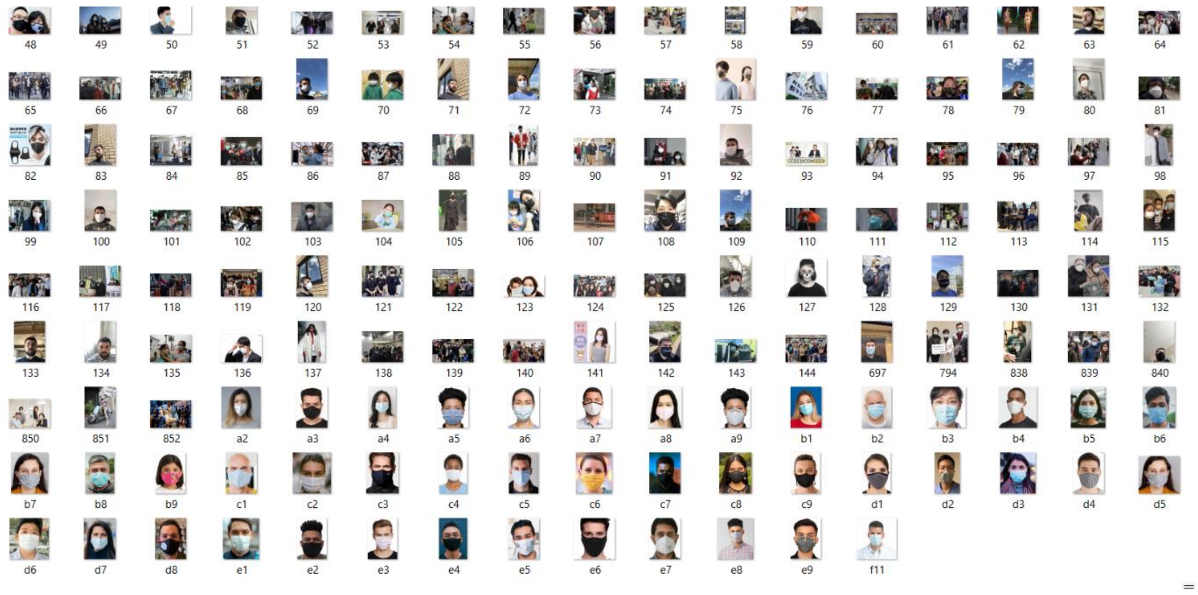
Haar Cascade for Face Mask Detection

1. Collecting Images

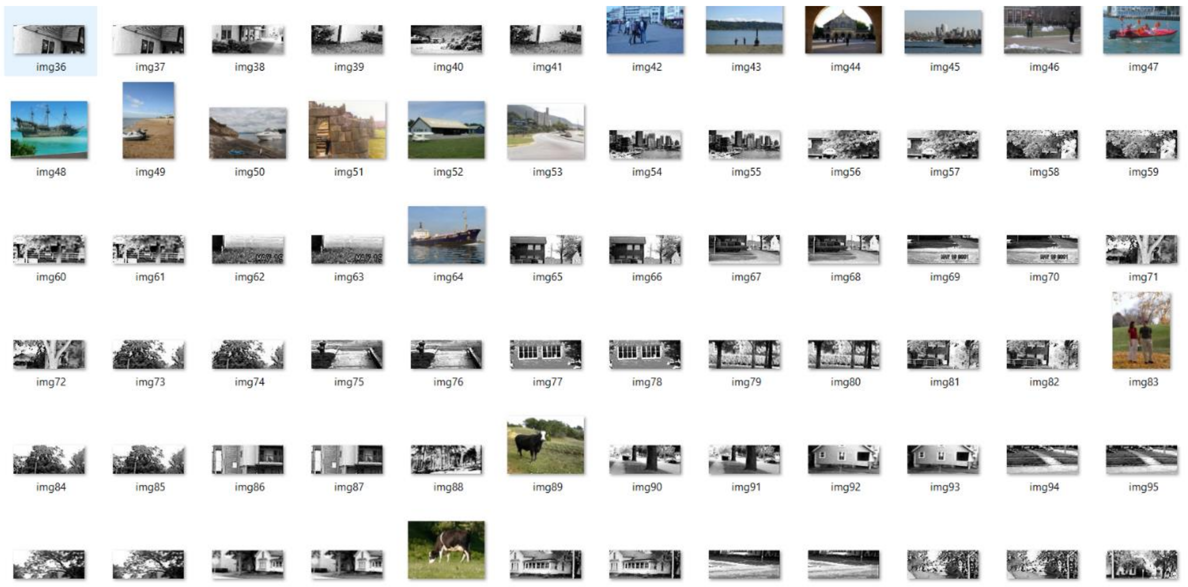
I gathered two main types of data: **positive images** (faces with masks) and **negative images** (backgrounds without faces or masks). This diverse dataset allowed the classifier to distinguish between mask-wearing faces and non-mask objects in various backgrounds.

- Extract images from videos and internet datasets. Save positive images as .bmp
- I extracted frames from videos and then converted the extensions from JPG, PNG, and JPEG to BMP
- For negative images, use images that don’t contain the object. Including images of the setting without the object will improve results. Save these images as .jpg files

Positive Images:

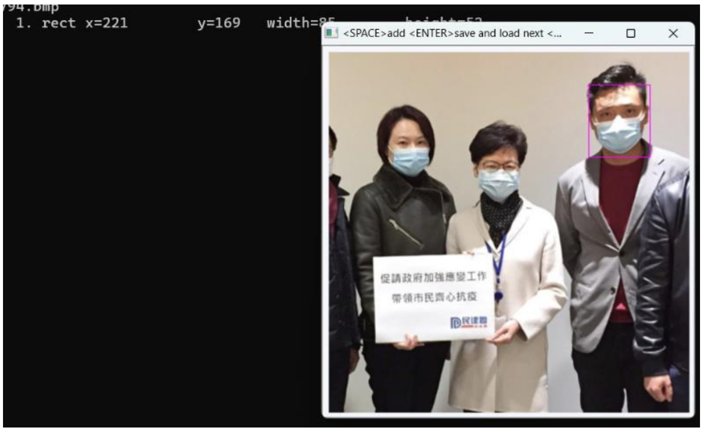


Negative images:

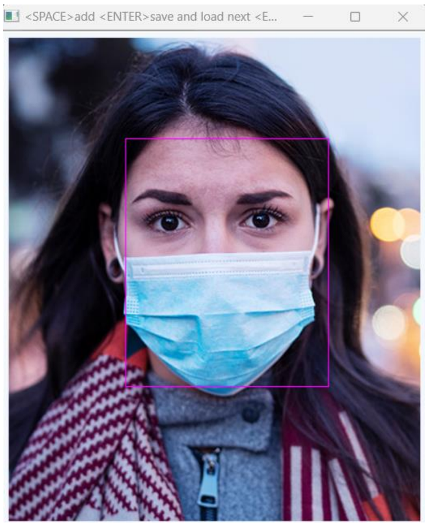

img36 img37 img38 img39 img40 img41 img42 img43 img44 img45 img46 img47
img48 img49 img50 img51 img52 img53 img54 img55 img56 img57 img58 img59
img60 img61 img62 img63 img64 img65 img66 img67 img68 img69 img70 img71
img72 img73 img74 img75 img76 img77 img78 img79 img80 img81 img82 img83
img84 img85 img86 img87 img88 img89 img90 img91 img92 img93 img94 img95

2. Describing Images

- Run create_list.bat to create a list of negative images, stored in infonegative.txt
- Use the Objectmarker utility to define object locations in positive images. Run objectmarker.exe to open two windows for this process.
- A file should be created in positive\info.txt when finished.



```
94.bmp
 1. rect x=221        y=169   width=85        height=52
```



3. Creating a Vector Training Set

- Edit creation.bat set the parameter to the number of positive images and adjust -w and -h for image size
- Run samples_creation.bat to generate a vector file

4. Training

- Edit haartraining.bat
- Set `-vec` to the path of your vector file.
- Set `-npos` to the number of positive images.
- Set `-nneg` to the number of negative images.
- Adjust `-nstages`
- Set `-mem` to the desired RAM usage in MB (e.g., 512 or 1024).
- Set `-w` and `-h` to match values from `samples_creation.bat`
- Delete files inside cascade folder
- Run `haartraining.bat` and wait for the training to complete.

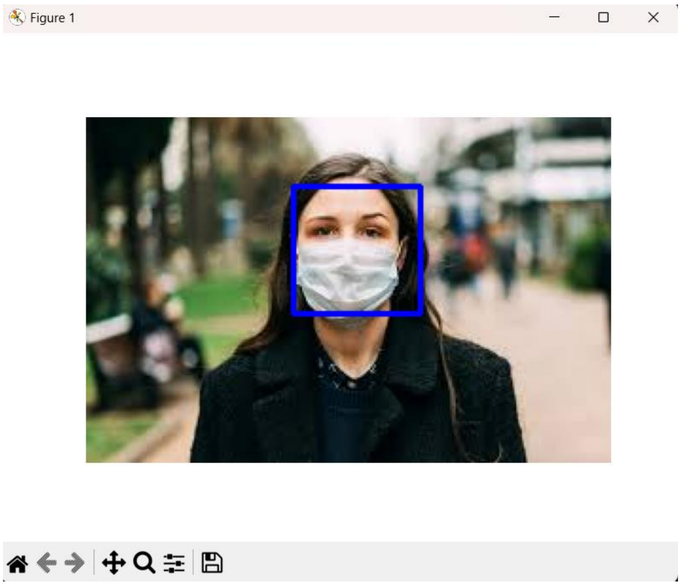
5. Generating the .xml File

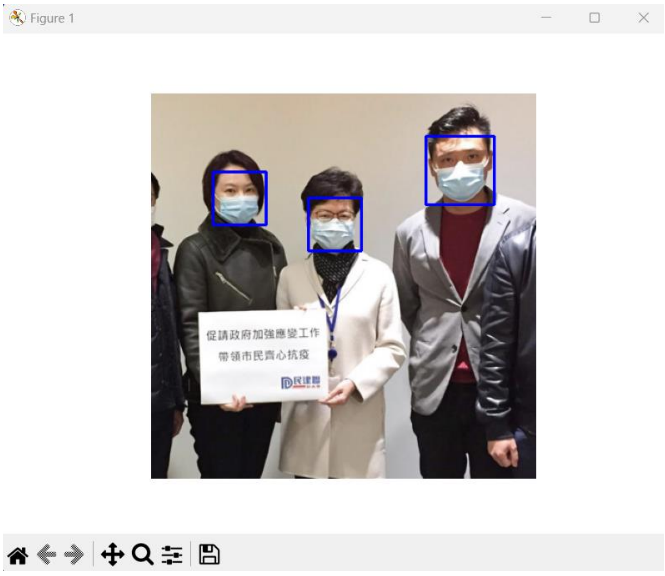
- Edit convert.bat
- Set the width and height to match those used in training and samples_creation.bat
- Change the name of the XML file.
- Run `convert.bat` to generate the XML file with your classifier.

6. Results

- Run the XML file on videos and images to test and validate the performance of your trained classifier.
- I tested this code using a Python script

Results from images:





Result from videos:

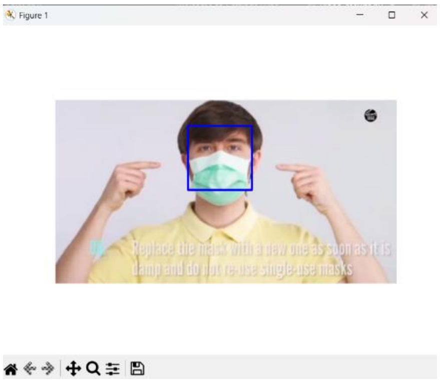
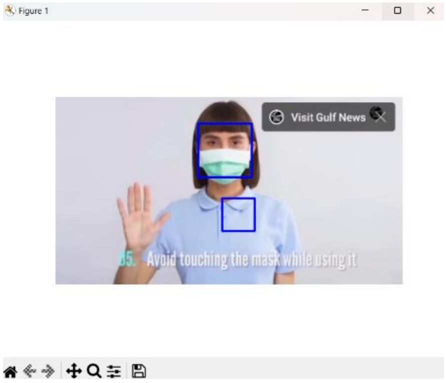
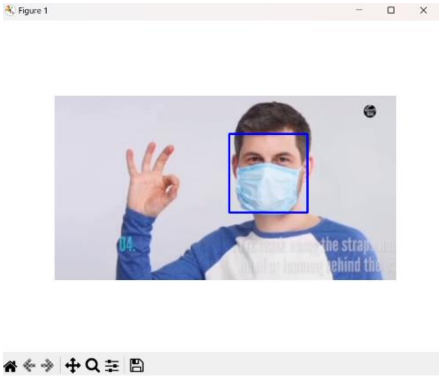


Figure 1
Replace the mask with a new one as soon as it is damp and do not re-use single-use masks





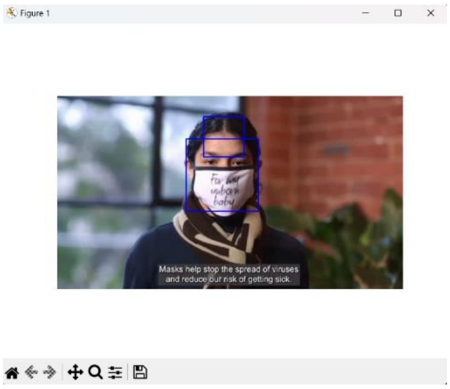


Figure 1
Masks help stop the spread of viruses and reduce our risk of getting sick

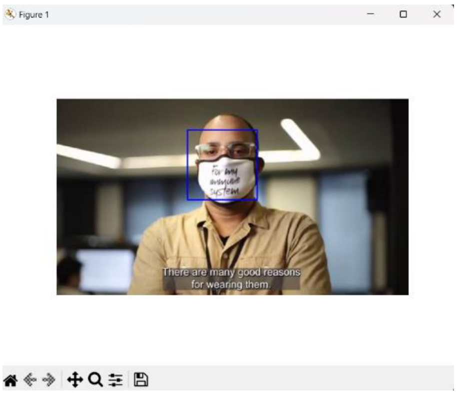


Figure 1
There are many good reasons for wearing them

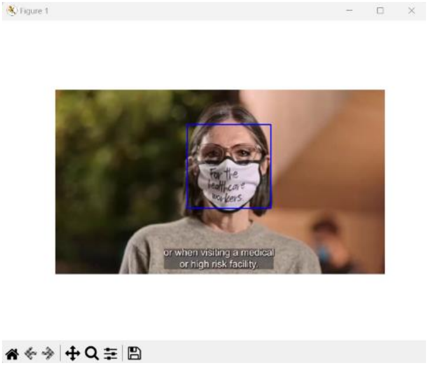


Figure 1
or when visiting a medical or high risk facility