Final Presentation - Rocks

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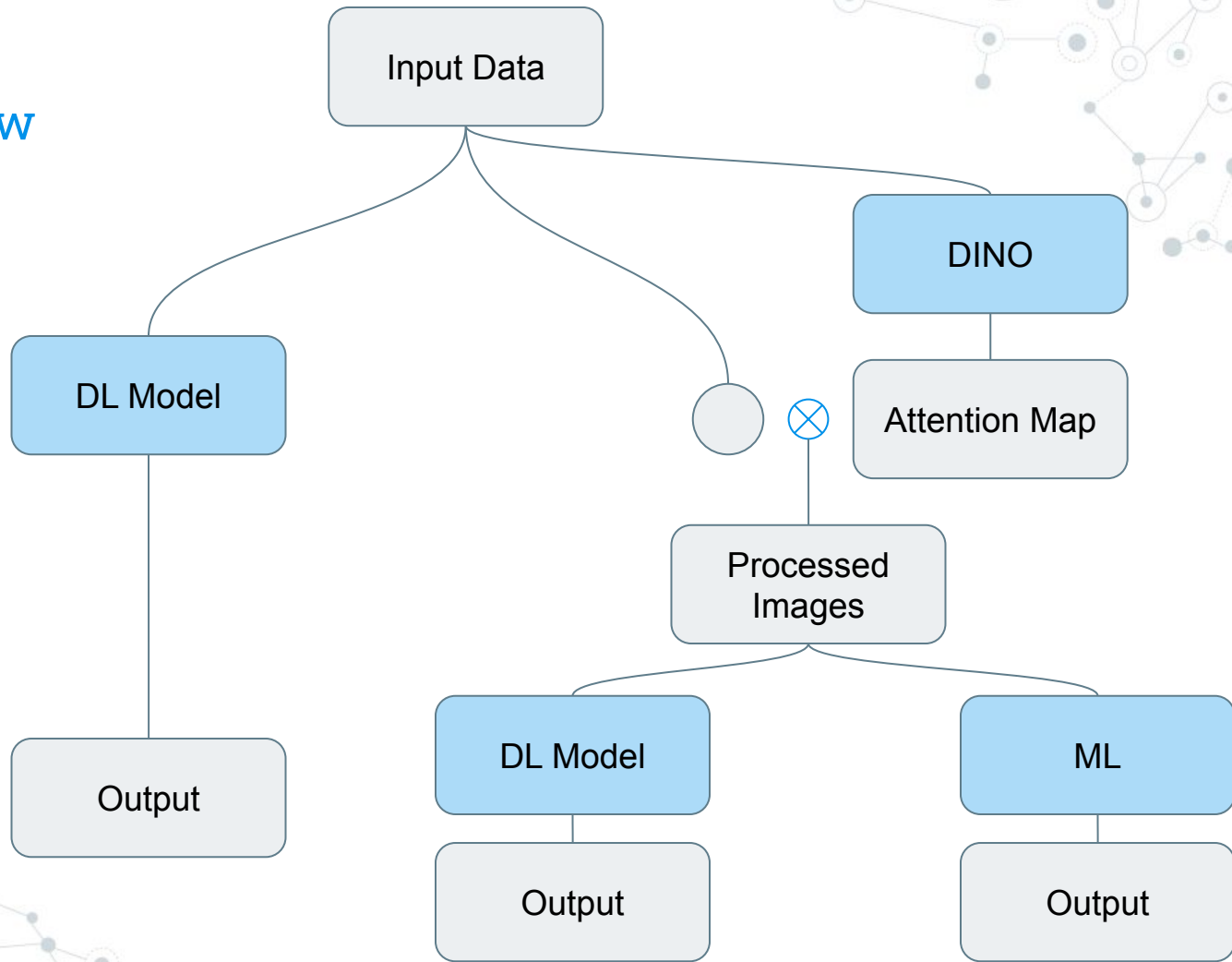
Agenda

1. Recap (Workflow, Data)

2. DINO

3. DL Results

4. ML Results

5. Works Distribution

Workflow

Dataset (~2000)

https://www.kaggle.com/salmaneunus/rock-classification

Basalt

Granite

Igneous

Marble
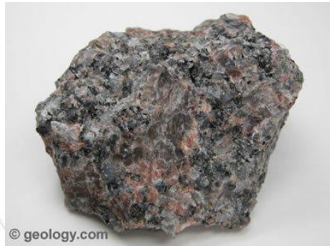
Quartzite

Metamorphic

Coal

Limestone

Sandstone

Sedimentary

DINO

https://arxiv.org/pdf/2104.14294

Self-Supervised Vision Transformers with DINO

https://github.com/facebookresearch/dino

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Principle

loss:
$$- p_2 \log p_1$$
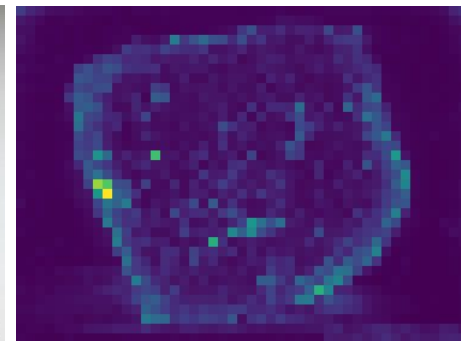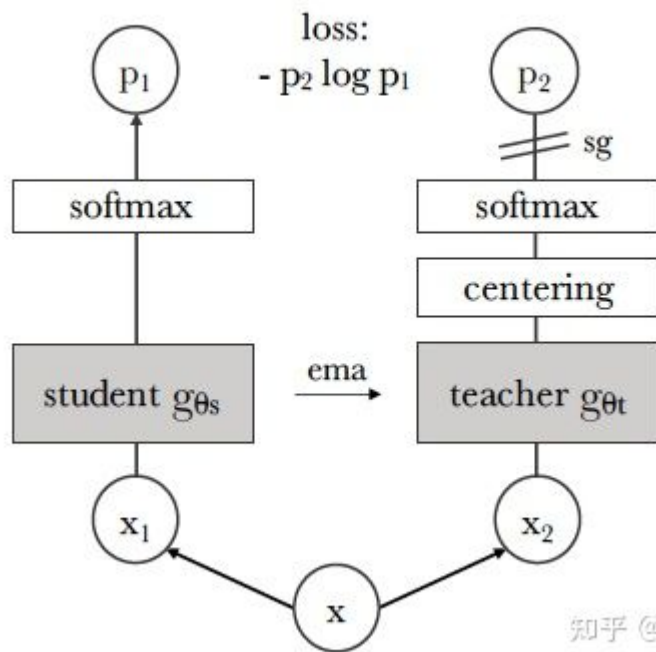
cow	dog	cat	car
0	1	0	0

Knowledge Distillation (Dark Knowledge)

cow	dog	cat	car
10^{-6}	.9	.1	10^{-9}

知乎 @溯流而上

Processing
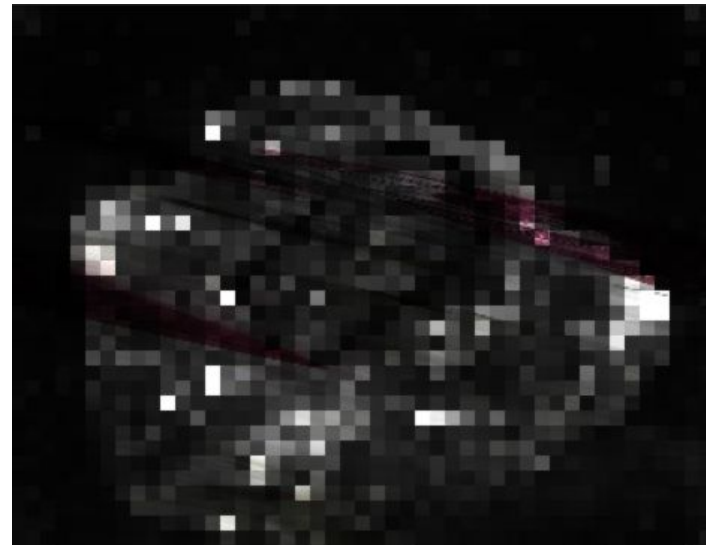
	A	B	C	D	E	F	G
1	file_name	blue_rate	green_rate	red_rate	hue_mean	sat_rate	class
2	['Sandston	0.244128	0.32586	0.430012	108.6497	108.3646	Sandstone
3	['Sandston	0.309625	0.295025	0.39535	43.25768	43.55428	Sandstone
4	['Sandston	0.167002	0.298952	0.534046	55.63048	54.34923	Sandstone
5	['Sandston	0.345713	0.313177	0.34111	36.20833	36.1091	Sandstone
6	['Sandston	0.125698	0.2972	0.577101	59.2648	58.94846	Sandstone
7	['Sandston	0.293316	0.332777	0.373907	21.10307	21.29496	Sandstone
8	['Sandston	0.333208	0.33688	0.329912	11.89254	11.92032	Sandstone
9	['Sandston	0.254192	0.336	0.409808	88.14529	87.99068	Sandstone
10	['Sandston	0.333333	0.333333	0.333333	1.52193	1.52193	Sandstone
11	['Sandston	0.315499	0.349698	0.334803	6.890351	6.890351	Sandstone
12	['Sandston	0.285316	0.329853	0.384831	1.145833	1.1425	Sandstone
13	['Sandston	0.282185	0.328642	0.389173	2.252252	2.252252	Sandstone
14	['Sandston	0.27031	0.328842	0.400848	80.83498	80.58662	Sandstone
15	['Sandston	0.27093	0.318364	0.410706	34.81667	34.68935	Sandstone
16	['Sandston	0.251184	0.292682	0.456134	57.41283	56.27029	Sandstone
17	['Sandston	0.291897	0.30945	0.398653	34.71217	36.14638	Sandstone
18	['Sandston	0.344646	0.337161	0.318192	42.64309	41.91831	Sandstone
19	['Sandston	0.098348	0.288539	0.613113	82.4682	83.01206	Sandstone
20	['Sandston	0.225333	0.354058	0.420609	55.91831	55.37061	Sandstone
21	['Sandston	0.335607	0.333548	0.330845	9.443531	9.368969	Sandstone
22	['Sandston	0.232268	0.307169	0.460563	50.20833	50.0784	Sandstone
23	['Sandston	0.21531	0.279137	0.505553	63.7034	63.8443	Sandstone
24	['Sandston	0.248289	0.318797	0.432914	0.978495	0.978495	Sandstone
25	['Sandston	0.321674	0.336532	0.341794	10.66064	10.42544	Sandstone
26	['Sandston	0.301171	0.254767	0.444061	85.09978	85.63487	Sandstone

DL Results

```
model   =   keras.applications.vgg16.VGG16(weights='imagenet',   include_top=False,   input_shape=(256,   256,   3))
flat    =   keras.layers.Flatten()(model.layers[-1].output)
class1  =   keras.layers.Dense(1024,   activation='relu')(flat)
class2  =   keras.layers.Dense(512,   activation='relu')(class1)
output      =   keras.layers.Dense(7,   activation='sigmoid')(class2)
model   =   keras.models.Model(inputs=model.inputs,   outputs=output)
model.summary()
```

```
Epoch 23/30
52/52 [==============================] - 21s 405ms/step - loss: 0.1099 - accuracy: 0.9644 - val_loss: 4.8875 - val_accuracy: 0.4039
Epoch 24/30
52/52 [==============================] - 21s 390ms/step - loss: 0.1459 - accuracy: 0.9517 - val_loss: 3.8502 - val_accuracy: 0.4039
Epoch 25/30
52/52 [==============================] - 21s 401ms/step - loss: 0.2525 - accuracy: 0.9210 - val_loss: 4.5918 - val_accuracy: 0.3869
Epoch 26/30
52/52 [==============================] - 21s 403ms/step - loss: 0.1846 - accuracy: 0.9415 - val_loss: 3.5220 - val_accuracy: 0.4088
Epoch 27/30
52/52 [==============================] - 21s 408ms/step - loss: 0.1613 - accuracy: 0.9487 - val_loss: 4.3876 - val_accuracy: 0.3771
Epoch 28/30
52/52 [==============================] - 21s 406ms/step - loss: 0.1023 - accuracy: 0.9723 - val_loss: 5.3225 - val_accuracy: 0.4063
Epoch 29/30
52/52 [==============================] - 21s 405ms/step - loss: 0.0820 - accuracy: 0.9735 - val_loss: 4.3787 - val_accuracy: 0.4282
Epoch 30/30
52/52 [==============================] - 21s 406ms/step - loss: 0.0669 - accuracy: 0.9765 - val_loss: 5.0024 - val_accuracy: 0.3820
```

ML Results

kNeighborsclassifier()

```
Accuracy: 28.000%
              precision    recall  f1-score   support

     Basalt       0.00      0.00      0.00        31
       Coal       0.28      0.35      0.31       104
    Granite       0.00      0.00      0.00        20
  Limestone       0.33      0.38      0.36        91
     Marble       0.18      0.20      0.19       101
  Quartzite       0.32      0.37      0.34       134
  Sandstone       0.32      0.22      0.26        94

   accuracy                           0.28       575
  macro avg       0.20      0.22      0.21       575
weighted avg      0.26      0.28      0.27       575
```

GaussianNB()

```
Accuracy: 42.957%
              precision    recall  f1-score   support

     Basalt       0.00      0.00      0.00        31
       Coal       0.35      0.64      0.45       104
    Granite       0.00      0.00      0.00        20
  Limestone       0.39      0.57      0.46        91
     Marble       0.30      0.06      0.10       101
  Quartzite       0.44      0.49      0.46       134
  Sandstone       0.70      0.61      0.65        94

   accuracy                           0.43       575
  macro avg       0.31      0.34      0.30       575
weighted avg      0.39      0.43      0.39       575
```

DecisionTreeclassifier()

```
Accuracy: 37.217%
              precision    recall  f1-score   support

      Basalt       0.06      0.03      0.04        31
        Coal       0.49      0.37      0.42       104
     Granite       0.06      0.05      0.06        20
   Limestone       0.35      0.33      0.34        91
      Marble       0.24      0.32      0.27       101
   Quartzite       0.41      0.45      0.43       134
   Sandstone       0.53      0.55      0.54        94

    accuracy                          0.37       575
   macro avg       0.31      0.30      0.30       575
weighted avg       0.37      0.37      0.37       575
```

SVC()

```
Accuracy: 34.435%
              precision    recall  f1-score   support

      Basalt       0.00      0.00      0.00        31
        Coal       0.38      0.41      0.40       104
     Granite       0.00      0.00      0.00        20
   Limestone       0.44      0.40      0.42        91
      Marble       0.23      0.18      0.20       101
   Quartzite       0.33      0.61      0.42       134
   Sandstone       0.38      0.20      0.26        94

    accuracy                          0.34       575
   macro avg       0.25      0.26      0.24       575
weighted avg       0.32      0.34      0.32       575
```
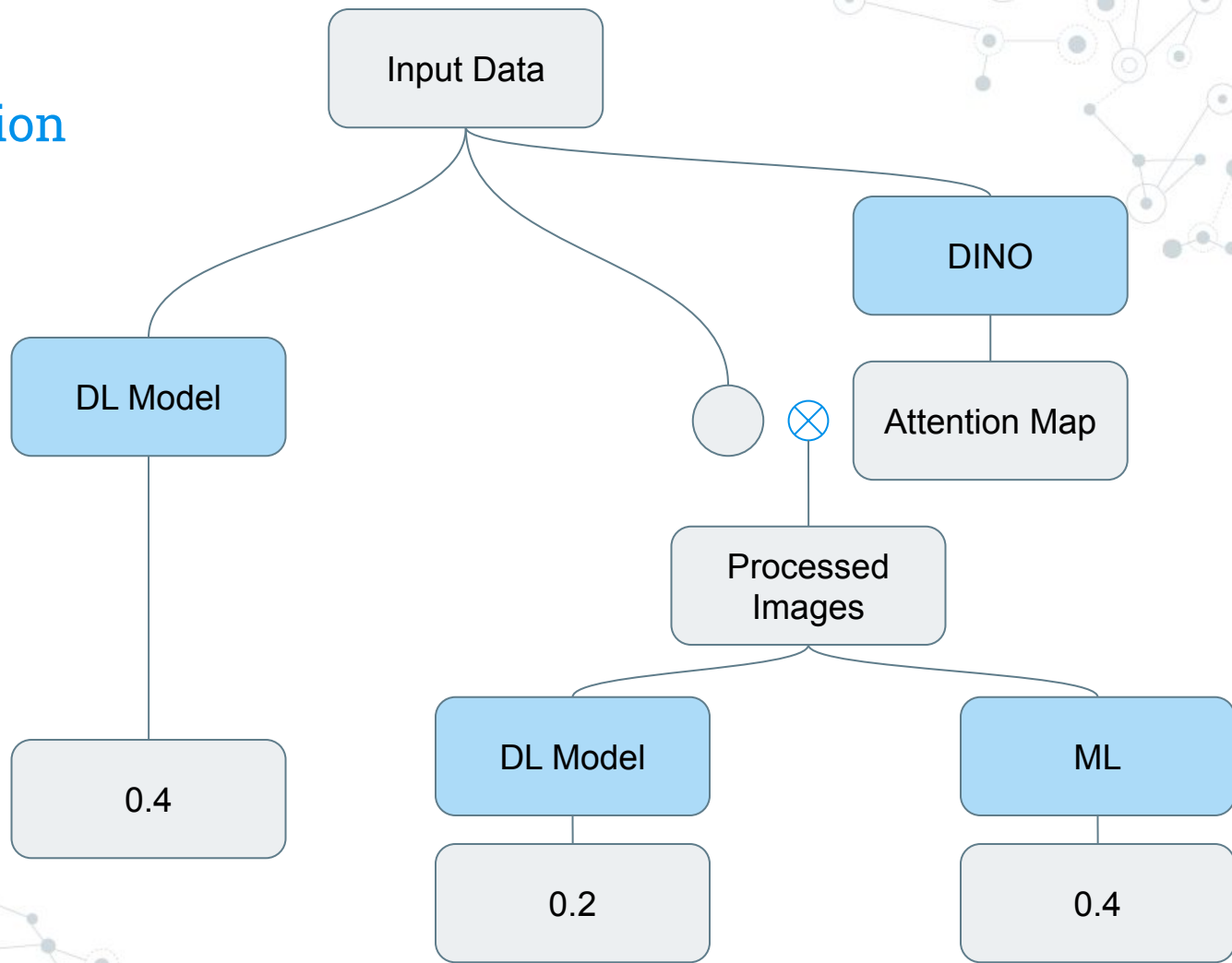
RandomForestclassifier(n_estimators=100, max_features=4)

```
Accuracy: 43.652%
              precision    recall  f1-score   support

      Basalt       0.20      0.03      0.06        31
        Coal       0.51      0.44      0.47       104
     Granite       0.00      0.00      0.00        20
   Limestone       0.44      0.52      0.48        91
      Marble       0.30      0.33      0.31       101
   Quartzite       0.41      0.49      0.45       134
   Sandstone       0.59      0.63      0.61        94

    accuracy                          0.44       575
   macro avg       0.35      0.35      0.34       575
weighted avg       0.42      0.44      0.42       575
```

Conclusion

Works Distribution

1063710 Tristan 陳亮融 - DINO + DL

1063723 Ian 涂義源 - ML

1063725 Andrew 溫穎 - ML