SAR IMAGE CLASSIFICATION

SAR IMAGES OF THE OCEAN SURFACE

Phillipe Caudal

Yousra Hamrouni

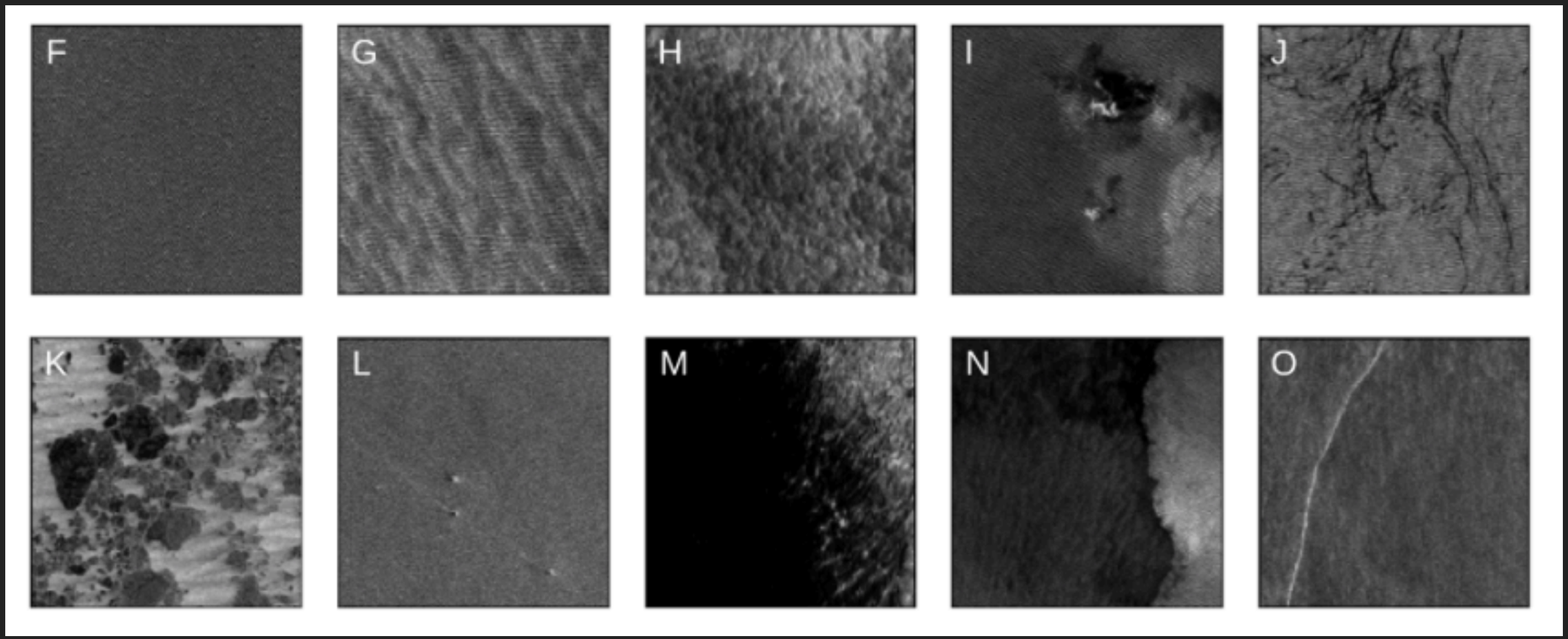
Audrey Hasson

Eve Laroche-Pinel

Adrien Vuvan

DATASET

- Goal: automatically classify different oceanic and atmospheric phenomena

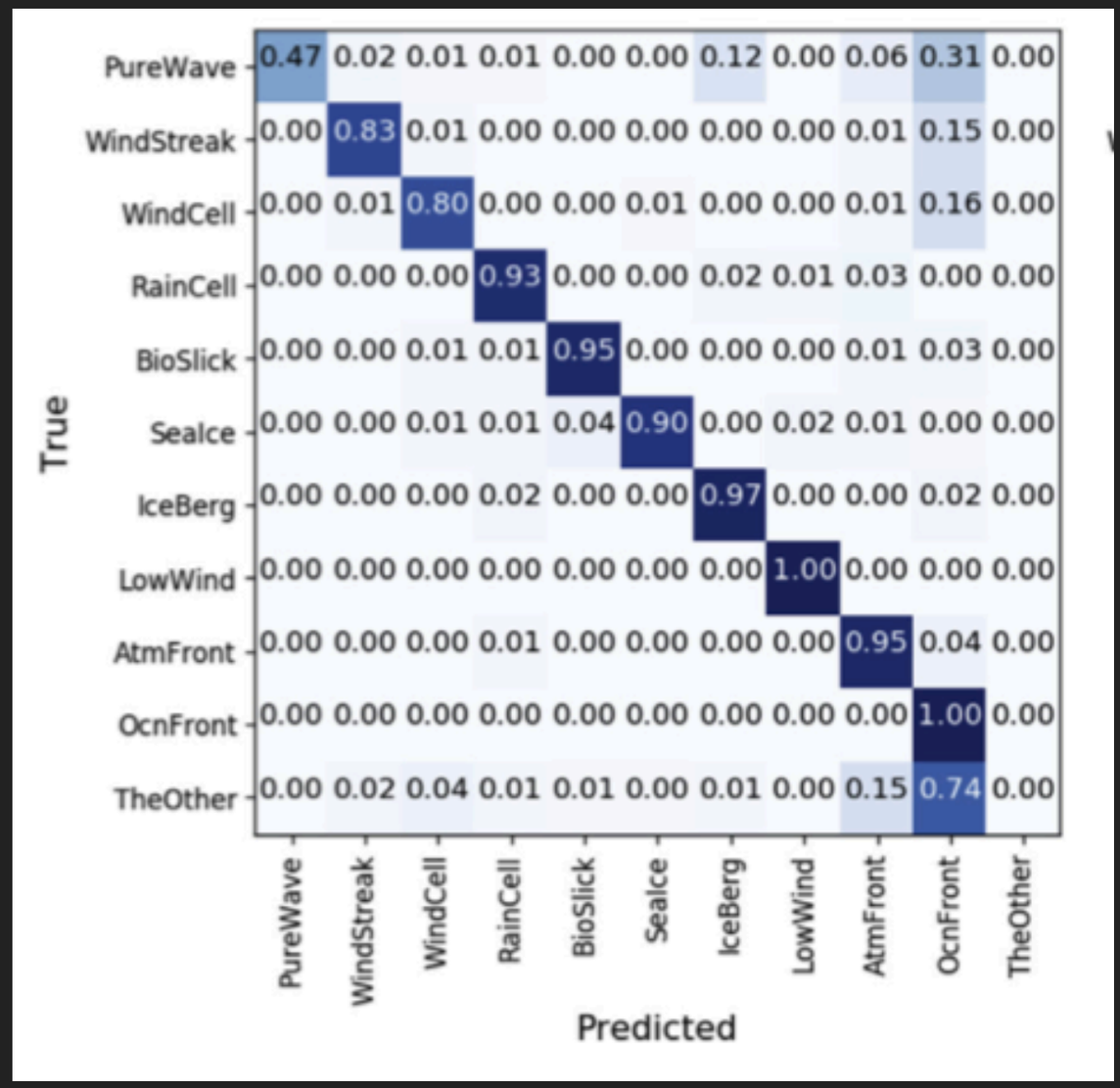


PAPER: WANG & AL, 2019

Re-training the Inception-v3 CNN

Easy implementation with the python deep learning library of Keras

- 320 images per classe
- Multilabel for multi feature images
- Validation accuracy : 94%



IMPROVE CLASSIFICATION ACCURACY

Apply naive classifier

In [0]:
```
# import functions
from sklearn.neighbors.nearest_centroid import NearestCentroid
from sklearn.metrics import accuracy_score

# apply k-nearest classification
clf = NearestCentroid()
clf.fit(X_train, y_train)
y_predict = clf.predict(X_validation)

# compute average classifier score
print('Accuracy: '+ str(accuracy_score(y_validation, y_predict)))

# we are far from the 94% accuracy given a deep learning model!
```

```
Accuracy: 0.2625
```

2 different methods

- Build a new network
- Use an exciting network (Resnet50)
- From an pre-train network (Inception V3)

160 images per classe

BUILD OUR OWN NEW NETWORK

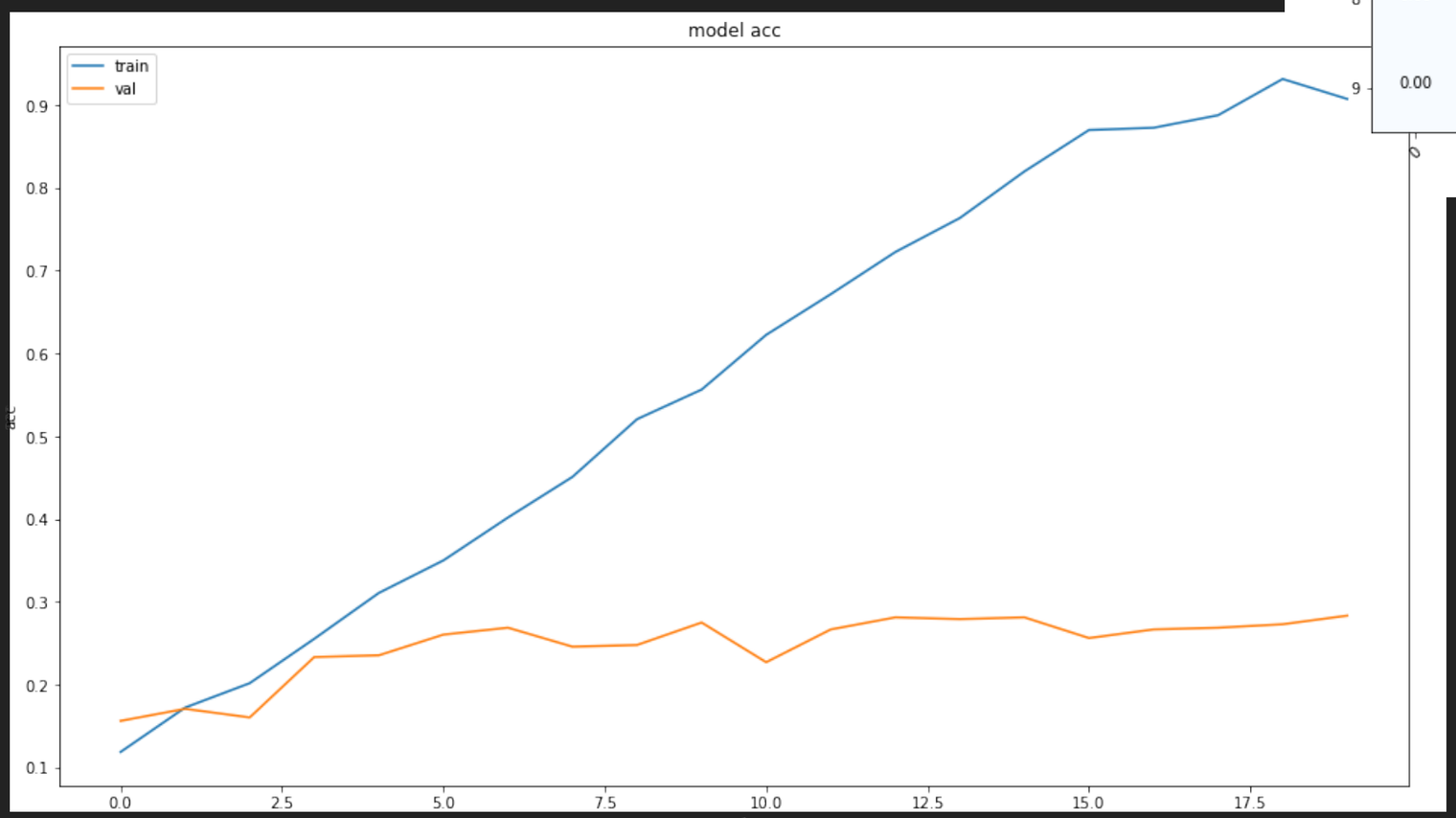
- MLP
- CNN

MLP

- 3 denses & 1 dropout

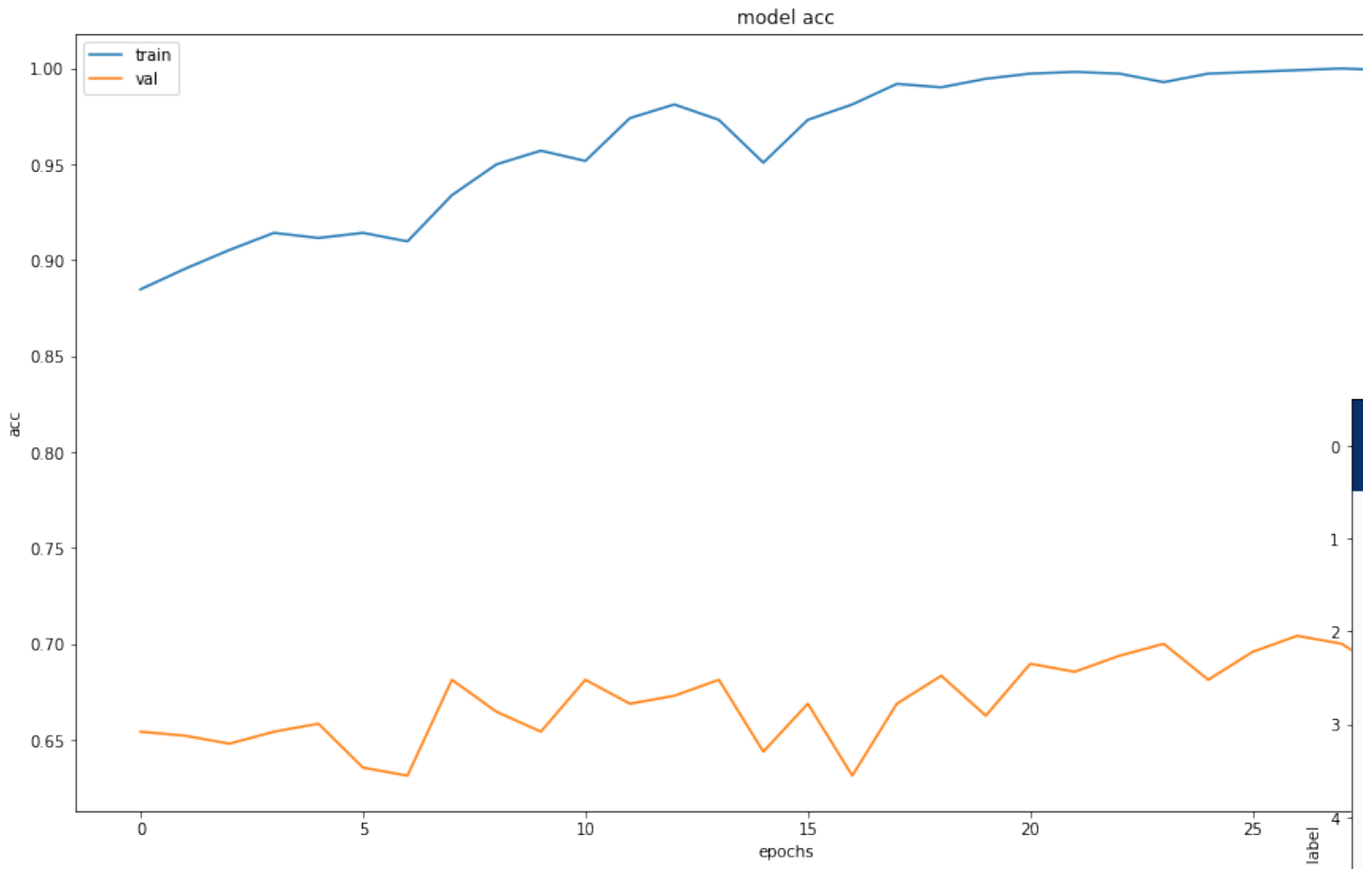
Accuracy 28%

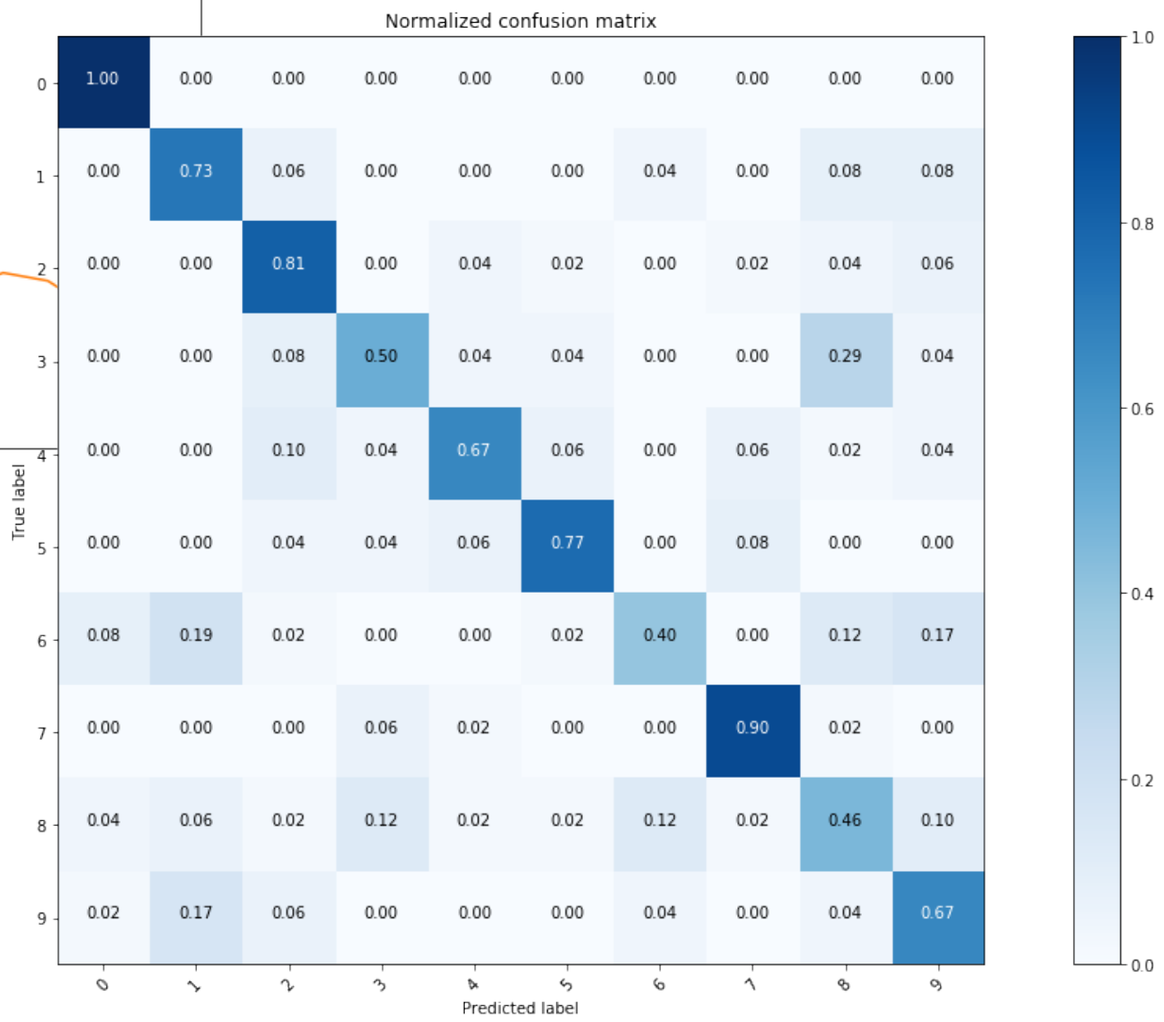
Epochs: 20



CNN

- 2 convolutions, 1maxpool, 2 Dense



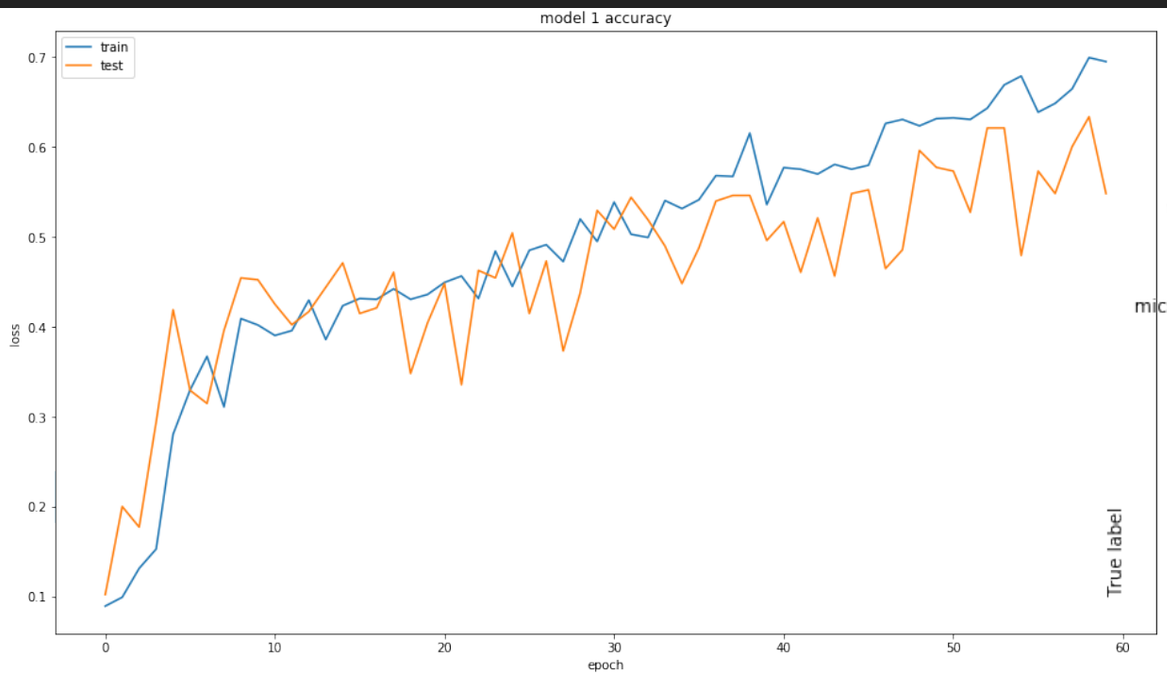


Accuracy 70%

Epochs: 30

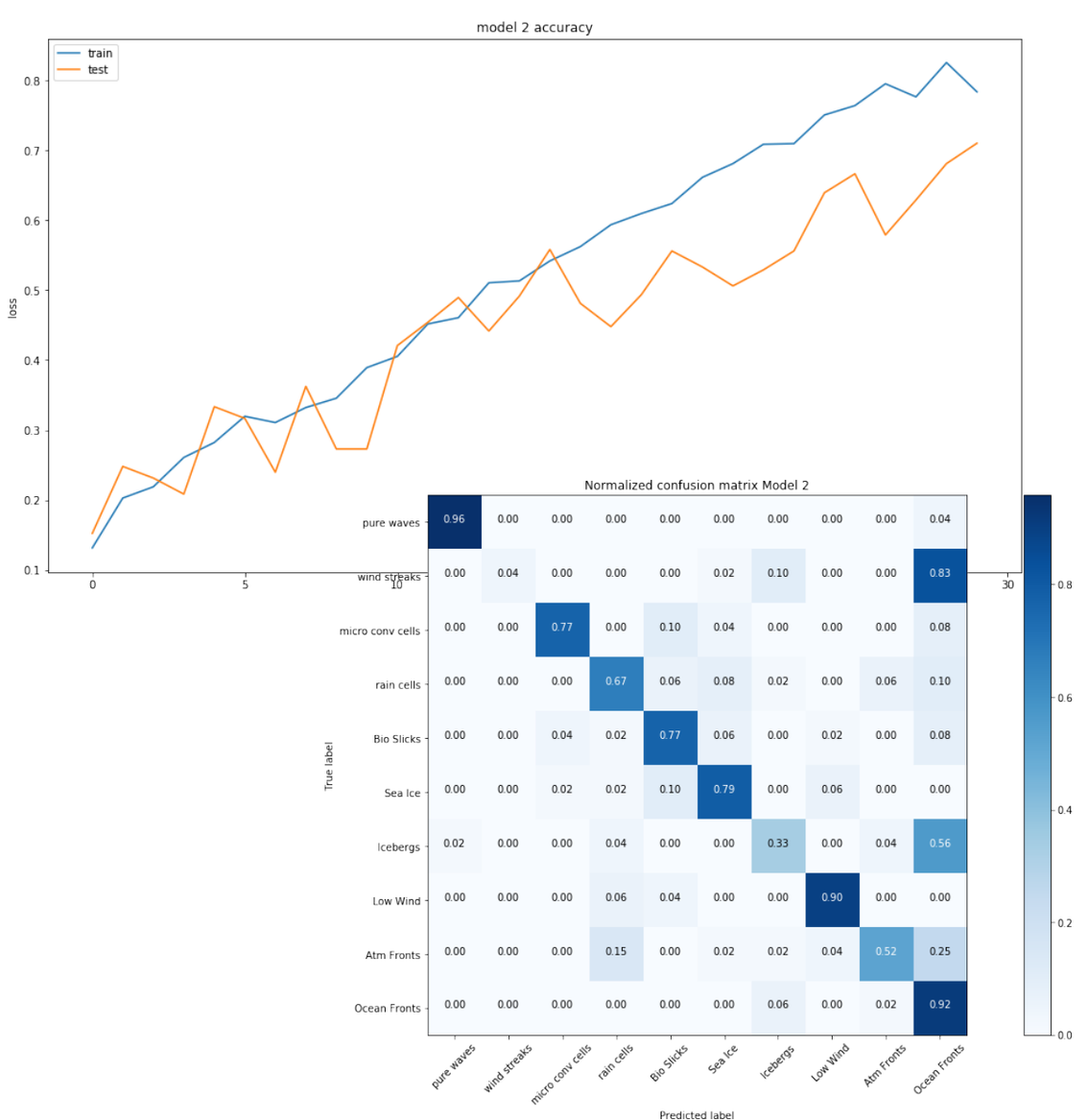
CNN A

- A :3 convolutions, 3 maxpooling, 2 Dense (1softmax) ==>
  No maxpooling at the top
  Validation Accuracy 60% (60 epochs)



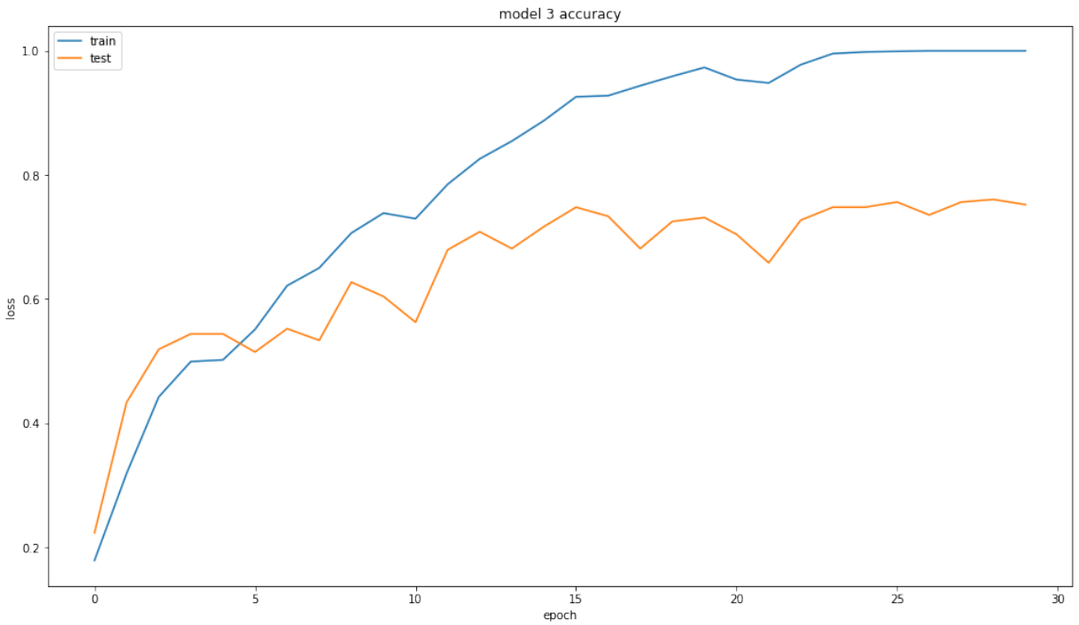
CNN B

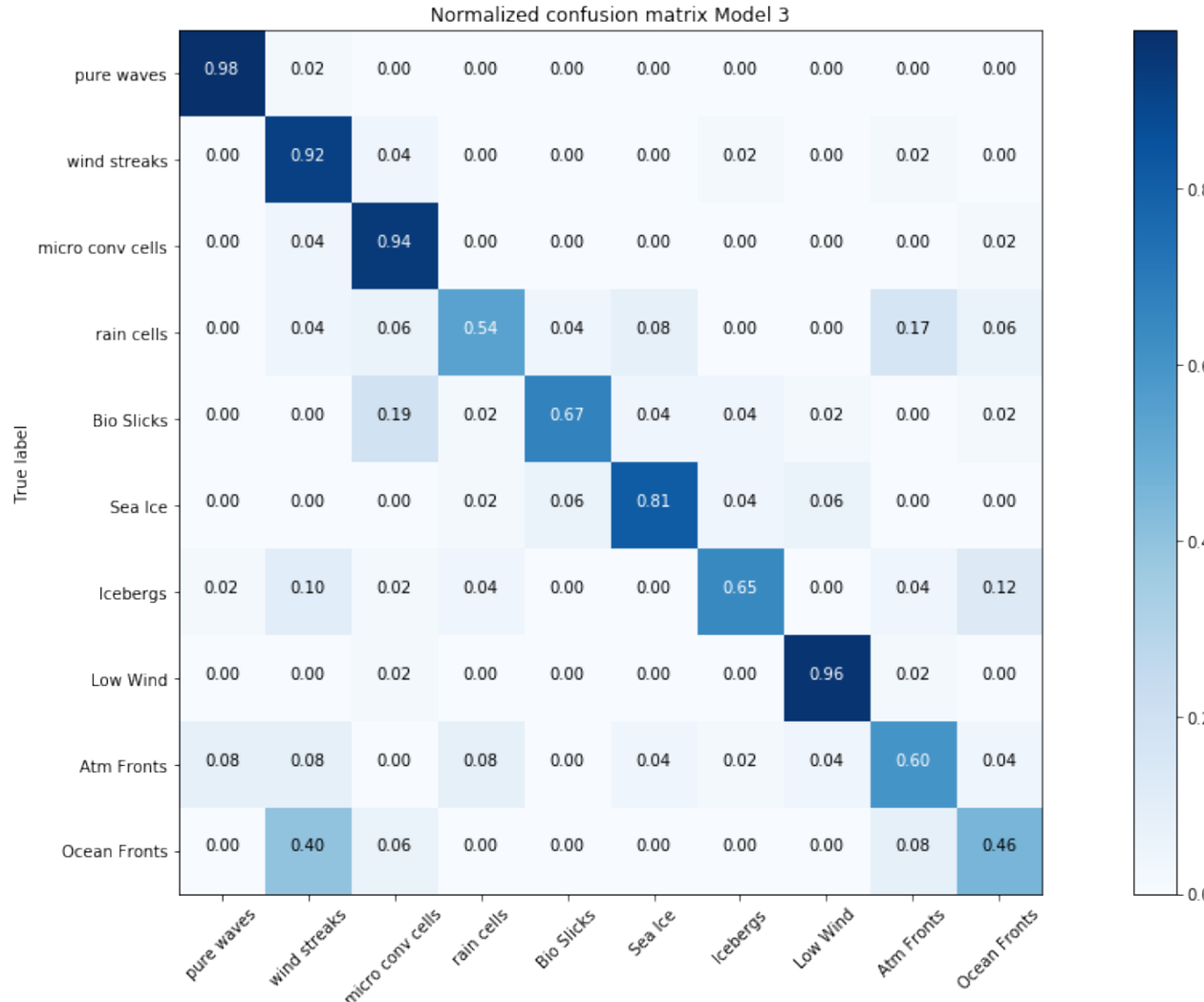
- B: add x^2 (physical explication of the observed phenomen)
  1 convolution2D
  2 convolution filters
  Concatenation → 3maxpool, 2 convolution, 2 Dense
  Validation accuracy: 73% (30 epochs)



CNN C

- C: second with kernel size of 7x7 instead of 3x3
  ==> Optimizing iceberg detection
  before dense layers: concatenation of first layer output with the last layer
  ==> More weight to x2
  Validation accuracy : 76% (20 epochs)



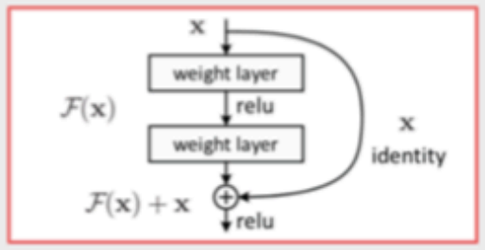


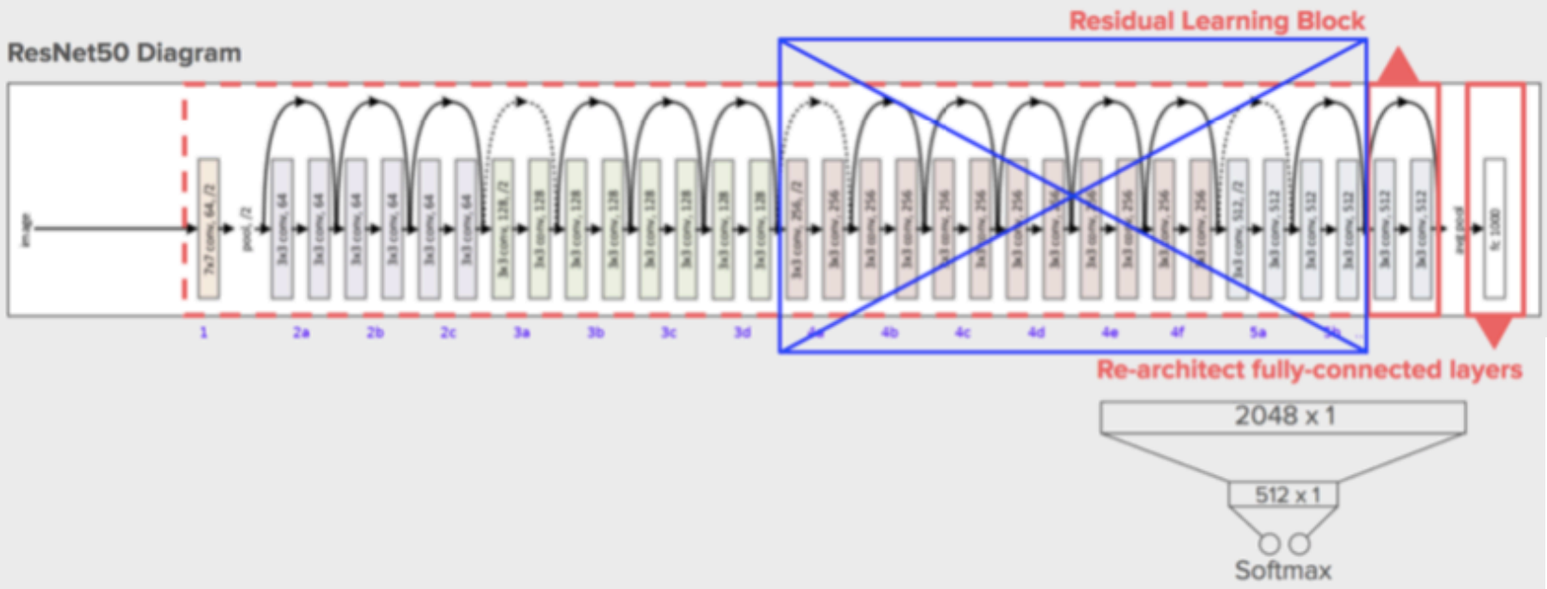
CNN D

- D: concatenate output model A and model C after softmax + softmax
  ==> Improve classification of all classes
  Validation accuracy: 20%

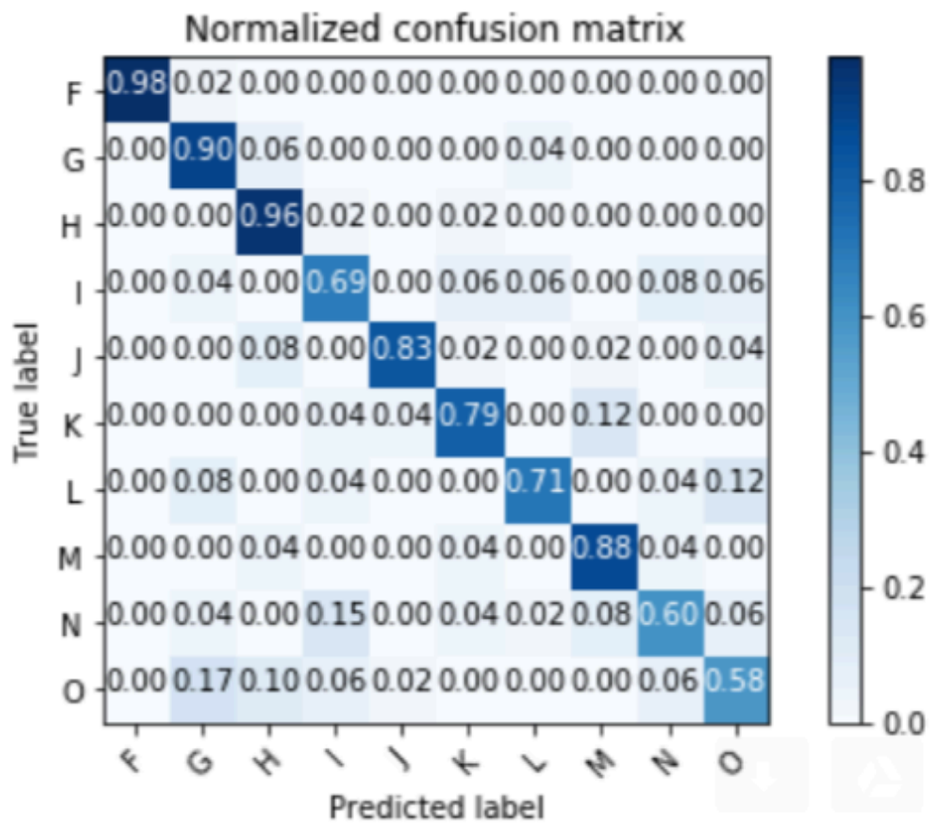
NETWORK RESNET 50

Retrain ResNet50





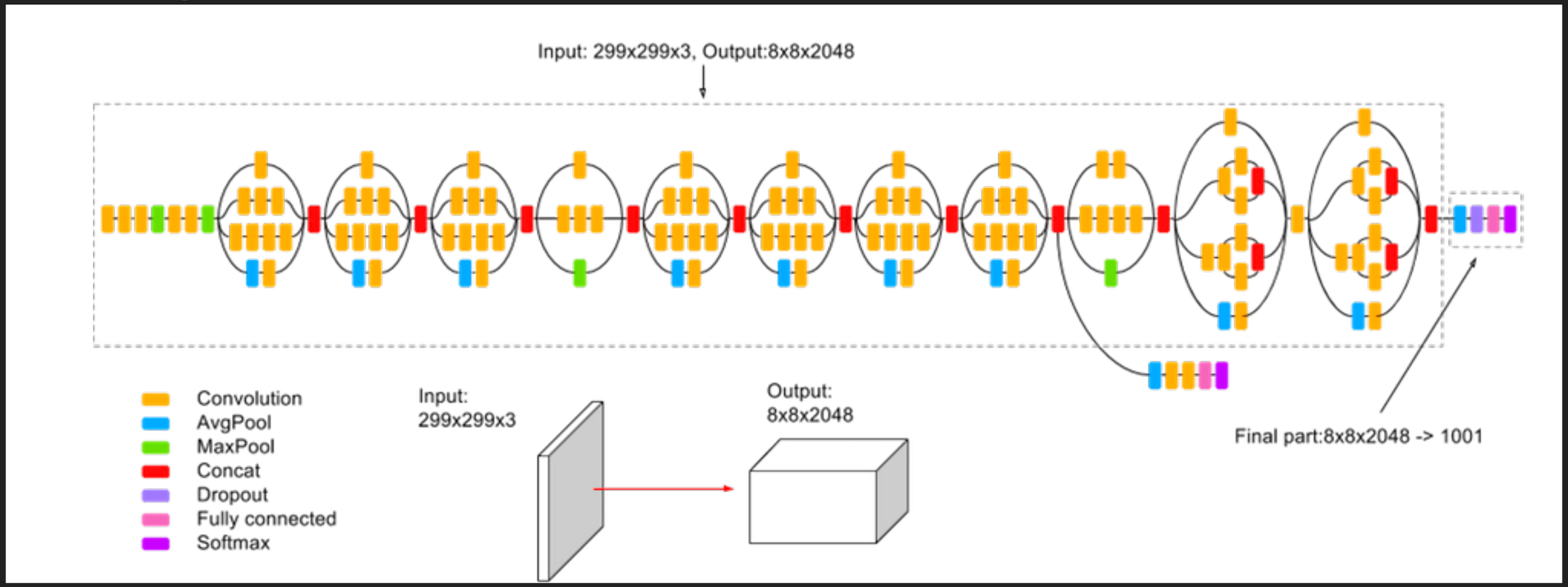

```
Test accuracy: 0.792
```



PRE-TRAIN NETWORK

- Inception V3

Imagenet Data base

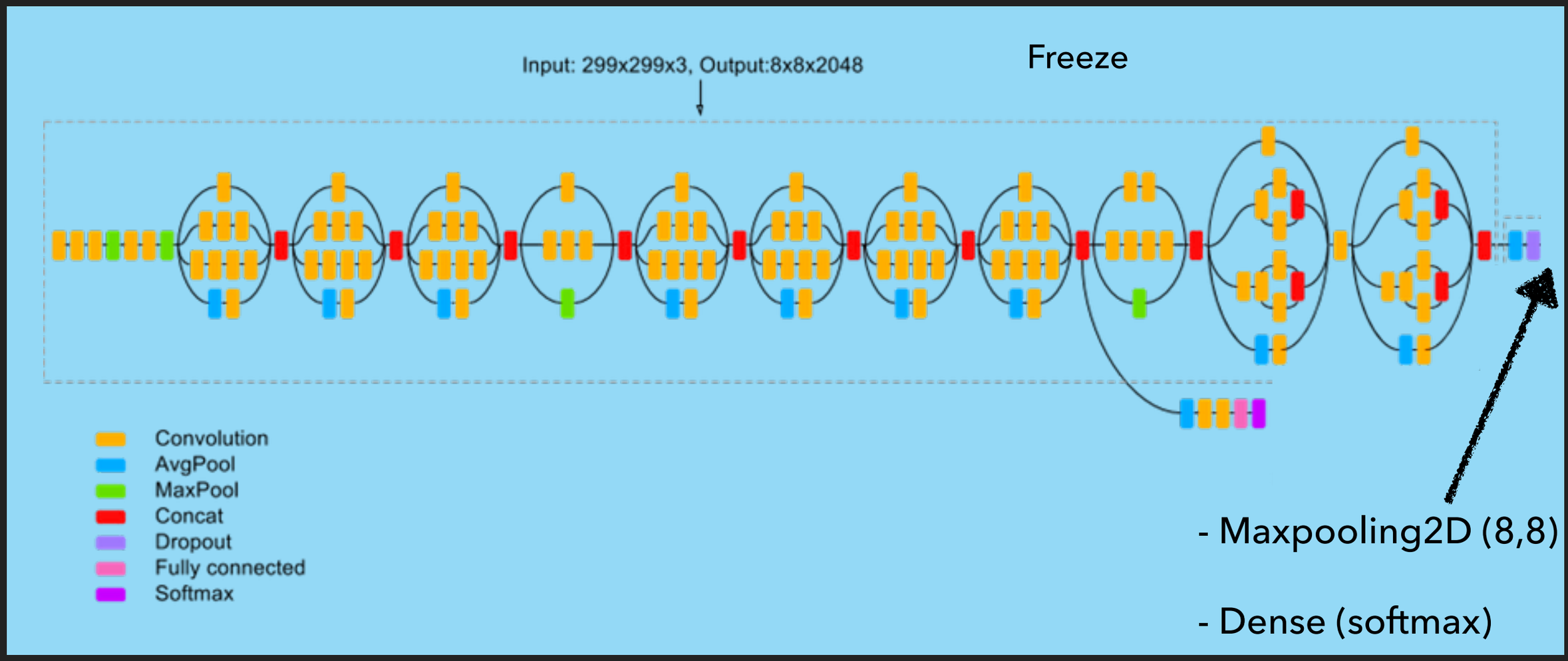


1- Replace the last layer

2- Add a new model

PRE-TRAIN NETWORK

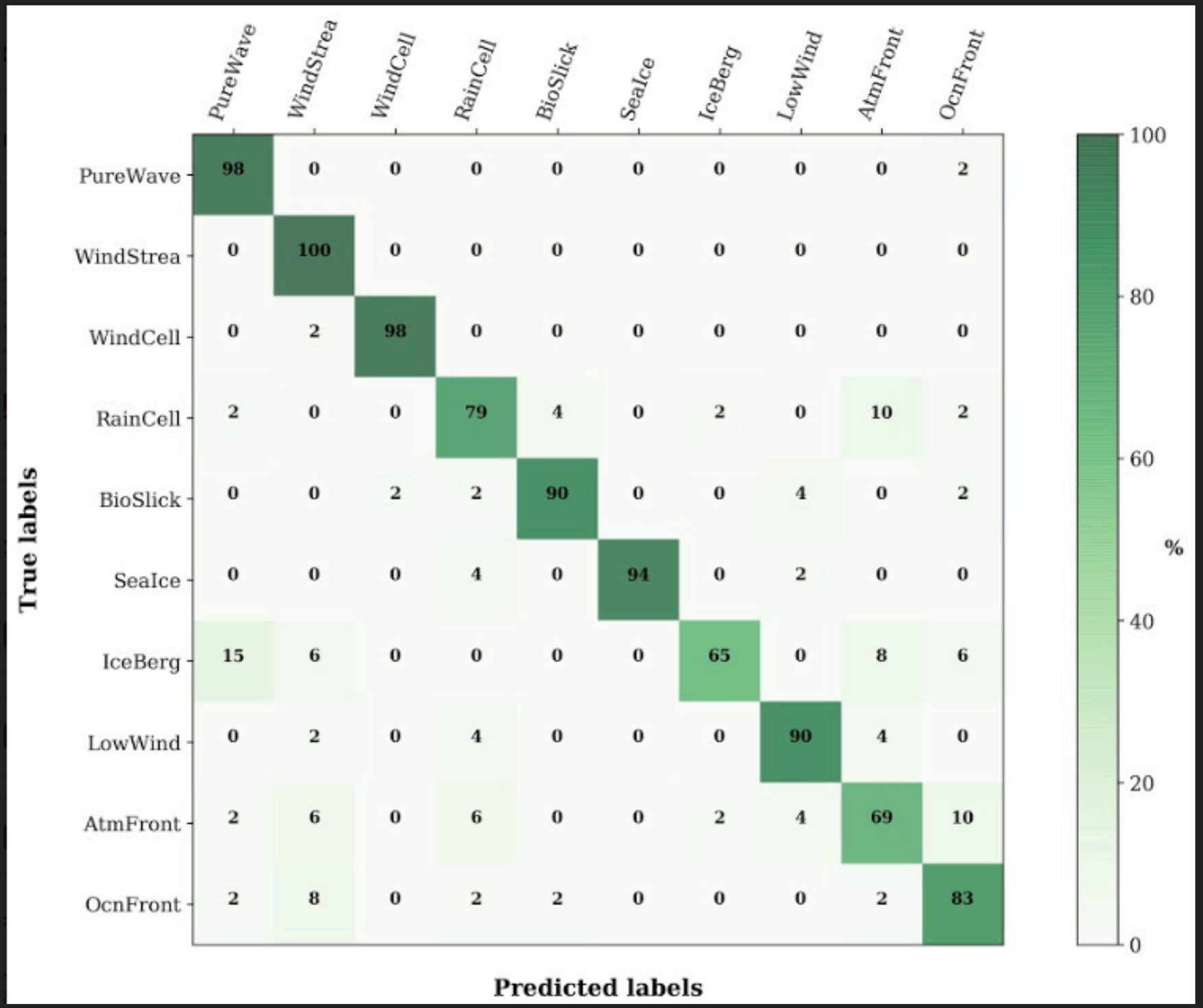
- 1: Replace the last layer of Inception V3



Validation accuracy: 86%

PRE-TRAIN NETWORK

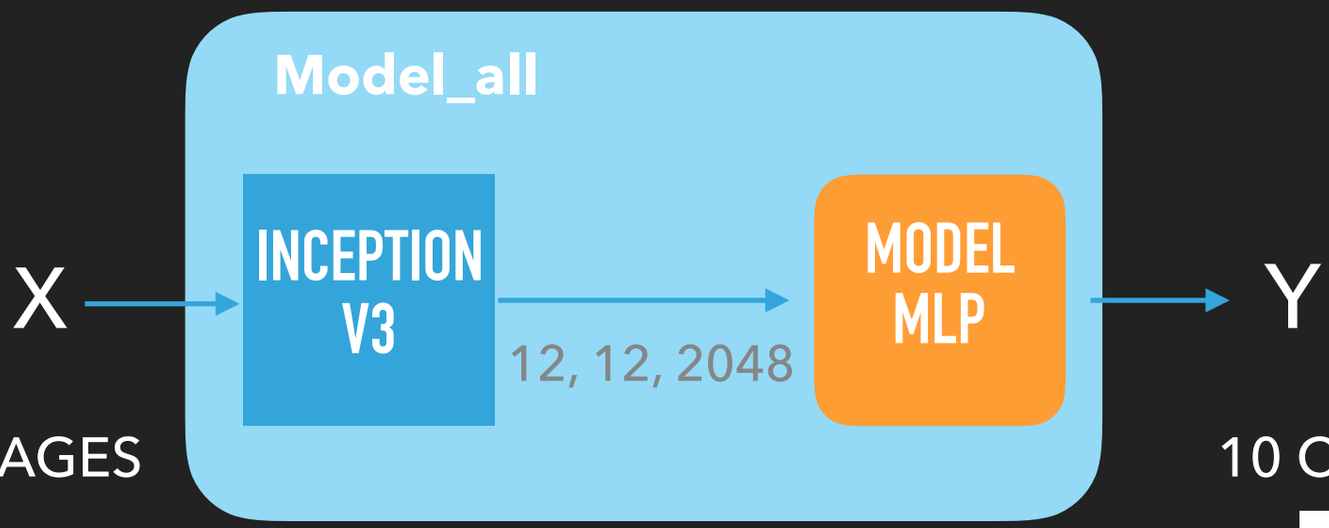
- 1: Replace the last layer of Inception V3



PRE-TRAIN NETWORK

- 2: add a new model

Validation accuracy : 55%



SAR IMAGES

450, 450, 3

10 Classes

MLP model :

- Flatten
- BatchNormalization
- Dense (softmax)