

# Facial Recognition System

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## Background and Objective

### Challenge of secure login

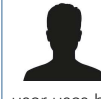
Authentication methods	Factors to consider			
	Fast	Secure	Easy to implement	Easy to use
Passwords	✓		✓	✓
Secure physical key		✓		
Facial Recognition		✓		✓

Passwords are security risk!

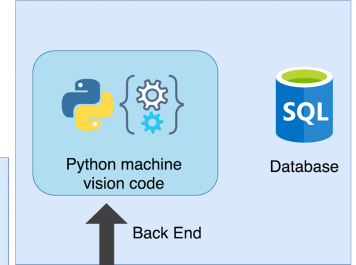


### Aim and outcome

A faster and more secure web login algorithm



user uses built-in camera to login

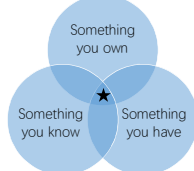


Improve the algorithm using a hybrid method so that it is both fast and secure



Unique

Ease of use



Facial Recognition  
(a better method?)

current algorithms:

- accurate
- slow
- hard to implement

trade-off  
between speed  
and accuracy

## Methodology

- (1) Design classification algorithm
- (2) Test image classification accuracy with Yale Face A dataset

Scale algorithm to use in web login

Create hybrid algorithm by including feature extractor to improve the accuracy

Test accuracy of new algorithm in web login

## Results and Discussion

### Classification Algorithm – Nearest Neighbour (k-NN)

Accuracy in percent vs. Ratio between training data and test data

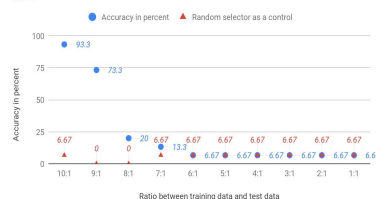


Figure 1: Summary of data collection result

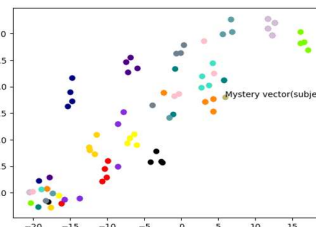


Figure 2: Scatter plot with 9 data points

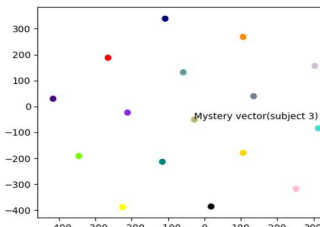
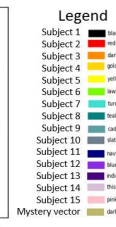


Figure 3: Scatter plot with 1 data point



Accuracy is reduced with less training data

Figure 1,2 and 3 showing the results of the simple classification algorithm as well as the visualised data. We can see that as the number of images used gets lower, there are lesser data points for comparison of the new data that will have to be tested

### Hybrid Algorithm

Accuracy in percent vs. Ratio between training data and test data

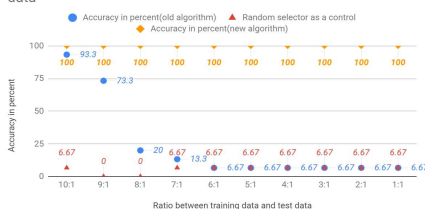


Figure 4: Summary of data collection result

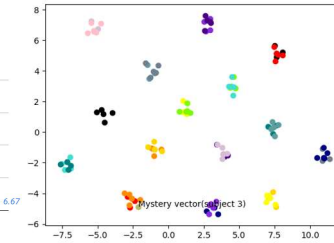


Figure 5: Scatter plot with 9 data points

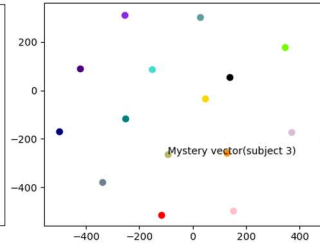
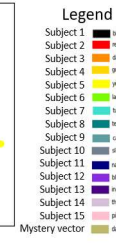


Figure 6: Scatter plot with 1 data point



Significant improvement in accuracy even with reduced training data  
93.3%

Figure 4,5 and 6 showing the results of the new classification algorithm tested on the same dataset with significant improvement in the accuracy at 93.3%

## Conclusion and Further research

### Hybrid algorithm



Faster



More accurate

When compared to k-NN

### Future Work

Improve low light performance of the algorithm

### References

- Picheta, R. (2019, April 23). *How hackable is your password?* Retrieved from CNN business: <https://edition.cnn.com/2019/04/22/uk/most-common-passwords-scli-gbr-intl/index.html>
- Belhumeur, P., Hespanha, J., & Kriegman, D. (1997). Eigenfaces vs. Fisherfaces: Recognition Using Class Specific Linear Projection. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, 711-720.
- All figures and graphs are self-drawn