# Facial Recognition System

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## Background and Objective

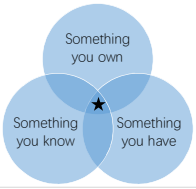
### Challenge of secure login

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

Passwords are security risk!

Unique

Ease of use




### Facial Recognition (a better method?)

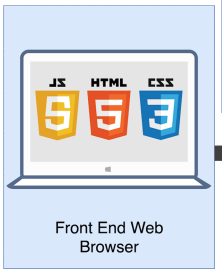
current algorithms:
- accurate
- slow
- hard to implement

→ trade-off between speed and accuracy

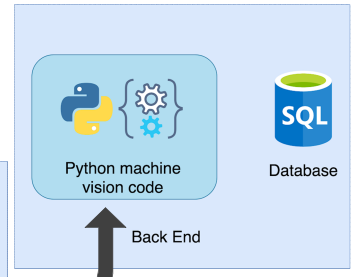
### Aim and outcome

A faster and more secure web login algorithm

user uses built-in camera to login




Front End Web Browser




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

## 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)

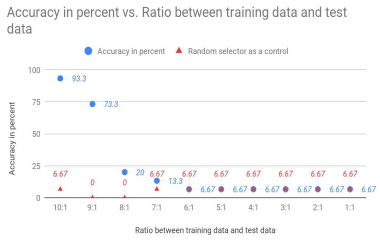



Figure 1: Summary of data collection result

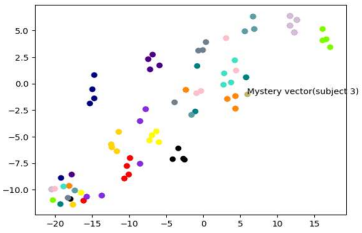



Figure 2: Scatter plot with 9 data points

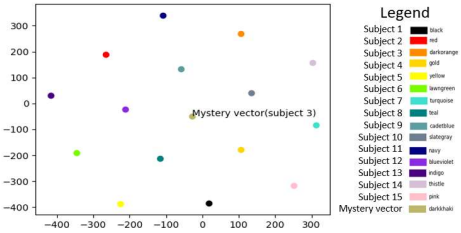



Figure 3: Scatter plot with 1 data point

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

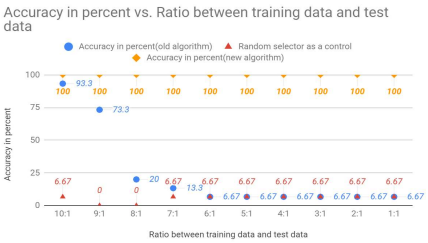



Figure 4: Summary of data collection result

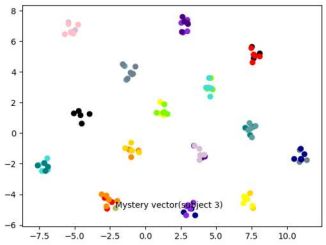



Figure 5: Scatter plot with 9 data points

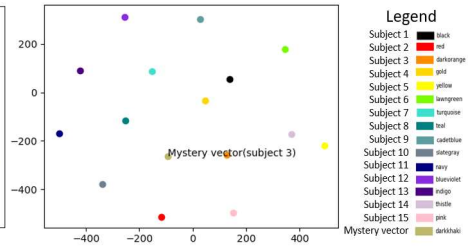



Figure 6: Scatter plot with 1 data point

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