Image Processing and Computer Vision - No Entry Sign Detector

**Subtask 1: The Viola-Jones Object Detector**

*1.1 Ground Truth and Visualisation*

The ground truth was manually annotated for the 6 images (ground truth being represented by the red rectangles) and put against the detected faces of the Viola-Jones Object Detector (the green rectangles). The ground truth bounding boxes are stored in the "GroundTruth.csv" file.



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I recommend zooming in the photos as the faces in them are relatively small to the dimensions of the image.

*1.2 TPR, F1-SCORE and Performance*

The TPR of the Object Detector is extremely good as it recognized every face, excluding the face in the left of the NoEntry7 image.

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| --- | --- | --- | --- | --- | --- | --- |
| Image | NoEntry1 | NoEntry2 | NoEntry4 | NoEntry5 | NoEntry7 | NoEntry11 |
| TPR | 1 | 1 | 1 | 1 | 0.5 | 1 |

1.2.1. The problem on assessing the TPR in a meaningful way is that it is hard to define what a true positive really is. For example, the face in NoEntry7 can be considered too small, or that it is

composed of too few pixels to be a face. In that case the TPR of the Object Detector would be 1.

1.2.2. It is easy to achieve a TPR of 100% on any detection task, as the algorithm can just detect all parts of the image as being a face. This would grant a 100% TPR, although it will also detect all the non-faces parts of the image as being a face (which does not contribute with much in deciding what is a face and what is not).

1.2.3. The F1 score is a much better way of assessing a detection algorithm, as it takes into consideration both TPR, FPR and FNR.

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| --- | --- | --- | --- | --- | --- | --- |
| Image | NoEntry1 | NoEntry2 | NoEntry4 | NoEntry5 | NoEntry7 | NoEntry11 |
| F1 | 0.2 | 0.13 | 0.06 | 0.33 | 0.22 | 0.18 |

**Subtask 2: No Entry Sign Detector**

*2.1 TPR vs FPR during training*