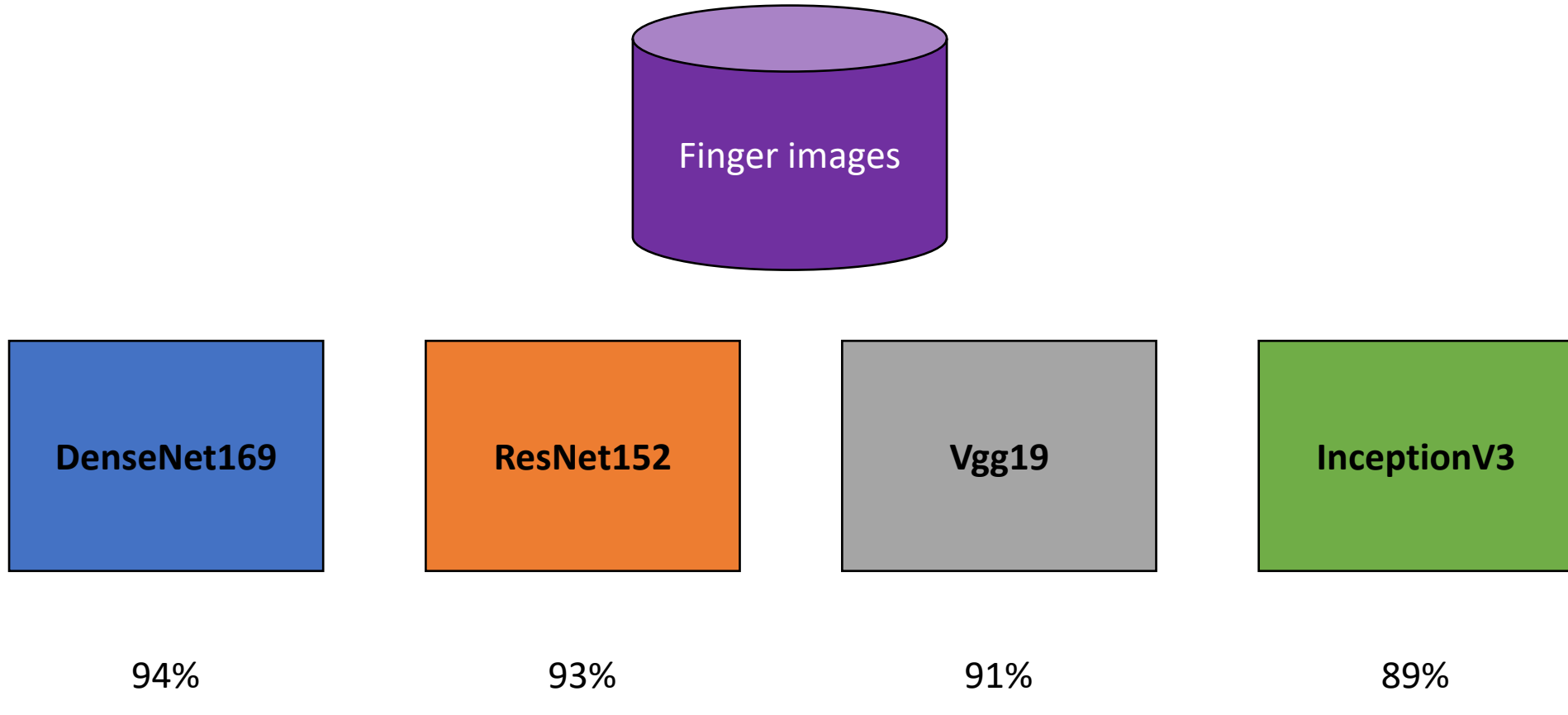# Ensemble Classification used in my MSc Dissertation

Shu-Wei Huang

Ensemble Classification

- What classifiers are ensembled?

- How to vote/find a better result?

- Weighted Ensemble Classifier

- Results

What classifiers are ensembled?

Finger images

| DenseNet169 | ResNet152 | Vgg19 | InceptionV3 |

Accuracy of each model

| 94% | 93% | 91% | 89% |

How to vote/find a better result? (Example)

Sum all predictions from individual models

Classifiers	Grades					
	1	**2**	**3**	**4**	**5**	**6**
True Value	0	0	0	1	0	0
DenseNet169	0.025	0.025	0.1	0.8	0.025	0.025
ResNet152	0.0375	0.0375	0.1	0.75	0.0375	0.0375
Vgg19	0.025	0.025	0.6	0.3	0.025	0.025
InceptionV3	0.0125	0.0125	0.25	0.7	0.0125	0.0125
Ensemble model	0.1	0.1	1.05	2.55	0.1	0.1

Weighted Ensemble Classifier (Example)

Sum all predictions which are multiplied by weights from individual models.
These weights are searched by Grid search.

Classifiers	Grades					
	1	**2**	**3**	**4**	**5**	**6**
True Value	0	0	0	1	0	0
DenseNet169	0.025	0.025	0.1	0.8	0.025	0.025
ResNet152	0.0375	0.0375	0.1	0.75	0.0375	0.0375
Vgg19	0.025	0.025	0.6	0.3	0.025	0.025
InceptionV3	0.0125	0.0125	0.25	0.7	0.0125	0.0125
Ensemble model	0.1	0.1	1.05	2.55	0.1	0.1

x w1
x w2
x w3
x w4

Results

```
Accuracy Score for model1 (DenseNet169) =  0.9354445797807551
Accuracy Score for model2 (ResNet152)   =  0.9293544457978076
Accuracy Score for model3 (Vgg19)       =  0.9110840438489647
Accuracy Score for model4 (InceptionV3) =  0.8976857490864799
Accuracy Score for average ensemble     =  0.9427527405602923
Accuracy Score for weighted average ensemble =  0.9500609013398295
```

GitHub: https://github.com/huangshuewei/MSc-Dissertation/blob/main/3.Ensemble%20models.ipynb