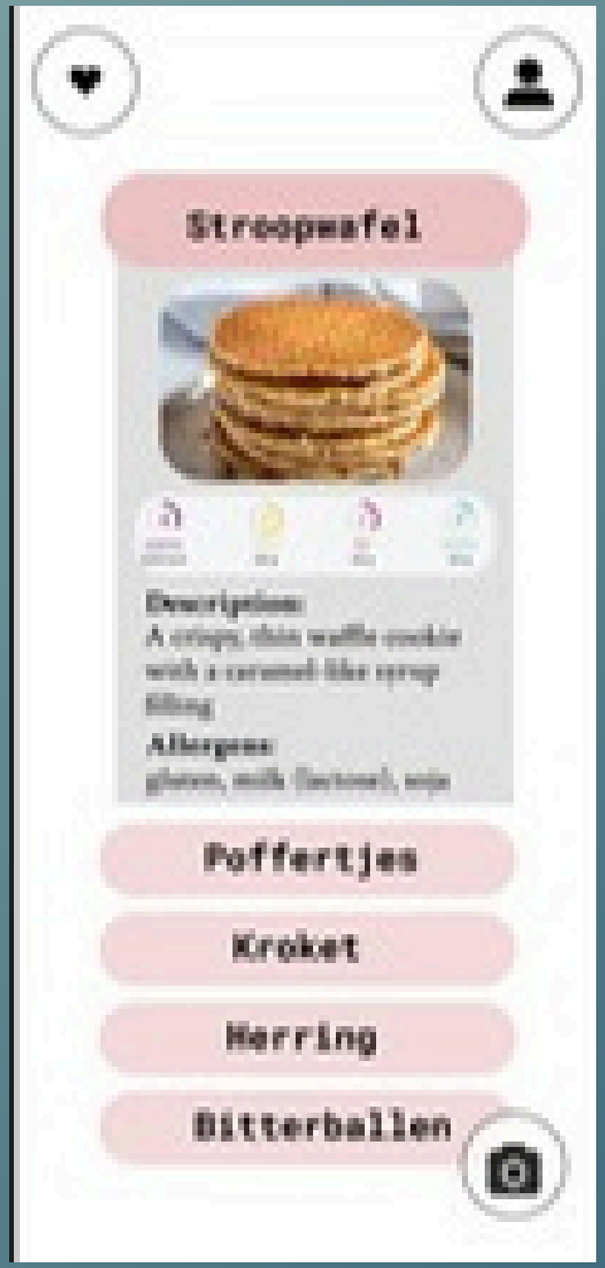
- *intuitive visual explanations via heatmaps*
- *Highlights what the CNN model focuses on*
- *Does not require architecture changes*
- *Ideal for verifying learning in models trained from scratch*

Insights:

- *Model focuses on meaningful features*
- *Bias detection - background color bias*
- *Feature robustness - augmented training led to generalizable features*
- *Data quality check - areas where more diverse data is needed*







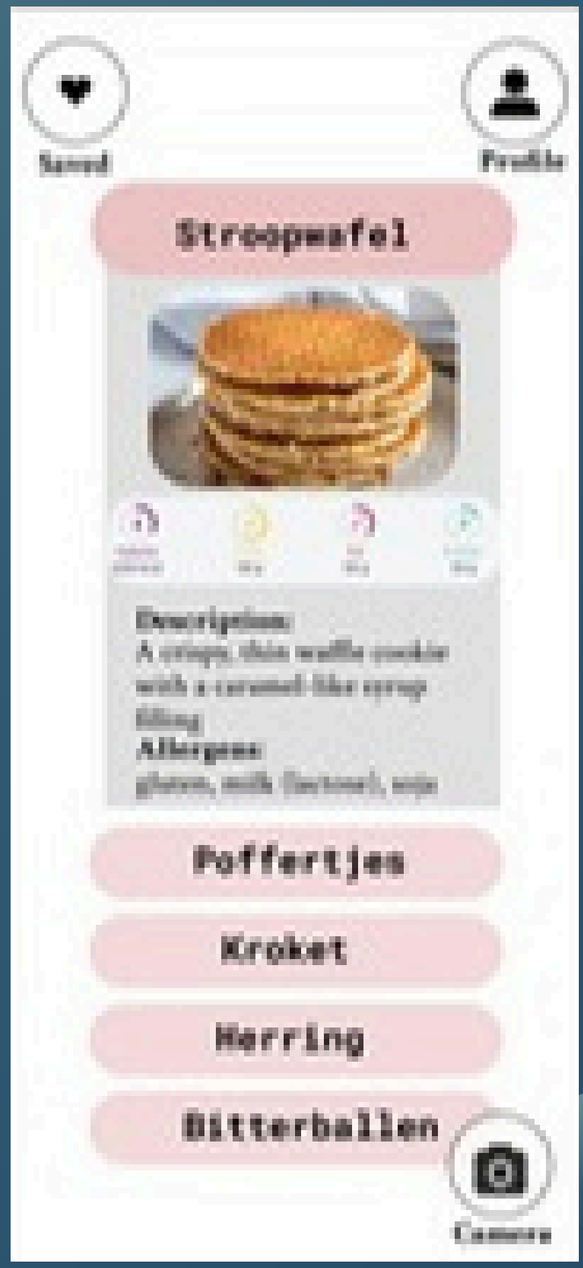
Think-Aloud Study

→ *clear buttons' labels*

→ *improved visibility of the calorie details*

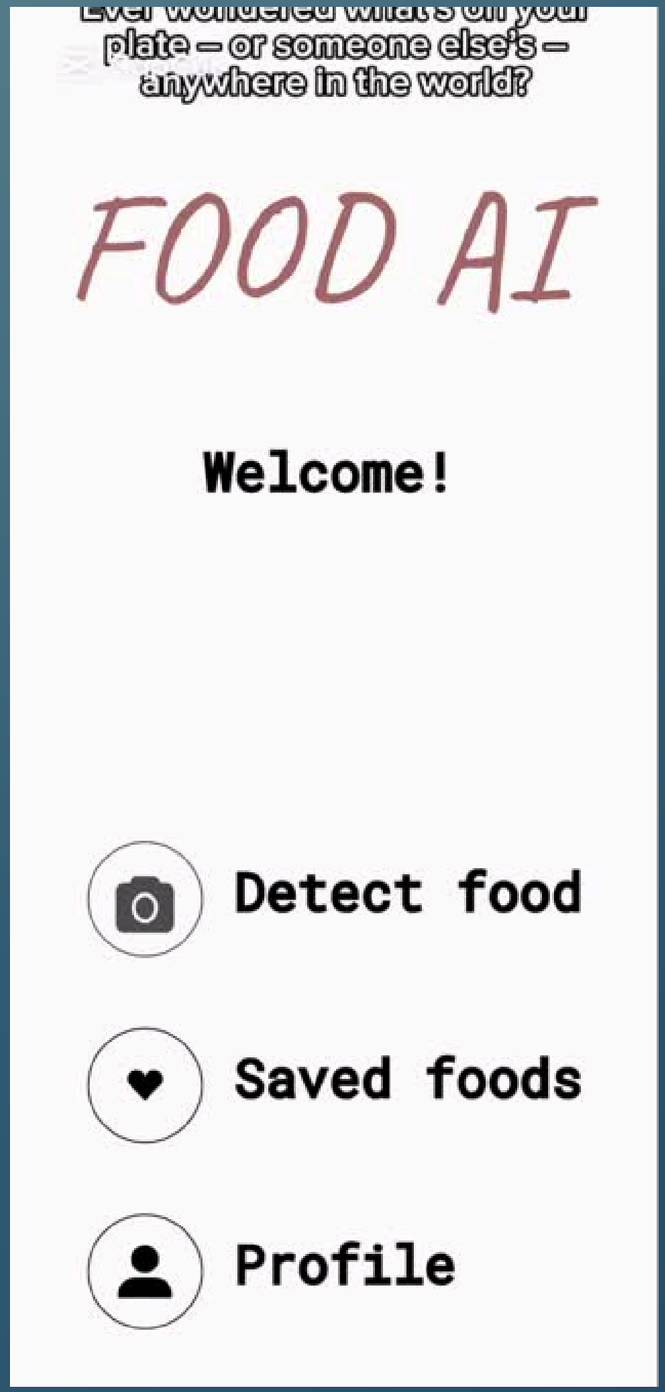
A/B Test Results

→ *improved version turned out to be more intuitive, easier to navigate*



Demo Video

(link)



THANK YOU

Github Repository:
https://github.com/zpilitowska1/food-recognition-cnn

Deep Learning Template:
https://github.com/zpilitowska1/food-recognition-cnn/blob/main/Deep-Learning-CNN-Zofia_Pilitowska.ipynb