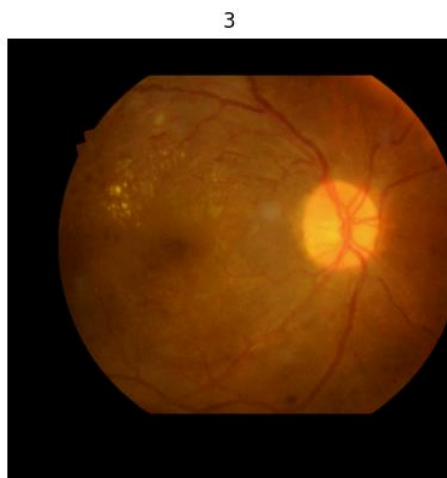# Diabetic Retinopathy Detection

Deep Learning Lab 2021

Author: Shuai ZHANG, Peng GU

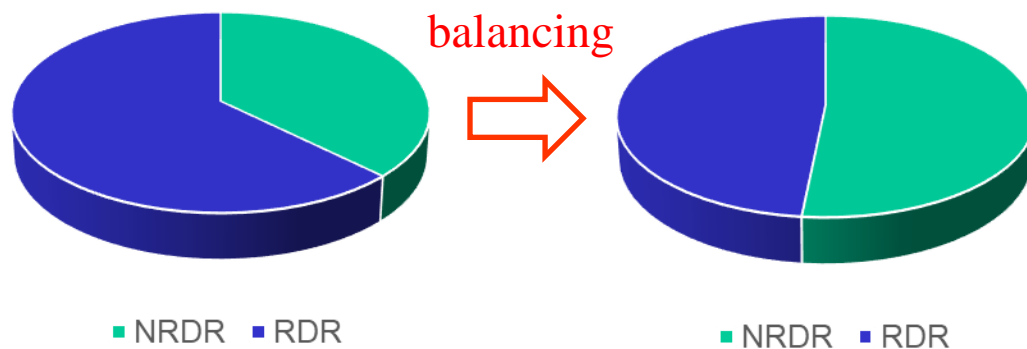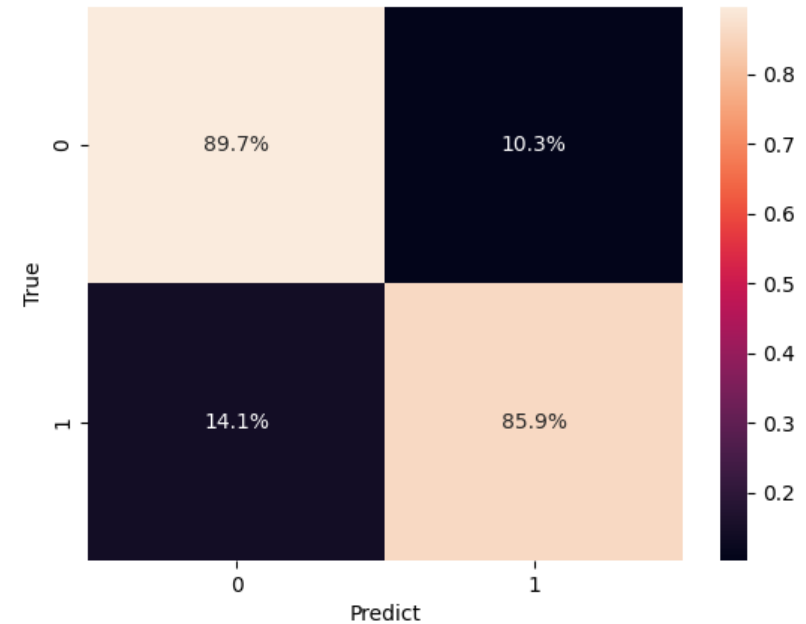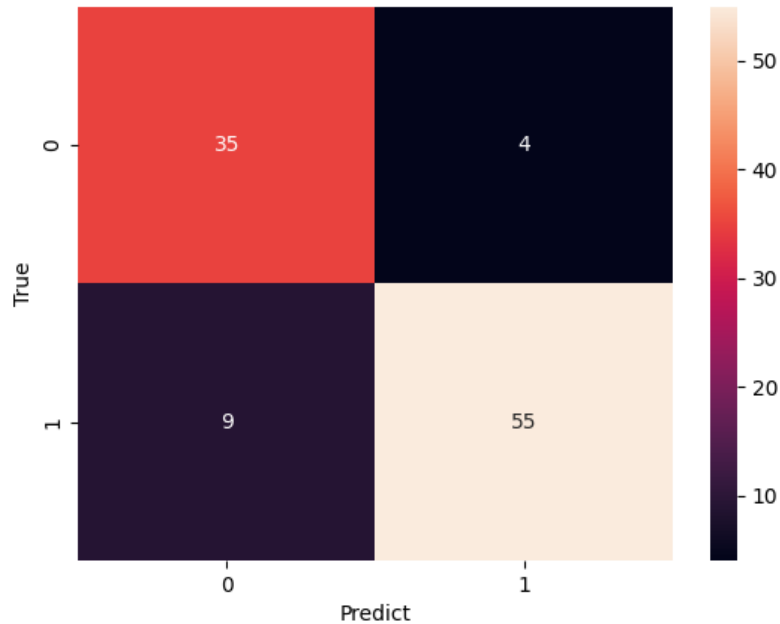# Input Pipeline

For each image:

- normalize to [0, 1]
- resize to (512, 512, 3)
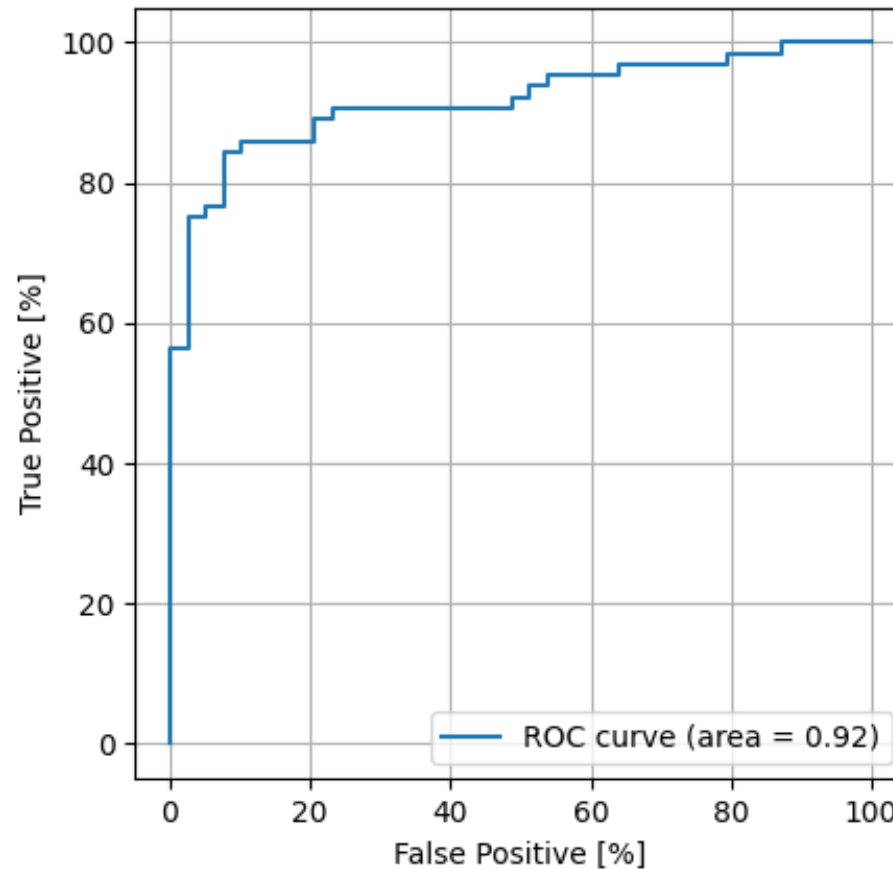- data augmentation

For dataset:

balancing

- load csv file
- create tfrecords
- balance dataset

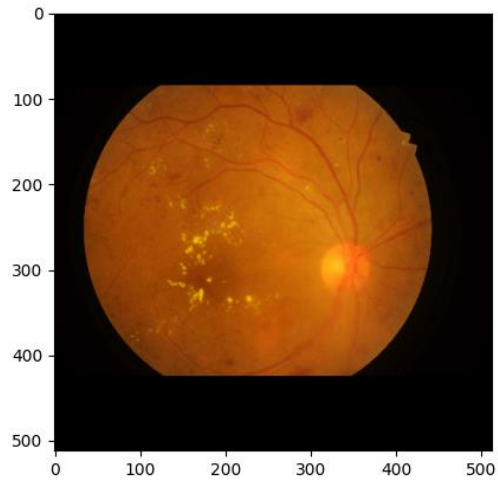# Evaluation

Confusion matrix:

- 87.4% accuracy
- **unbiased** to labels
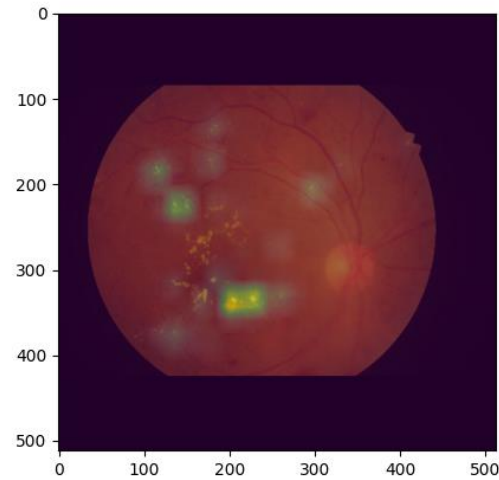
Evaluation

ROC curve:

- ROC: classification performance at all thresholds
- AUC: scale-invariant & classification-threshold-invariant

Deep Visualization
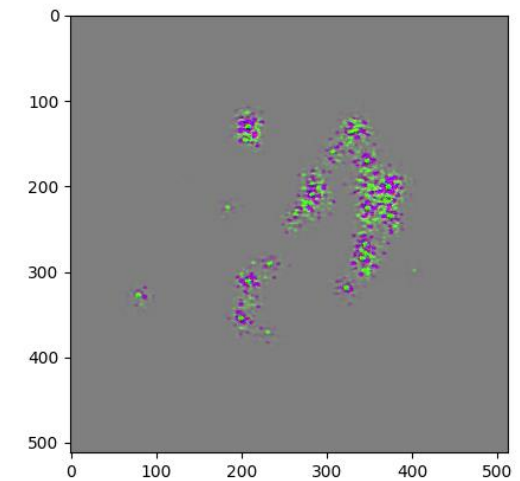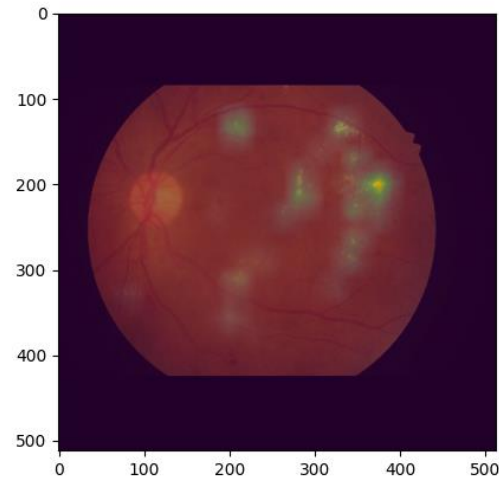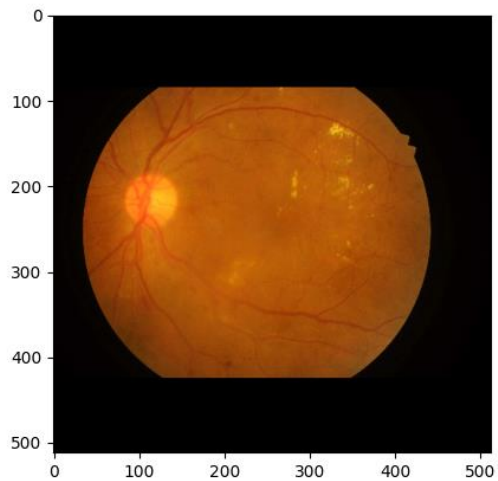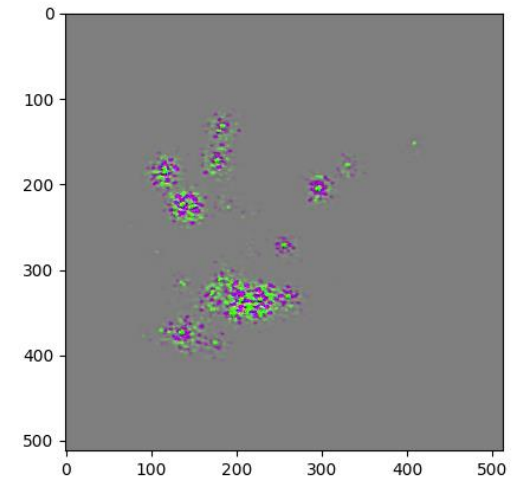
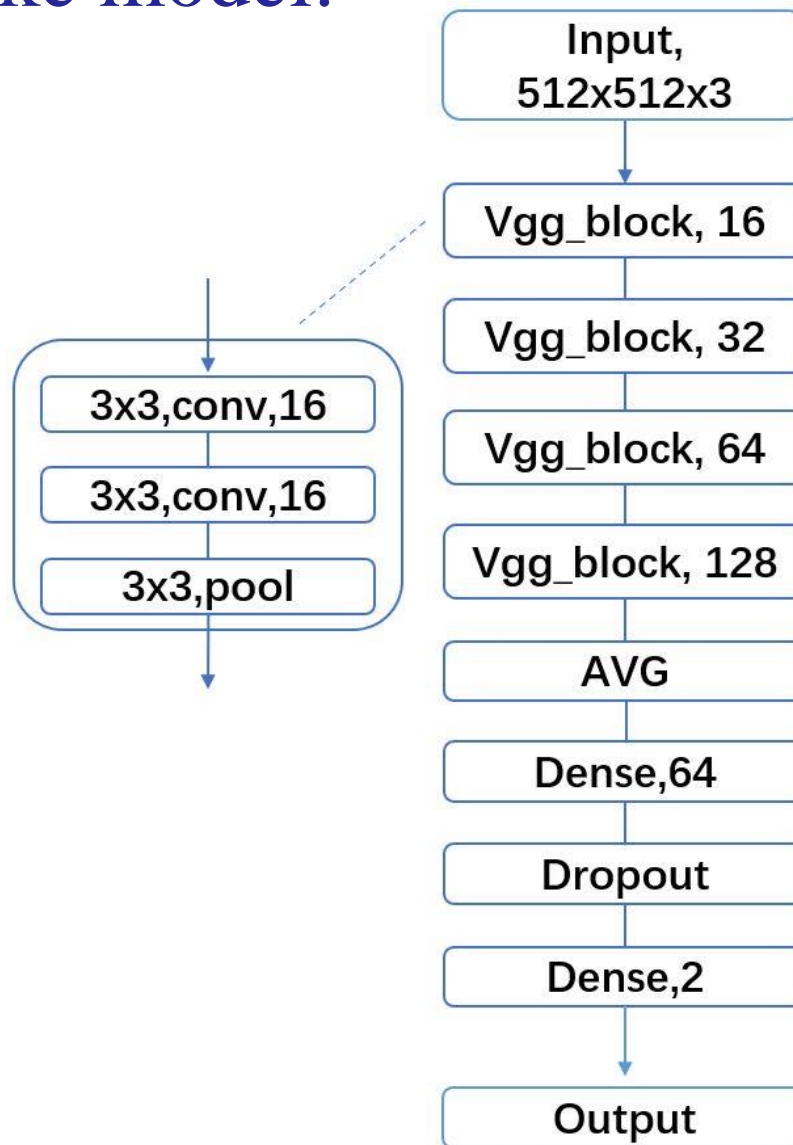original   low-resolution   high-resolution
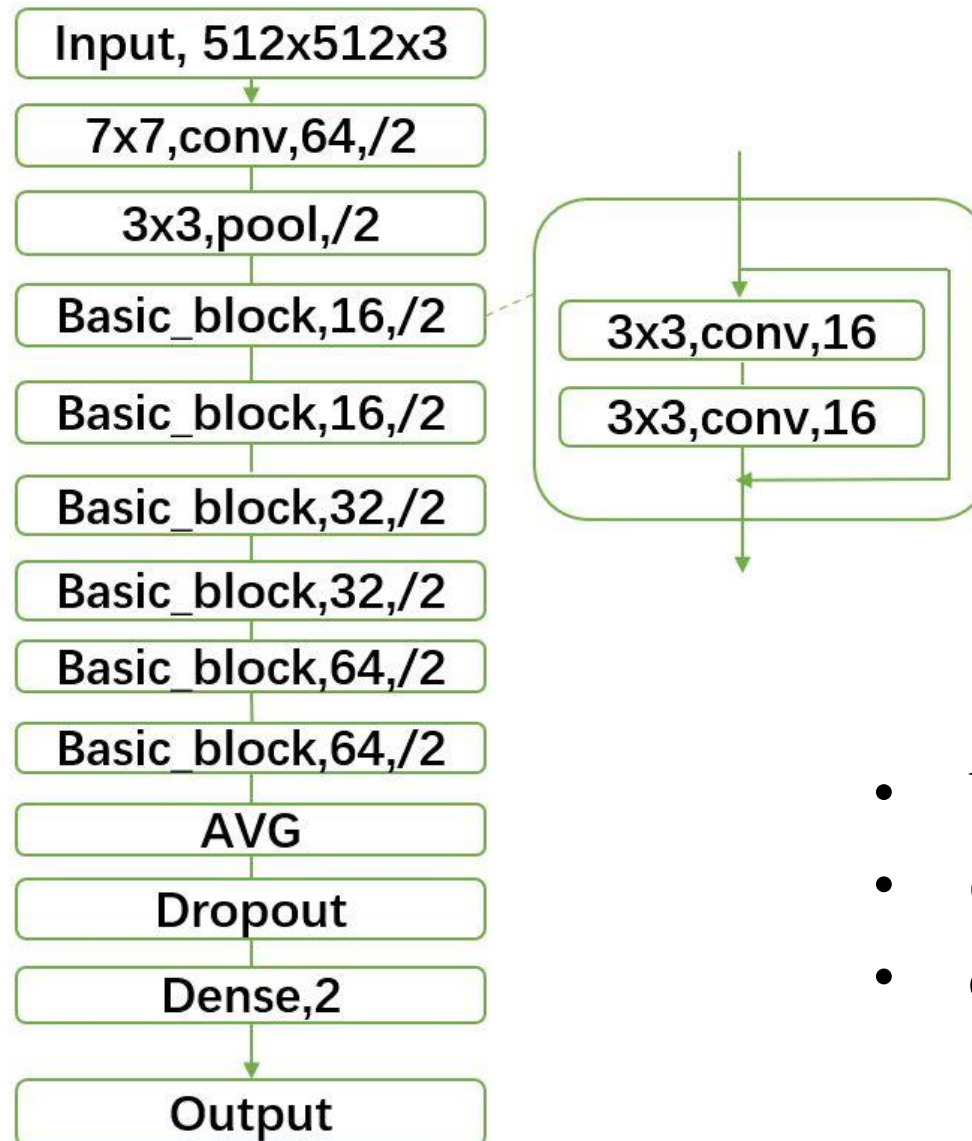
Vgg-like model:

- base filters 16
- 4 vgg blocks
- dropout rate 0.5

Model

Resnet-like model:

- base filters 16
- 6 basic blocks
- dropout rate 0.5

Model

Transfer model:

```
┌─────────────────┐
│     Input,      │
│   512x512x3     │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│   DenseNet121   │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│      AVG        │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│    Dropout      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│    Dense,2      │
└─────────────────┘
         │
         ▼
┌─────────────────┐
│    Output       │
└─────────────────┘
```
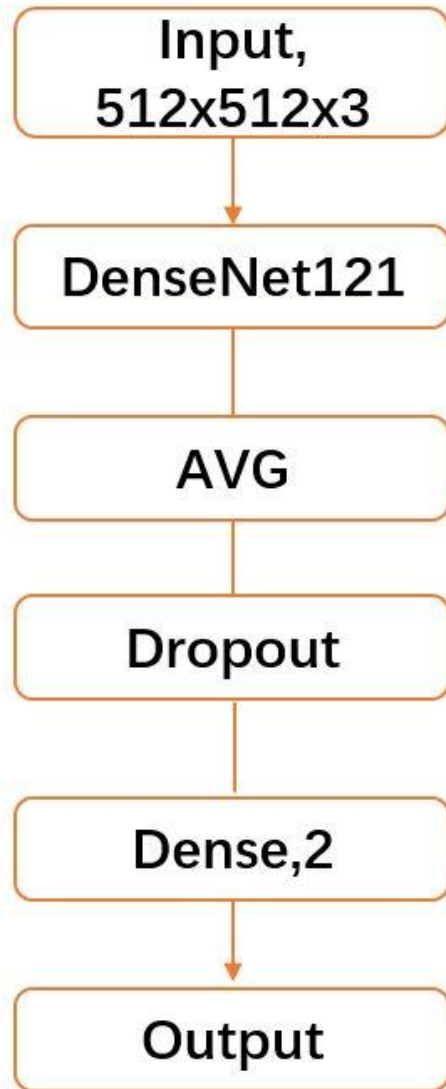
- GAP layer, dropout layer and a classification output layer on the top

- dropout rate 0.4

- first 88 convolutional layers frozen, the other layers trainable

Model

Ensemble model:

Training and Result

Training:

- class weighted balanced loss
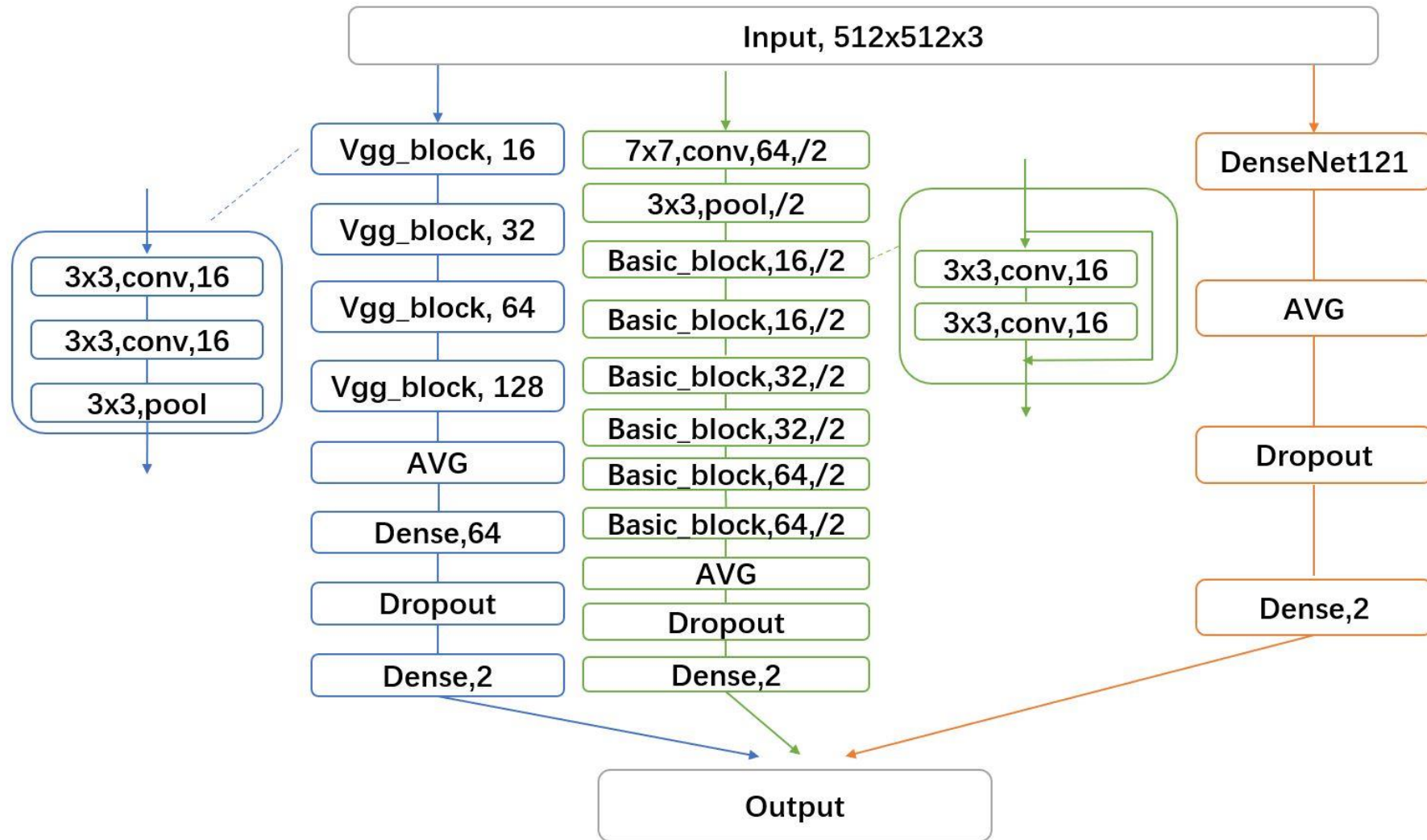- class weighted balanced accuracy

Result:

Model	Precision	Recall	Specificity	F1 Score	Accuracy
Vgg-like	0.93	0.86	0.90	0.89	87.4%
Resnet-like	0.98	0.81	0.97	0.89	87.4%
Transfer(Densenet121)	0.88	0.88	0.79	0.88	84.5%
Ensemble(averaging)	0.96	0.84	0.95	0.90	88.3%
Ensemble(voting)	0.96	0.84	0.95	0.90	88.3%

5. Conclusion and Outlook

Conclusion:

🎯 accuracy reached about 88%

🎯 F1 score reached about 0.9

🎯 unbiased result on imbalanced dataset

Future work:

🔍 improve multi-classes classification performance

Thank you for your attention!