



VCL Mini Project - 1

Problem Statement

The goal is to create and deploy a minimal image classifier to differentiate between 5 classes from a custom-made dataset and evaluate its performance under special conditions.

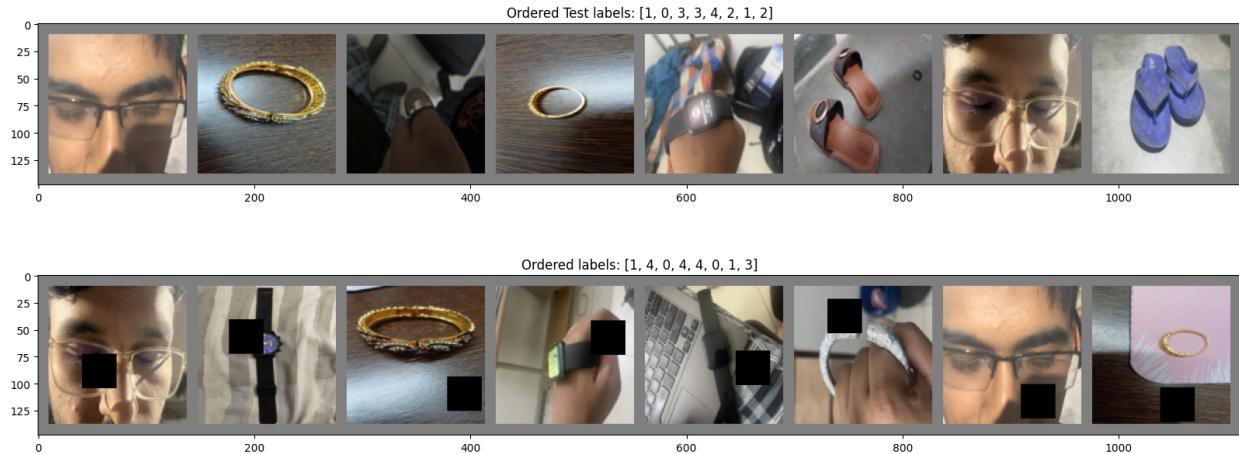
Dataset Description

Created a dataset of 180 images ($5 \times 12 \times 3$) \Rightarrow 5 classes \Rightarrow 12 instances \Rightarrow 3 orientations/lightings

Number\Class	Bracelet	Eyeglasses	Floppers	Ring	Watch
Training - 150	30	30	30	30	30
Testing - 30	6	6	6	6	6



| Training Images



Testing Images

Testing Accuracies and Relevant Numbers

Model Architecture

Layer (type:depth-idx)	Output Shape	Param #
=====		
Model	[1, 5]	--
└─Conv2d: 1-1	[1, 32, 128, 128]	896
└─ReLU: 1-2	[1, 32, 128, 128]	--
└─MaxPool2d: 1-3	[1, 32, 64, 64]	--
└─Conv2d: 1-4	[1, 64, 64, 64]	18,496
└─ReLU: 1-5	[1, 64, 64, 64]	--
└─MaxPool2d: 1-6	[1, 64, 32, 32]	--
└─Conv2d: 1-7	[1, 128, 32, 32]	73,856
└─ReLU: 1-8	[1, 128, 32, 32]	--
└─MaxPool2d: 1-9	[1, 128, 16, 16]	--
└─Linear: 1-10	[1, 128]	4,194,432
└─ReLU: 1-11	[1, 128]	--
└─Linear: 1-12	[1, 5]	645
=====		

Total params: 4,288,325

Trainable params: 4,288,325

Non-trainable params: 0

Strategy Against Patch Occlusion

- Dropout Regularisation with p=0.3 after Conv2d 1-4 and Conv2d 1-7

- Randomly drops out 30% of the neurons at the abovementioned depths, which makes it less prone to overfitting and gives it a sense of generalizability.
- Since dropout occurs during training only, the trend of higher accuracy in the test set than the training set seen above is attributed to the same.
- L2 regularisation
 - Penalizes the model for learning large/redundant weights, which prevents overfitting and ensures that the model has learnt more fundamental features than superficial ones.

Hyper Parameters

- Optimizer: Stochastic Gradient Descent
- Loss: Log L1 loss / Cross Entropy Loss
- Learning Rate: 0.07
- Epochs: 25

Accuracy

Training

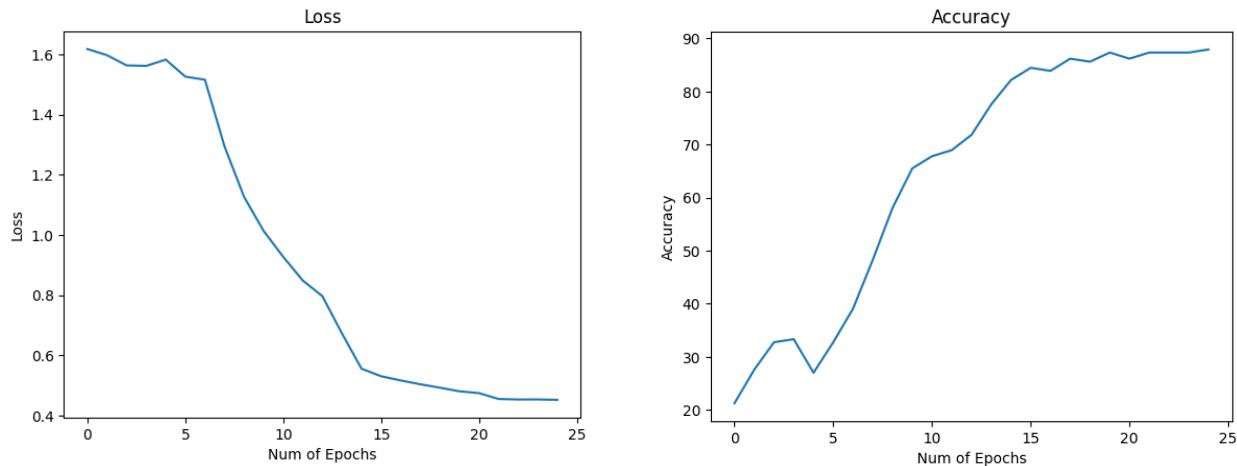
10th Epoch	65%
20th Epoch	87%
25th Epoch	87%

Testing (Normal / Black-Patch)

10th Epoch	70%	76%
20th Epoch	87%	88%
25th Epoch	87%	76%

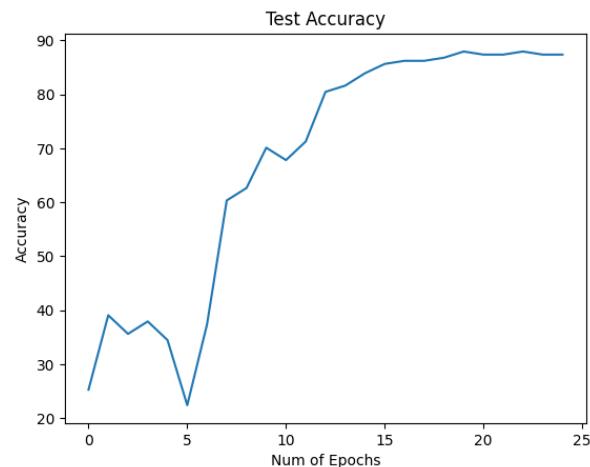
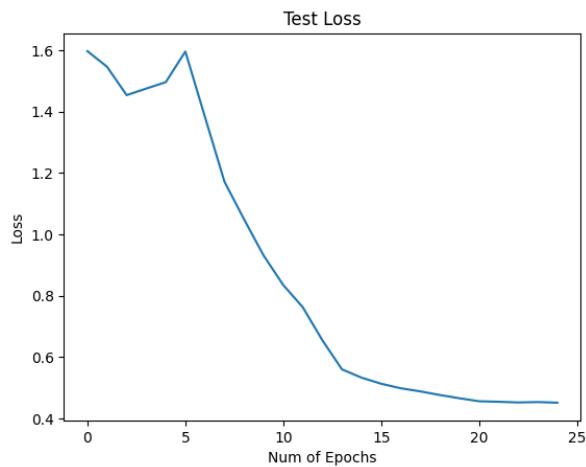
Supporting Graphs

Training Metrics

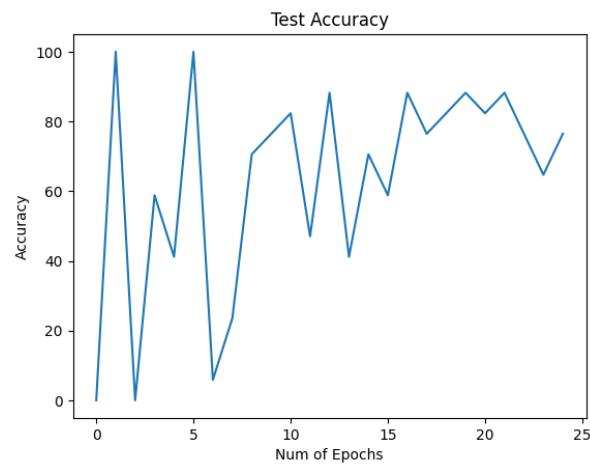
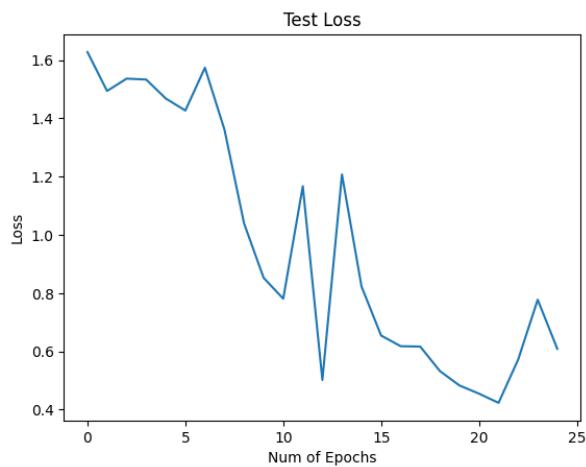


Testing Metrics

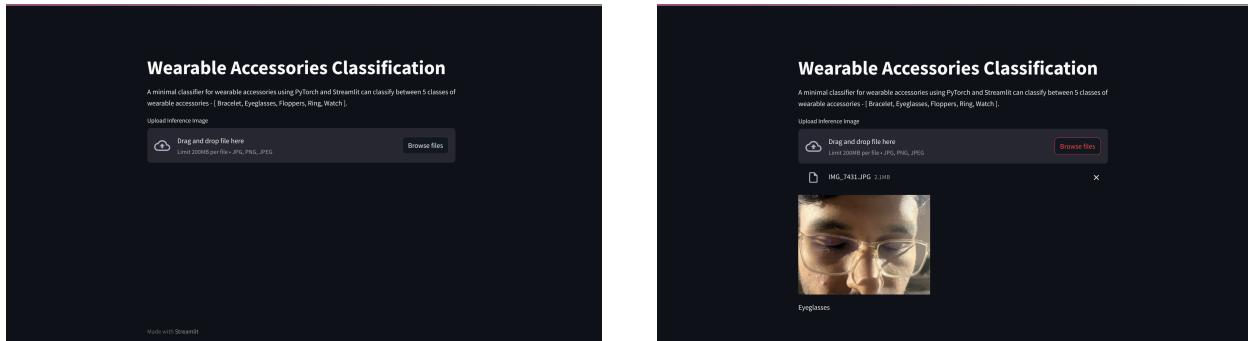
Normal Data



Data Marred with Random Black Patches of 32x32



Snapshots of Deployed WebApp



Deliverables Required are Provided in the Sections Below

Deployment Code:

<https://github.com/eternal-f1ame/MP-1-VCL/blob/main/main.py>

Training and Testing Code:

<https://github.com/eternal-f1ame/MP-1-VCL>

Saved Model:

<https://github.com/eternal-f1ame/MP-1-VCL/blob/main/model.pt>

WebApp:

<https://minimal-wa-classifier.streamlit.app/>