# Yan Zhang 的 Graduation-Design-Project

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## WebLog

1. Project Description.
The core of the project is to train a clothing recognition model based on the DeepxFashion2 dataset using the Yolov8 algorithm. In order to improve the processing ability and efficiency of complex image data, we integrated MHSA (Multi-Head Self-Attention) and CBAM into YOLOv8 for optimisation, and finally chose to use MHSA as the attention mechanism of C2f to train the model by comparing the model training results. The system can accurately identify clothing items in images in complex environments and recommend fashion items that match the user's current style, thus providing tailored personalised dressing recommendations.

2. Algorithm Reference
For Yolov8, refer to the official Github: https://github.com/ultralytics/ultralytics.
For the prototype of CABM, please refer to :
https://github.com/Jongchan/attention-module
For MHSA reference: https://github.com/tranleanh/yolov4-mhsa

3. Source of dataset
The dataset used in this project is from DeepFashion2:
https://github.com/switchablenorms/DeepFashion2

4. Model evaluation metrics
mAP, Precision, Recall, FPS, IoU, all data are saved under result path for analysis after training. Reference blog: https://blog.csdn.net/java1314777/article/details/134154676

## June 20

Met with Supervisor Jasper for the first time. Discussed the requirements for the graduation project and developed a plan for the summer.

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## June 27

Selected a few potential topics for the graduation project based on our previous discussions and met with Jasper to discuss the feasibility of these thesis directions.

## June 27 - July 15

After reading literature and consulting with my supervisor, I finally decided on my thesis topic: an intelligent system related to fashion.

## July 15 - August 10

Read and organized articles related to the thesis topic. Understood the current trends and technologies in fashion recommendation systems.

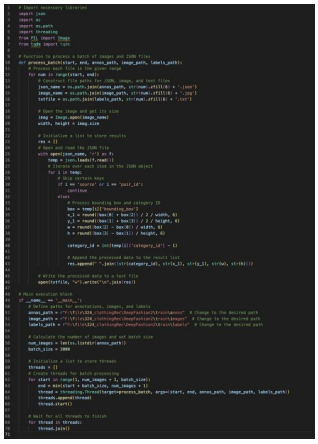
## August 15

After reading literature and comparative studies, decided to use the DeepFashion2 dataset to train my model because it has collected a large number of fashion images and annotations.

## August 15 - August 25

Started preprocessing the dataset to facilitate later training.

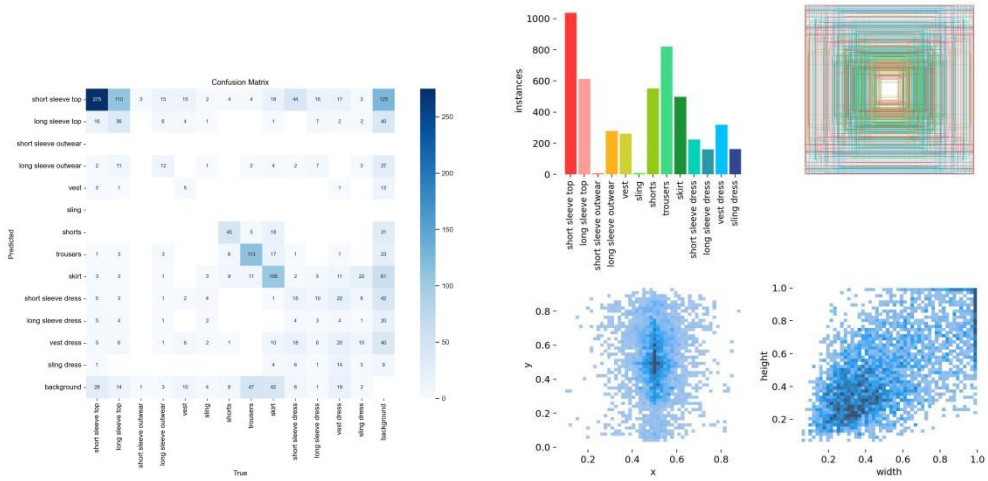
Data preprocessing and format conversion: the DeepFashion2Yolo_thread.py (Figure 2) script was used to convert the DeepFashion2 dataset annotations into a format compatible with the Yolov8 model. This conversion includes converting bounding box coordinates and class labels.

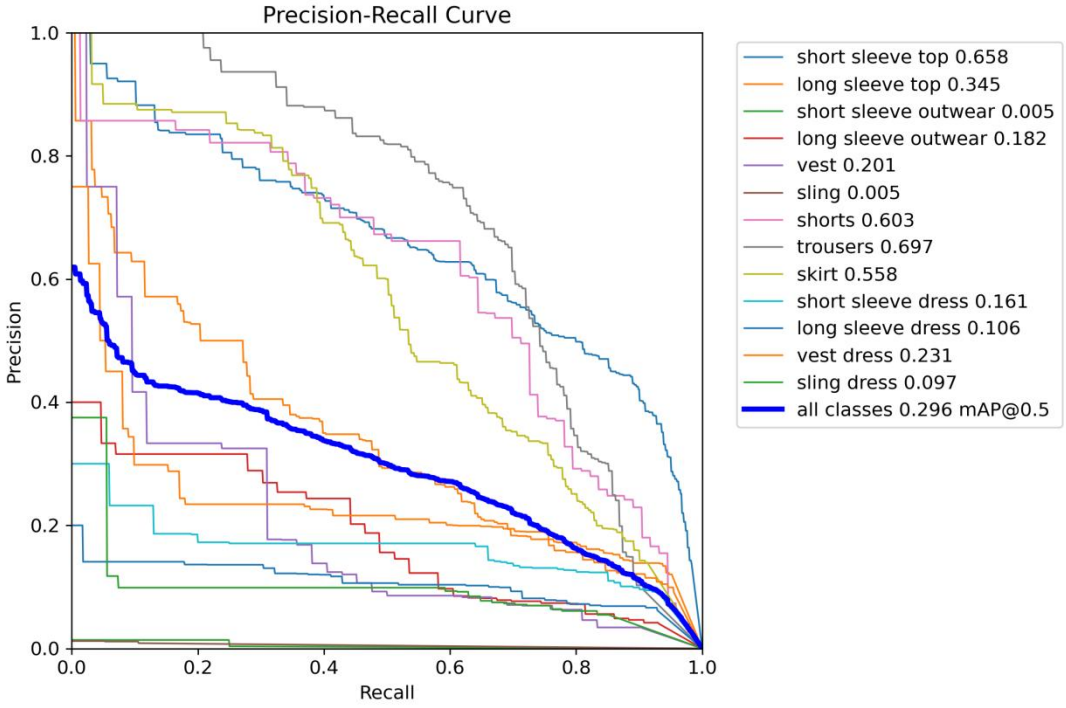


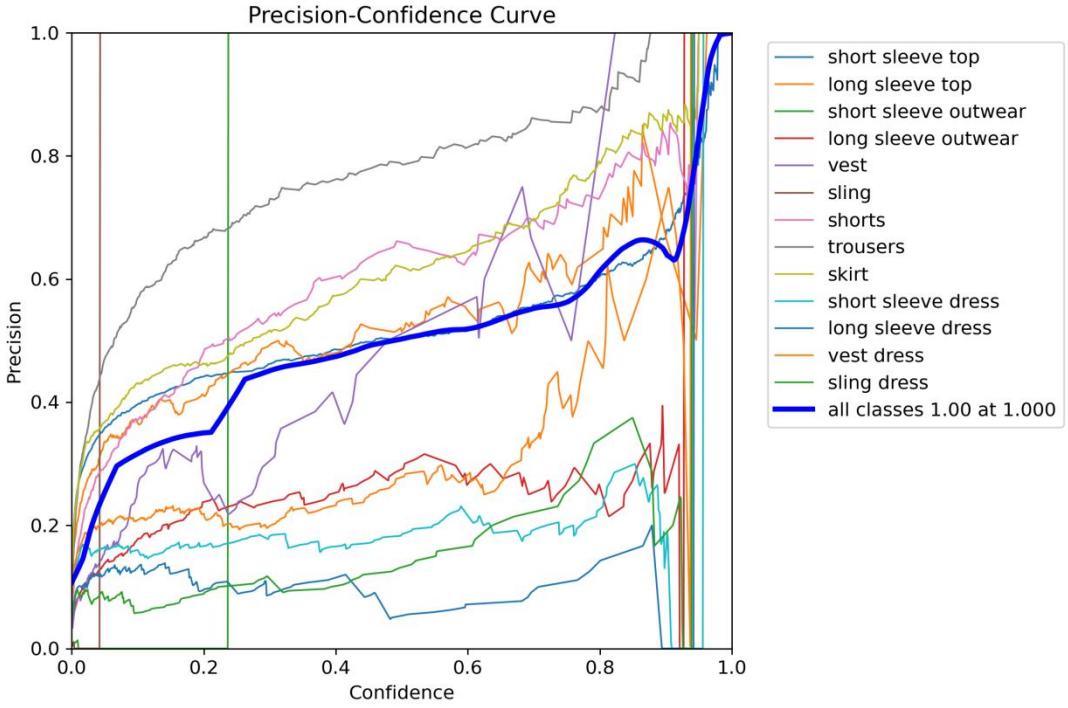
1.2 Verify that the dataset has been correctly converted using "showLabel.py".

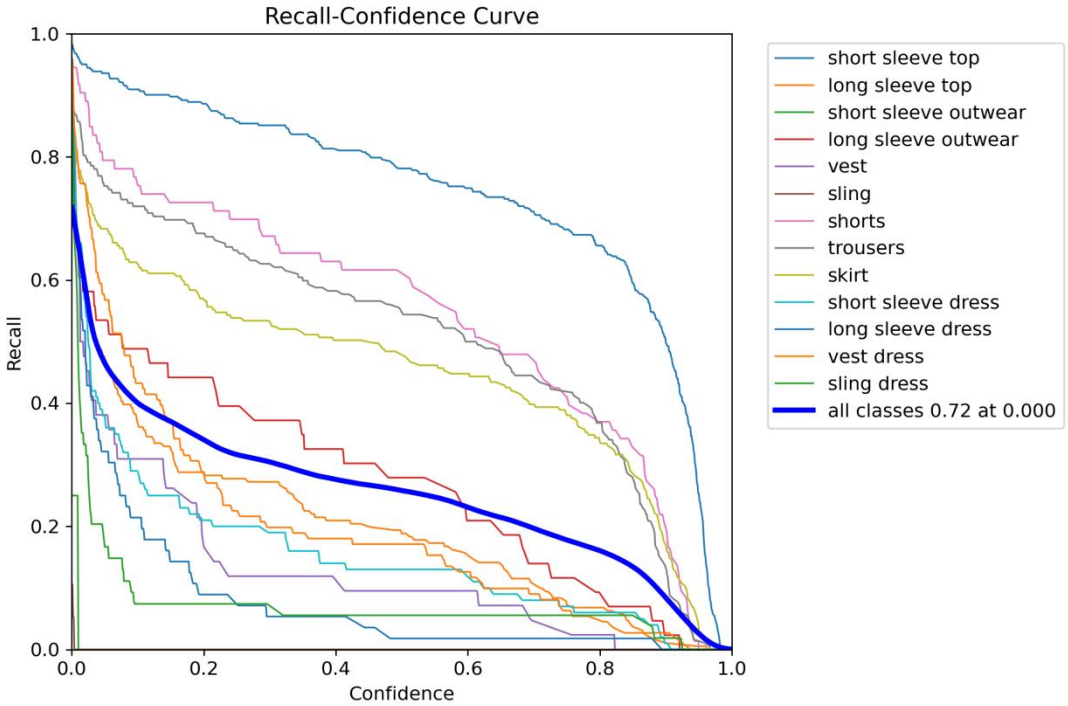
```python
# Import necessary libraries
import json
import os
import os.path
from PIL import Image
import time
from tqdm import tqdm

# Function to process a batch of images and JSON files
def process_batch(start, end, annos_path, image_path, labels_path):
    # Process each file in the given range
    for num in range(start, end):
        # Define paths for JSON, image, and text files
        json_name = os.path.join(annos_path, str(num).zfill(6) + '.json')
        image_name = os.path.join(image_path, str(num).zfill(6) + '.jpg')
        txtfile = os.path.join(labels_path, str(num).zfill(6) + '.txt')

        # Open the image and get its size
        img = Image.open(image_name)
        width, height = img.size

        # Initialize a list to store results
        res = []
        # Open and read the JSON file
        with open(json_name, 'r') as f:
            temp = json.load(f.read())
            # Iterate through each item in the JSON object
            for k in temp:
                # Skip certain keys
                if k == 'source' or k == 'pair_id':
                    continue
                else:
                    # Process bounding box and category ID
                    box = temp[k]['bounding_box']
                    x_1 = round(box[0] - box[2] / 2 / width, 6)
                    y_1 = round(box[1] - box[3] / 2 / height, 6)
                    w = round(box[2] / width, 6)
                    h = round(box[3] / height, 6)

                    category_id = int(temp[k]['category_id']) - 1

                    # Append the processed data to the result list
                    res.append(" ".join([str(category_id), str(x_1), str(y_1), str(w), str(h)]))

        # Write the processed data to a text file
        open(txtfile, 'w').write("\n".join(res))

# Main execution block
if __name__ == '__main__':
    # Define paths for annotations, images, and labels
    annos_path = r"F:\fit\DL24_clothingRec\DeepFashion2\train\annos"  # Change to the desired path
    image_path = r"F:\fit\DL24_clothingRec\DeepFashion2\train\images"  # Change to the desired path
    labels_path = r"F:\fit\DL24_clothingRec\DeepFashion2\train\labels"  # Change to the desired path

    # Calculate the number of images and set batch size
    num_images = len(os.listdir(annos_path))
    batch_size = 1000

    # Initialize a list to store threads
    threads = []
    # Create threads for batch processing
    for start in range(1, num_images + 1, batch_size):
        end = min(start + batch_size, num_images + 1)
        thread = threading.Thread(target=process_batch, args=(start, end, annos_path, image_path, labels_path))
        threads.append(thread)
        thread.start()

    # Wait for all threads to finish
    for thread in threads:
        thread.join()
```

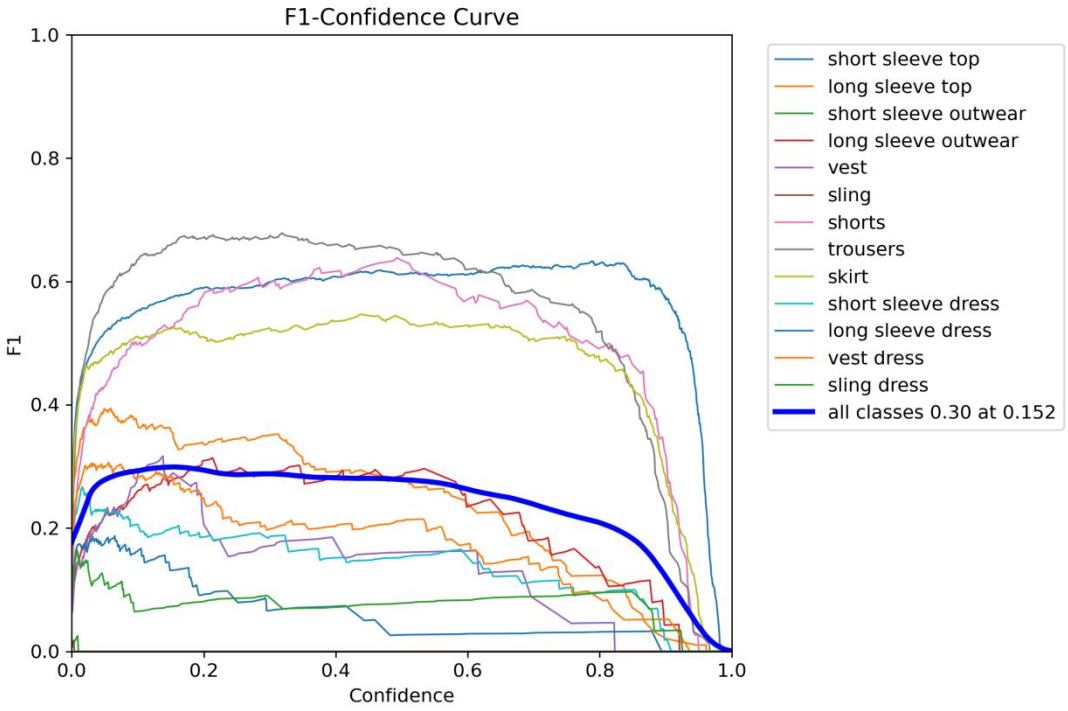
Training results:




Precision-Confidence Curve
Precision
Confidence
0.0
0.2
0.4
0.6
0.8
1.0
short sleeve top
long sleeve top
short sleeve outwear
long sleeve outwear
vest
sling
shorts
trousers
skirt
short sleeve dress
long sleeve dress
vest dress
sling dress
all classes 1.00 at 1.000


Recall-Confidence Curve
Recall
Confidence
0.0
0.2
0.4
0.6
0.8
1.0
short sleeve top
long sleeve top
short sleeve outwear
long sleeve outwear
vest
sling
shorts
trousers
skirt
short sleeve dress
long sleeve dress
vest dress
sling dress
all classes 0.72 at 0.000




From the results, it can be seen that there is still much room for optimisation of the model.

## August 26

After various comparisons and literature analysis, decided to use the YOLO series model for clothing detection and recognition.

## August 26 - September 10

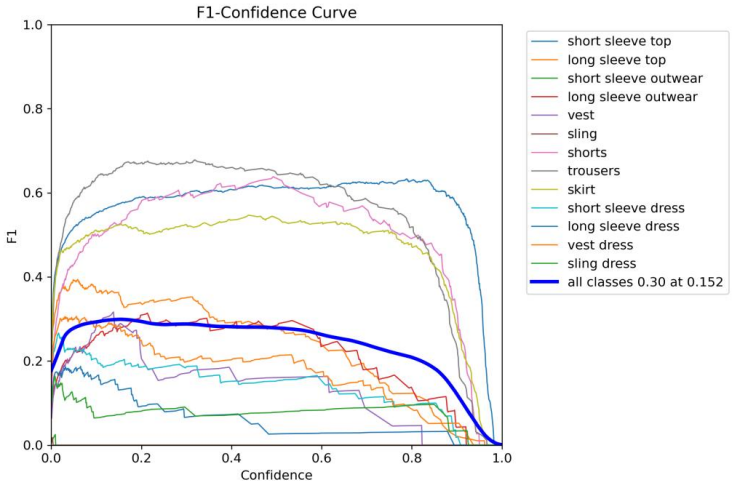
Initially chose the YOLOv4 model but found its accuracy to be low. Finally selected YOLOv8.

## September 10 - October 1

Trained the YOLOv8 model using the DeepFashion2 dataset. Due to equipment limitations, only the first 3000 images of the dataset were used for training.

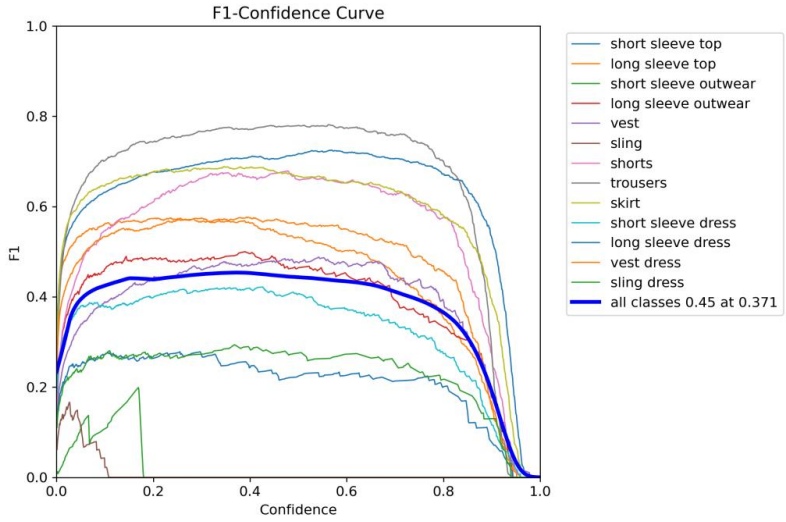
## Otober 1 - October 10

Integrated CBAM into YOLOv8 for optimization, but there was not much improvement in the model training results.



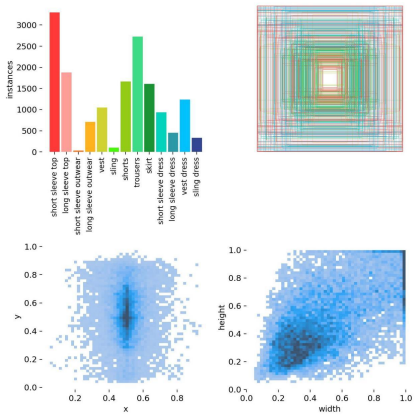

## October 10 - October 25

Integrated MHSA into YOLOv8 for optimization. After training model comparison, finally chose to use MHSA as the attention mechanism for C2f in the model training.



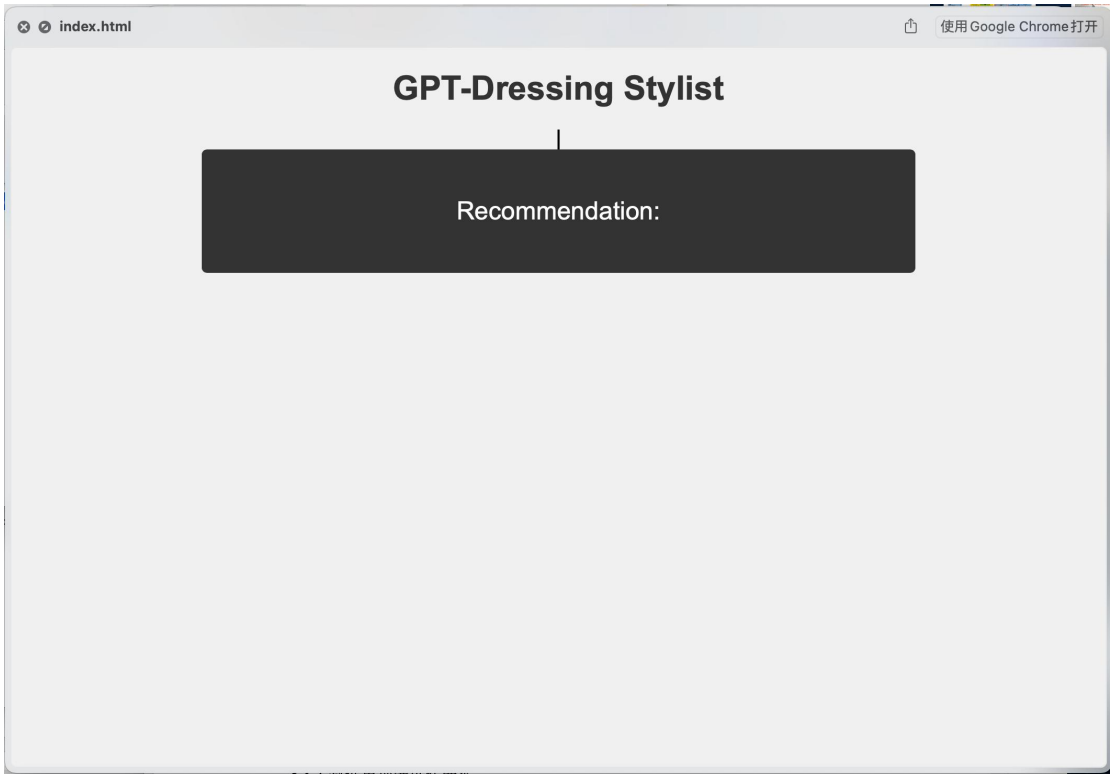

## October 25 - November 10

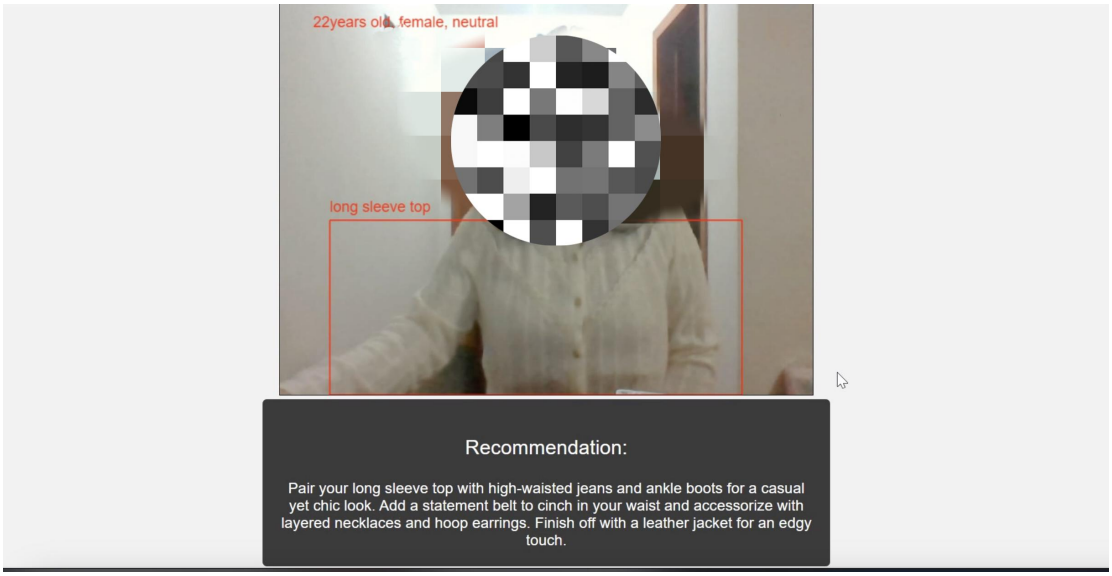
Expanded the training set to the first 10,000 images of the dataset and retrained the model to improve its accuracy and generality.




## November 10 - November 15

Worked on system integration and the development of a visual interface.






## November 15 - November 22

Organized the literature learned during the process and completed the thesis.