

Lab 1 Pneumonia Classification

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1 Introduction

This is a task of classifying pneumonia and normal cases using deep learning approach. The main medical image type is X-ray. It is a binary classification task using transfer learning. We tried different models and optimizers to seek for the best performance. Furthermore, we plotted the figures containing training/testing accuracy and F1 score.

2 Experiment setups

The setting of hyperparameters is showed in table1. All of the experiments were done in the same settings.

Table 1 Hyperparameters setting

Batch size	Learning rate	Epochs
64	1e-5	20

3 Experiment Results

We first changed different type of ResNet to see whether it influenced the performance(table 2). We can see that ResNet18 showed the best performance on classifying pneumonia, while its accuracy, recall and F1 score is the highest but precision a slightly lower than others.

Table 2 Testing performance related to different model

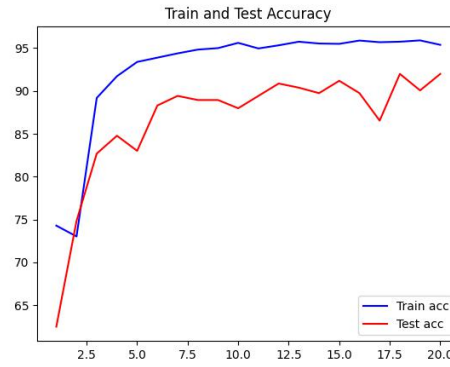
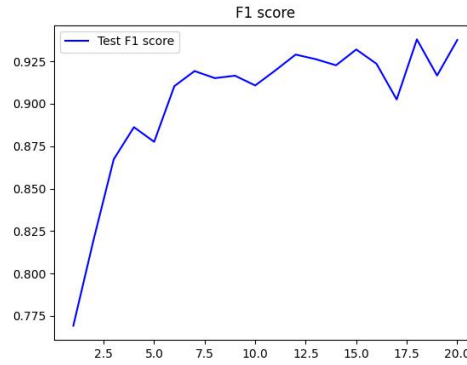
Model	Accuracy	Recall	Precision	F1 Score
ResNet18	0.9200	0.9692	0.9087	0.9380
ResNet50	0.9087	0.9385	0.9173	0.9278
ResNet101	0.9103	0.9538	0.9073	0.9300

Second, we then changed the optimizer to see its influence(table 3).

Table 3 Testing performance related to different optimizers

Model	Adam				SGD			
	Accuracy	Recall	Precision	F1 Score	Accuracy	Recall	Precision	F1 Score
ResNet18	0.9200	0.9692	0.9087	0.9380	0.8526	0.9923	0.8130	0.8938
ResNet50	0.9087	0.9385	0.9173	0.9278	0.9135	0.9769	0.8944	0.9338
ResNet101	0.9103	0.9538	0.9073	0.9300	0.7420	0.9949	0.7093	0.8282

Its is obvious to observe that the performance is better when using Adam than SGD. Though SGD showed a higher recall rate, its precision rate is much lower than Adam. The training/ testing and F1 score figures are showed as below which are all inferenced by ResNet18.

**Fig. 1** Training and testing accuracy**Fig. 2** Testing F1 score

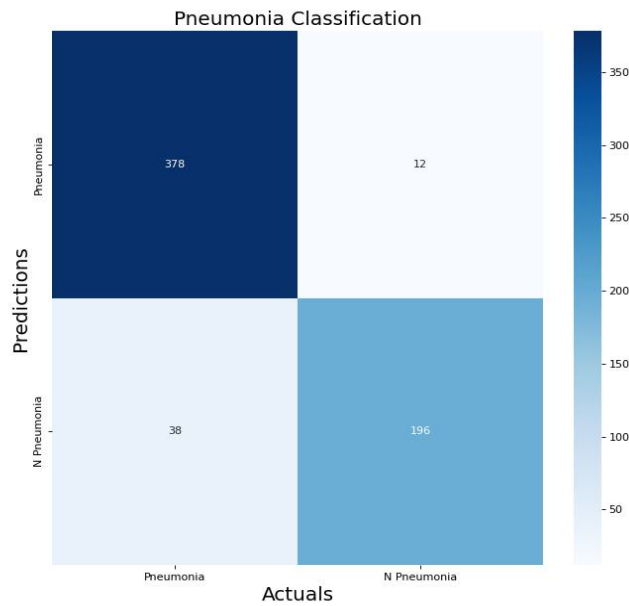


Fig. 3 Confusion matrix

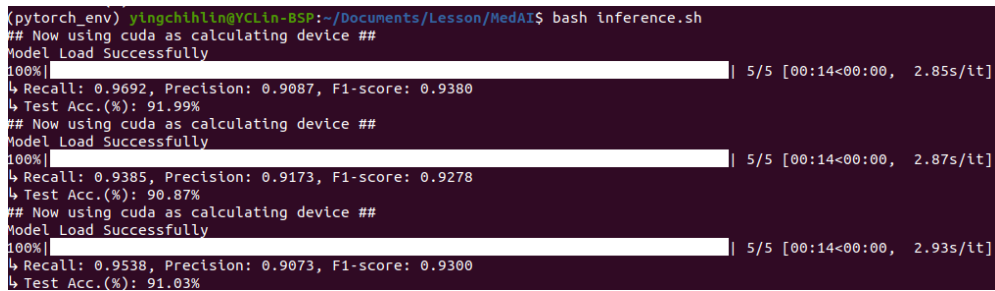


Fig. 4 Screenshot of accuracy

4 Discussion

Looking upon table 2, we can see that the more the parameter is, does not mean the better the performance is. ResNet18 got the best performance in the end. Nevertheless, we can observe that the performance is better when using Adam as the optimizer than using SGD(table 3). Finally, we can conclude that using ResNet18 with Adam as the optimizer can perform the best.

5 Github Link

URL: <https://github.com/xup6YJ/Medical-Image-Analysis>