SURVEILLANCE SPYHOLE
(Man-Woman Classifier)

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Introduction:

Gender classification is a fundamental task in computer vision, which has recently attracted immense attention. It plays an essential role in a wide range of real-world applications such as targeted advertisement, forensic science, visual surveillance, content-based searching, human-computer interaction systems, etc. However, gender classification is still an arduous task due to various changes in visual angles, face expressions, pose, age, background, and face image appearance. It is more challenging in the un-constrained imaging conditions.

In this project, Deep learning is being used to accurately identify the gender of a person from a single image of the face. This will enable computers to see and identify digital images and videos as a human would. Computer Vision involves acquiring, processing, analysing, and understanding digital images to extract high-dimensional data from the real world in order to generate symbolic or numerical information which can then be used to make decisions.

Task Definition:

To build a man and woman classifier that can approximately guess the gender of the person (face) in a picture. The model could predict if the image(face), is of a man or a woman. It will take the image or a video URL as input and predict if its of a man or a woman.

Requirements:

- **Dataset:** The required dataset has been picked from Kaggle (https://www.kaggle.com/chriscch/face-man-woman) .

- **Computation Power:** GPU is used to train the model and to perform convolutional neural network(CNN) based operations. It can perform operations in batch of 64,128 or 256.
  Google Colab provides free access to computing resources including GPUs which I have used here.

Basic Flow:

1.Dataset:

The required dataset has been picked from Kaggle (https://www.kaggle.com/chriscch/face-man-woman) .

It contained about 1000 images of each category i.e. man and woman.

A test data was created containing about 345 images with nearly equal number of images of both categories. It had images of variable sizes, so I resized all the images. This data was used to create a test video and check the model over it.

Then I uploaded this dataset on Kaggle and used it to train the model.

Gender	Training Set	Test Set
Man	997	175
Woman	964	170
Total	1961	345

2.Training the model:

2.1. Dataset is downloaded using Kaggle API.

2.2. Deep Learning Library: I have used fastai which is the first deep learning library to provide a single consistent interface to all the most commonly used deep learning applications for vision, text, tabular data, time series, and collaborative filtering. The fastai library provides many useful functions to quickly and easily build neural networks.

2.3. Model: I have used ResNet50. It has 50 layers neural network. It generally performs better than ResNet34 as it is a deep network with more parameters

2.4. The dataset images are pre-processed before training. For the same, I have used get_transforms(). I have used the ImageDataBunch.from_folder() function to load the images and assign labels to the images based on the name of the folder they are placed in.

2.5. After training, the model has been exported. The export.pkl file is used to load learner and further used to make predictions.
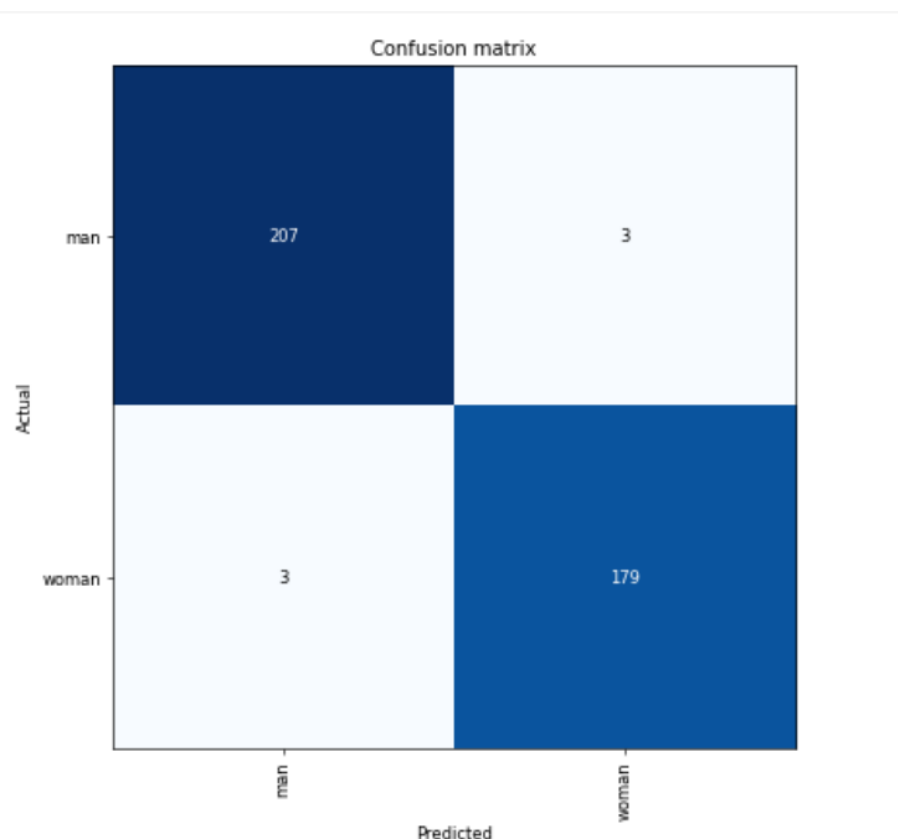
3.Predictions:

3.1. Image Predictions: I created a predictor function which takes the image address and returns the predicted gender i.e. 'man' or 'woman'.

3.2. Video Predictions: I created a video of the test data to make predictions within a video.

3.2.1. It takes the video url and downloads it. Then I used cv2 library to extract frames and save it into a local folder. The prediction function is used to predict for all the frames. Further a video is created using the predicted images.

Results: **Confusion matrix:**

Confusion matrix

	man	woman
man	207	3
woman	3	179

Predicted / Actual

The model predicted the image(face) of a man as woman and vice versa 3 times each i.e. made 6 wrong predictions in all.

The model is 98.4% accurate to detect a face image as man or woman.

Reference:

- https://stackoverflow.com/
- https://www.geeksforgeeks.org/

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