



## Computer Vision and Pattern Recognition (Coursework)

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### Overview

In this coursework, you will build and evaluate a Face Recognition system using Supervised Machine Learning (ML) Algorithm. You are required to choose your own dataset from a public data-sets repository. Or alternatively, you can use the dataset that was presented during the fourth week lab. You will then use three different machine learning algorithm/s of your choice (i.e. SVM, RF, , CNN, ...) to build a classification model that recognises the person in the image. You should compare the performance of the three algorithms you have chosen, and make a conclusion accordingly (e.g. which one is performing better).

Your solution will need to be implemented in Python, and you will be using Jupyter Notebook for coding, presenting, and discussing your work. You will make use of *Jupyter Markdown Cells* to add your discussion, justification, and other relevant explanation required. You must structure and produce your final report according to the instructions provided in Sections 1, 2, 3 and Section 4.

## 1 Research & Data Exploration

In this task, you will choose a dataset or use the one provided in Week 4. You need then to pick one peer-reviewed paper relevant to face recognition and critically review, discuss and evaluate it in no more than 500 words. Details about these two tasks are outlined below:

### 1.1 Dataset

First, you will select a dataset face images. You are encouraged to explore datasets other than the one presented in Week 4. Plenty of similar datasets are available in the public domain ie.g. <sup>1</sup>. Whether you chose your own dataset, or you use the one we presented in the lab, you need to provide detailed description of the data, and where it was obtained from. Your description might include:

- Number of images per person
- Size of the images,
- ...
- Any other information you think it is relevant

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<sup>1</sup><https://www.face-rec.org/databases/>

## 1.2 Peer-Reviewed paper:

You must select one paper that is relevant to your dataset, or to the algorithms you are going to use. It must be addressing a **Face Recognition**. Your review must not be more than **500** words. I expect you to tell me what is the paper about, and what problem it is trying to solve? What methods and technologies were used? How were the reported results? And finally, your say on the work presented in the paper.

## 1.3 Data Pre-processing

Finally, in this section you need to describe any method/s you applied to the images, e.g. .resizing, sharpening, filtering etc. . . If you haven't applied any pre-processing methods to the dataset of face images, then state this in your report, and explain why?

## 2 Modelling/ Classification

In this task you will build three classification models to classify/ predict the name of the person in the image. The models choice is up to you. In other words you can use SVM, Random Forest, Neural Net or any other classification models that you studied in the module. You must justify your choice of the method, and write, explain and comment the code you produce. More specifically, your code must:

1. Divide the dataset into training and testing subsets
2. Build a model of your choice using the training set
3. Test and evaluate your models performances
4. Report, compare, discuss and interpret results

You must discuss training and testing error, and any other issues related to results. Code must be commented and the steps explained. Your code must be developed as a set of functions where possible, to make it easier to re-use. Your must aim at improving the model's performance using the various methods you learnt, e.g. hyper-parameters tuning, cross-validation, etc. . .

## 3 Deploy the Solution

You will develop a front end and interactive system. This should enable the user to navigate through the testing sets and see if the correct/ incorrect classification was performed, and should also be able to upload his/her own image, and pick the model he/she wants to use (out of the three) and let your solution predict who is that. You are allowed to use the code provided in the labs to complete this task e.g. using *streamlit*. So the minimum requirement for this task as to have a front-end similar to Figure 1

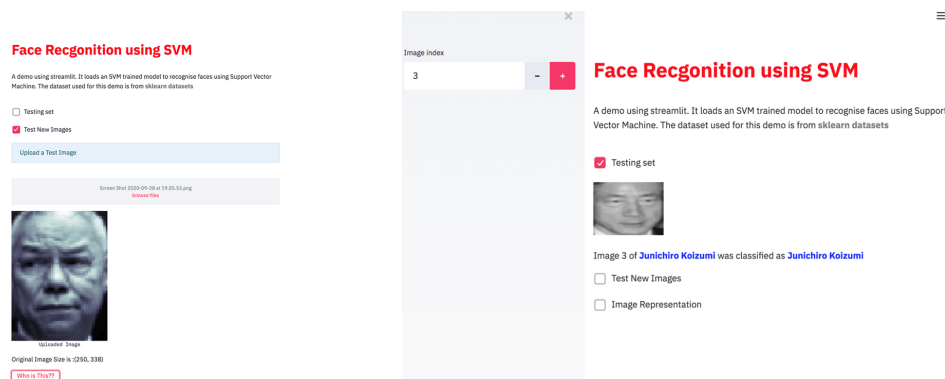


Figure 1: Face Recognition System

## 4 Reproducibility and Presentation

You will need to produce your solution using Jupyter Notebook. You will make use of *Jupyter Markdown Cells* to add your discussion, justification, and other relevant explanation required. Using Markdown, you can structure your project as a set of sections and subsections, add your discussion, highlight certain text, add math formulas (if needed) and much more, in addition to your **Python** code.

Once your project is complete and all requirements are covered as outlined in Sections 1, 2, 3, and 4, you need to save your project as **PDF** file. This is the only document that you need to submit for the **Final Deliverable**. I should be able to reproduce your solution by just following the document and the code. No need to submit the dataset, or any other document.

## Deliverables & Due-Dates

This coursework makes 100% of the overall grade and will be submitted as one PDF document:

1. You will prepare five-minutes presentation and present your work to the class on the **18<sup>th</sup> of December 2021**. This will be followed by few questions related to your work.
2. Final Deliverable: you must submit your solutions for all parts of the coursework including Sections 1, 2, 3. Your submission must be in the form of one PDF file and as described above in Section 4. Following the steps and code provided in your PDF file, I should be able to reproduce your results. Make sure you comment your code, and explain your approach where possible. Your work must be submitted by the **19<sup>st</sup> of December 2021** 5 pm.

**Note:** More discussion about structuring your solution in a single Jupyter Notebook, and exporting it into PDF format will be explained in the lecture time.

## Grading Scheme

- Presentation and questions / answering (**20%**)
- **80%** of the overall grade will be based on the report your submitted, assessment will include:
  1. Quality and structure of your document
  2. Quality of the code presented
  3. Coding styles and explanation of your steps
  4. Quality of the paper you review (e.g. the paper choice, your review, and critical discussion)
  5. Overall performance of your face recognition system (e.g. accuracy)
  6. Discussion and interpretation of the results