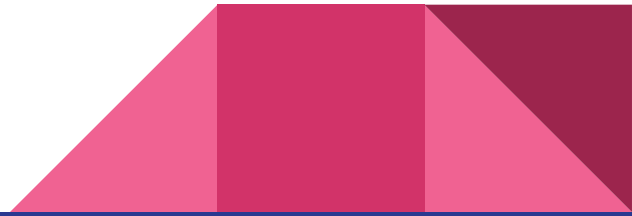
Road sign detection

Project by Mihalache Mihai & Mițca Dumitru

Goal

Our goal is simple, to detect road signs in pictures.



The First Attempt

We trained a custom neural network to classify precut images of road signs and got over 94% accuracy on the test dataset. Success?

NO

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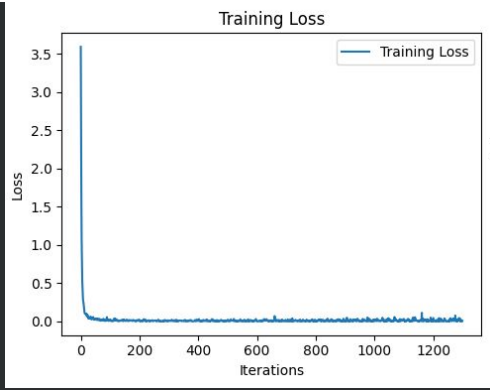
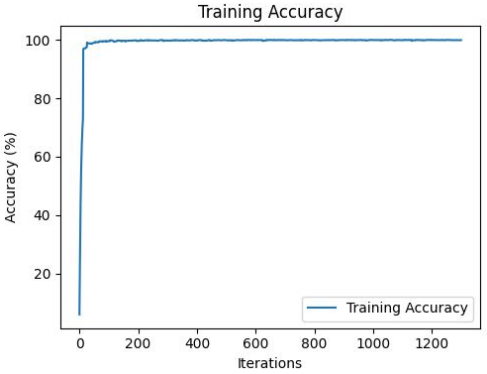
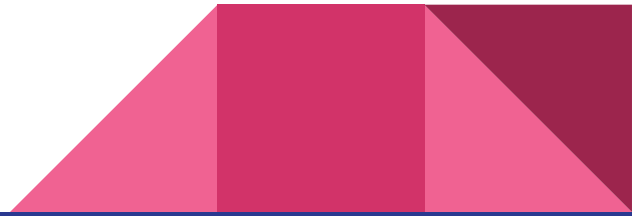
[Epoch 1, Batch 100] Loss: 3.594 Accuracy: 5.95%
[Epoch 1, Batch 200] Loss: 2.550 Accuracy: 14.73%
[Epoch 1, Batch 300] Loss: 1.644 Accuracy: 26.57%
[Epoch 1, Batch 400] Loss: 1.067 Accuracy: 36.46%
[Epoch 1, Batch 500] Loss: 0.748 Accuracy: 44.57%
[Epoch 1, Batch 600] Loss: 0.539 Accuracy: 51.05%
[Epoch 1, Batch 700] Loss: 0.424 Accuracy: 56.27%
[Epoch 1, Batch 800] Loss: 0.336 Accuracy: 60.49%
[Epoch 1, Batch 900] Loss: 0.265 Accuracy: 63.99%
[Epoch 1, Batch 1000] Loss: 0.255 Accuracy: 66.82%
[Epoch 1, Batch 1100] Loss: 0.222 Accuracy: 69.25%
[Epoch 1, Batch 1200] Loss: 0.183 Accuracy: 71.35%
[Epoch 1, Batch 1300] Loss: 0.154 Accuracy: 73.20%
[Epoch 2, Batch 100] Loss: 0.109 Accuracy: 96.84%
```





Lesson learned

A custom neural model may not be the best idea since we have basically no experience in designing one that actually performs well.

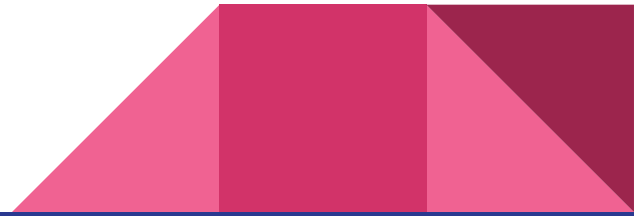


Second Attempt

We tried to train YOLOV8 on the whole Mapilirary dataset which had over 12000 images. The data set was to large to handle, and to train it it would take a really long time.

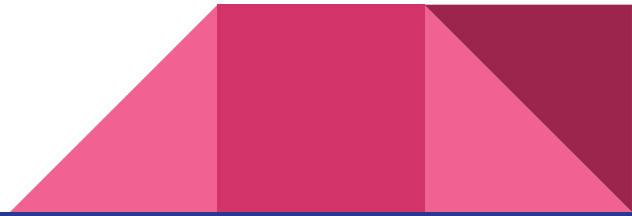
Lesson learned

Choose a smaller dataset, if it even means to loose on accuracy.



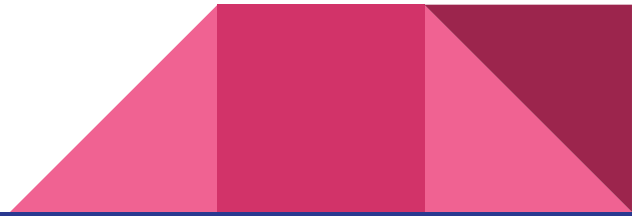
Third attempt

We tried to trim the Mapilliary dataset, to around 250 images, we trained the AI using YOLOV8, and in the end we got no detections, because the signs used in the test were not included in the trimmed dataset.



Lesson learned

We must make sure that at least some pictures from each class is a part of the dataset.



Fourth attempt

We tried a segmentation dataset of russian road signs, we uploaded it to roboflow and got really promising results, BUT our own tests, which include: showing pictures taken from our phones, showing real time video of a road sign search on google, showing a video of driving in a city, we didn get ANY detection.

“Reality often differs from one’s expectations”

Lesson learned

The dataset may not have been segmented correctly.

Bloopers

```
 14            [-1, 4]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 15                -1  2    517632  ultralytics.nn.modules.block.C2f             [576, 192, 2]
 16                -1  1    332160  ultralytics.nn.modules.conv.Conv             [192, 192, 3, 2]
 17           [-1, 12]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 18                -1  2   1846272  ultralytics.nn.modules.block.C2f             [576, 384, 2]
 19                -1  1   1327872  ultralytics.nn.modules.conv.Conv             [384, 384, 3, 2]
 20            [-1, 9]  1         0  ultralytics.nn.modules.conv.Concat           [1]
 21                -1  2   4207104  ultralytics.nn.modules.block.C2f             [960, 576, 2]
 22       [15, 18, 21]  1   4007875  ultralytics.nn.modules.head.Detect           [401, [192, 384, 576]]
Model summary: 295 layers, 26088499 parameters, 26088483 gradients, 80.4 GFLOPs

Transferred 469/475 items from pretrained weights
zsh: segmentation fault (core dumped)
```

Even Python segfaults sometimes…