

# Lab1 & Environment settings

TA: Frank

# Important Rule

**Submission Deadline: 2025/10/12 (Sun.) 23:59**

**Late submission: grade \* 80%**

Turn in:

1) Experiment Report (.pdf) to E3 「LAB1\_yourstudentID\_name.pdf」

eg : 「LAB1\_311xxxxx\_陳小川.pdf」

2) Source Code (.py) to your own github

(a)「train.py」「inference.py」.....

(b) README.md

## Lab Objective

Pneumonia Classification in chest X-ray images

**Object 1: write your own custom DataLoader**

**Object 2: Pneumonia Classification**

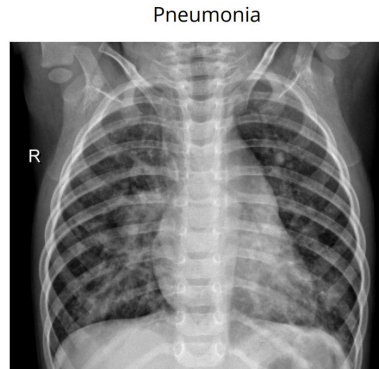
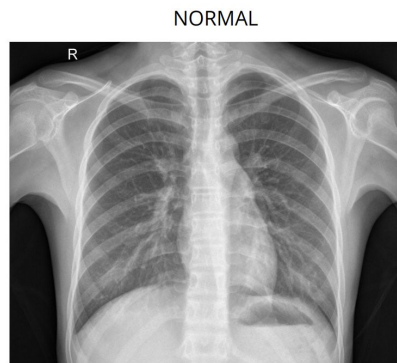
**Object 3: Evaluation**

# Requirements

1. Implement the **at least 2 ResNet architectures** (ResNet18, ResNet50, ResNet101 ... or others), calling model from pytorch API is allowed.
2. **Visualize the accuracy and F1-score trend between the models**, you need to plot each epoch accuracy and F1-score **during training phase (necessary)** or validation phase (optional, bonus).
3. **Plot the confusion matrix** of the final result.
4. **Upload you code to your own github** including README.md

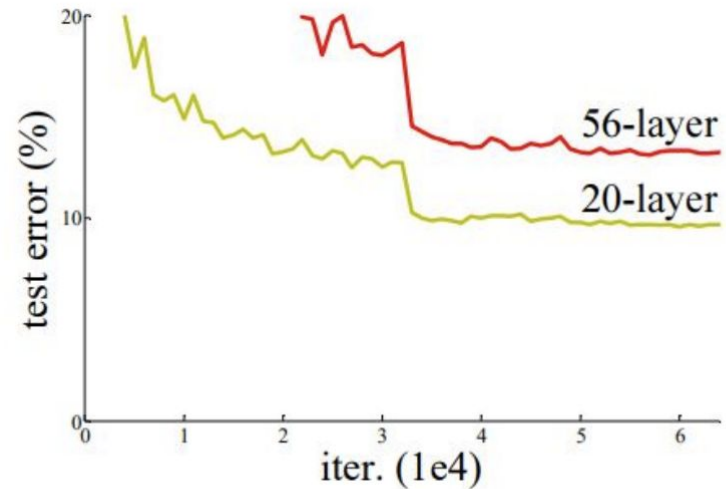
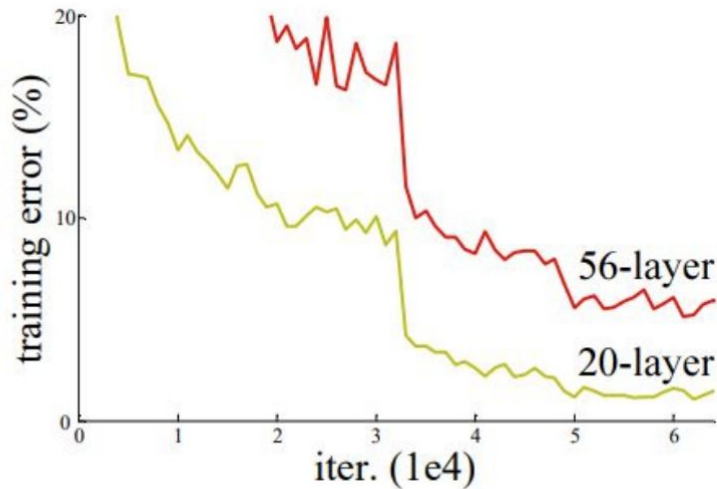
# Dataset - Chest X-ray (kaggle)

- Download the dataset from the url below:
  - <https://www.kaggle.com/datasets/paultimothymooney/chest-xray-pneumonia>
- Train / Val (optional) / Test
- **Train the model on the “train” dataset**
- **Evaluate the model on the “test” dataset**
- “Val” dataset is optional, you could choose the best performance model on train dataset or val dataset to do the final evaluation



# ResNet

ResNet (Residual Network) is the Winner of ILSVRC 2015 in image classification, detection, and localization, as well as Winner of MS COCO 2015 detection, and segmentation



# ResNet

To solve the problem of vanishing/exploding gradients, a skip / shortcut connection is added to add the input  $x$  to the output after few weight layers as below

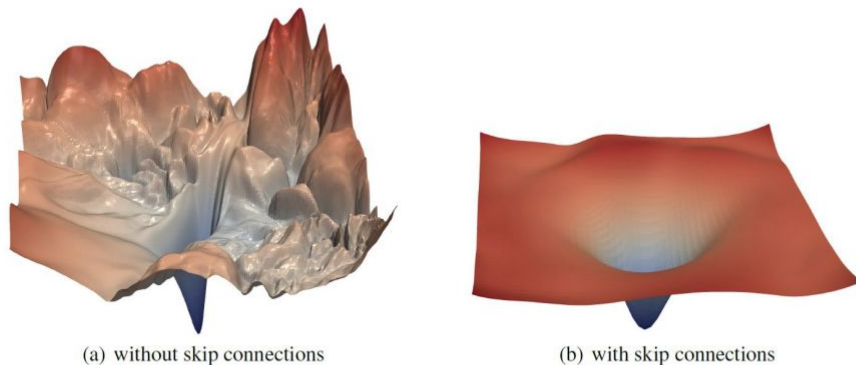
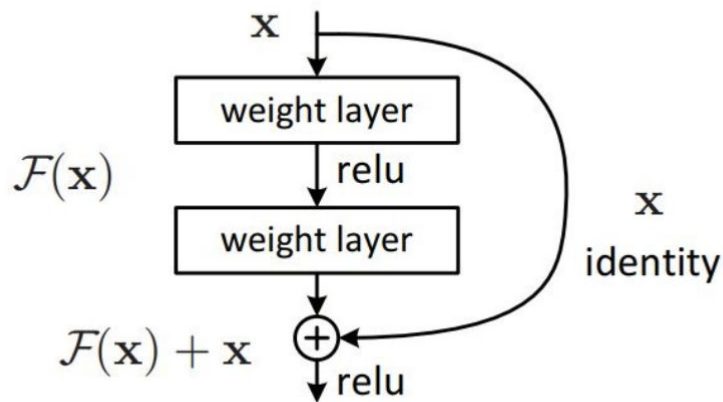
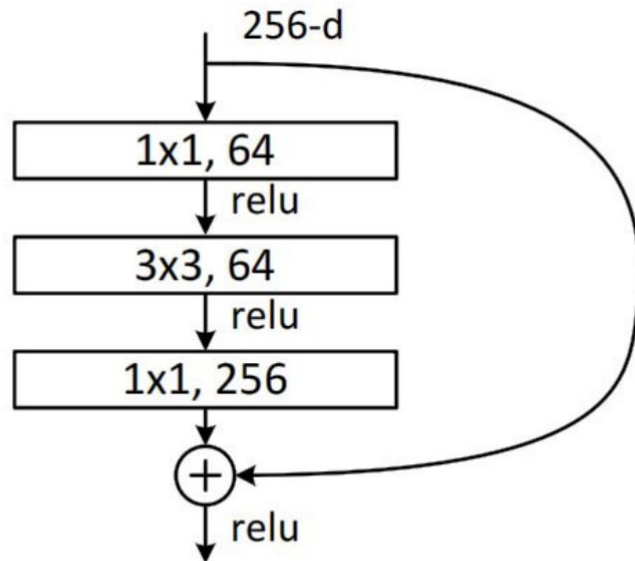
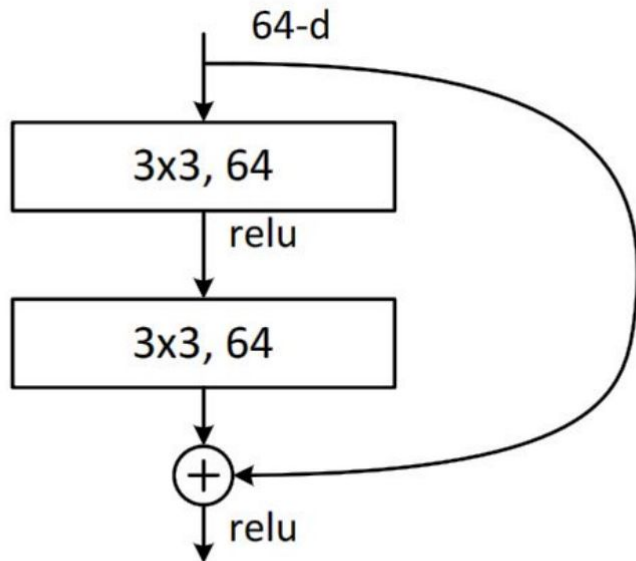


Figure 1: The loss surfaces of ResNet-56 with/without skip connections. The proposed filter normalization scheme is used to enable comparisons of sharpness/flatness between the two figures.

Source: Li, Hao, et al. "Visualizing the loss landscape of neural nets." *Advances in Neural Information Processing Systems*. 2018.

# ResNet

ResNe18(Basic block), ResNet50(Bottleneck block)





# Using Pretrained Model

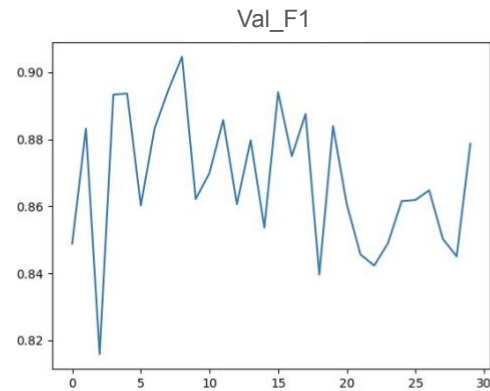
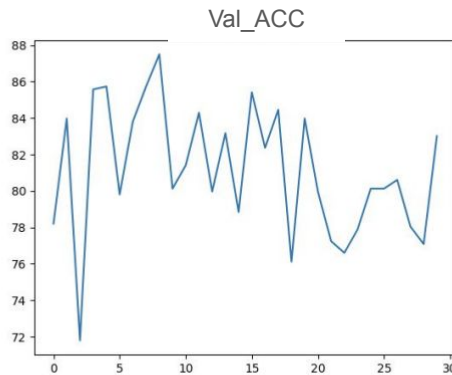
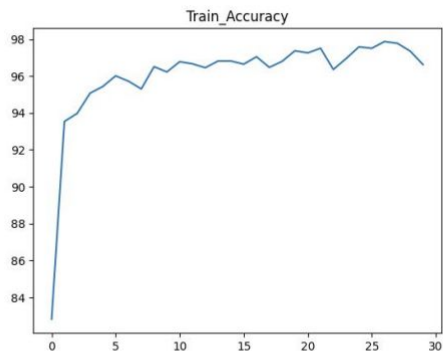
Using pretrained model by torchvision module

```
ResNet(  
  (conv1): Conv2d(3, 64, kernel_size=(7, 7), stride=(2, 2), padding=(3, 3), bias=False)  
  (bn1): BatchNorm2d(64, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)  
  (relu): ReLU(inplace)  
  (maxpool): MaxPool2d(kernel_size=3, stride=2, padding=1, dilation=1, ceil_mode=False)  
  (layer1): Sequential(  
    :  
  )  
  (layer2): Sequential(  
    :  
  )  
  (layer3): Sequential(  
    :  
  )  
  (layer4): Sequential(  
    :  
  )  
  (avgpool): AvgPool2d(kernel_size=7, stride=1, padding=0)  
  (fc): Linear(in_features=512, out_features=1000, bias=True)  
)
```

**You need to reinitialize  
the specific layers**

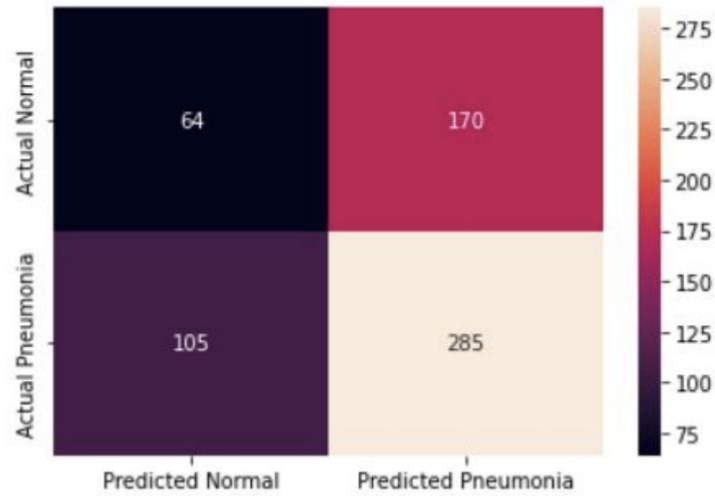
# Result Comparision

Compare and visualize the accuracy and F1-score trend in training phase  
(validation phase is optional, **you'll get a 5 point bonus if you visualize the result of validation phase**)



# Confusion Matrix

Calculate the confusion matrix and plotting



# How to plot on Python

Tutorial:

<https://matplotlib.org/stable/tutorials/introductory/pyplot.html>

<https://seaborn.pydata.org/generated/seaborn.heatmap.html>

# Report Spec

1. Introduction (5%)
2. Experiment setups (25%)
  - a. The detail of your model
  - b. The detail of you Dataloder (e.g. different data augmentation methods)
3. Experiment result (30%)
  - a. Highest testing accuracy and F1-score (screenshot)
  - b. Ploting the comparsion figure
    - i. Training and testing accuracy curve
    - ii. Testing F1-score curve
    - iii. Highest testing accuracy heatmap
  - c. Anything you want to present

# Report Spec

## 4. Discussion (35%) (**Most important part**)

a. Discuss your discovery or share anything you want

## 5. Github Link (5%) (Do not forget)

## 6. Bonus (**Optional**, 10%)

- a. Implement other model like DenseNet121 / Vision Transformer ... (or other models) and then discuss in the discussion section
- b. Display the result confusion matrix

# Score criterion of Lab1

Score: 30% experimental results + 70% report

---- Criterion of result (30%) ----

Accuracy  $\geq 90\%$  = 100 pts

Accuracy 80~90% = 90 pts

Accuracy 70~80% = 80 pts

Accuracy  $< 70\%$  = 70 pts

# Note

1. If the report exists **format errors** (file name or the report spec), it will be 5-point penalty (-5)
2. **Do not cheat by training the test dataset** to achieve high performance, it's illegal, and I will check the code and report. Anyone who cheats will be 30-point penalty (-30)



# Reference

[1] He, Kaiming, et al. "Deep residual learning for image recognition." Proceedings of the IEEE conference on computer vision and pattern recognition. 2016.

[2] <https://www.kaggle.com/paultimothymooney/chest-xray-pneumonia>

Download the dataset after registration



# SSH

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VPN使用方法如以下說明：

1. 請先至：<https://openvpn.net/community-downloads/> 下載安裝好openvpn
2. 接著匯入以下連結的設定檔：  
<https://www.dropbox.com/s/p8uukyhf4xi22vd/GPU-research.ovpn?dl=0>
3. 匯入方式：至 openvpn 的 config 目錄，以win平台來說會在 %USERPROFILE%\OpenVPN\config 之後以管理權限 (因要對 routing table 增加資料)啟動 openvpn 以進行連線 (帳號密碼在csv中的第一欄位跟第二欄位，VPN的)
4. 然後以 ssh client(如 pietty...等)連至所屬的 container IP,可 sudo 成 root.
5. SSH 進入主機後的密碼為最後一欄的密碼

# How to use SSH to connect to GPU (VPN)

VPN使用方法如以下說明：

(1) 請先至: <https://openvpn.net/community-downloads/> 下載安裝好openvpn

Source tarball (gzip)	GnuPG Signature	<a href="#">openvpn-2.5.5.tar.gz</a>
Source tarball (xz)	GnuPG Signature	<a href="#">openvpn-2.5.5.tar.xz</a>
Source zip	GnuPG Signature	<a href="#">openvpn-2.5.5.zip</a>
Windows 32-bit MSI installer	GnuPG Signature	<a href="#">OpenVPN-2.5.5-i602-x86.msi</a>
Windows 64-bit MSI installer	GnuPG Signature	<a href="#">OpenVPN-2.5.5-i602-amd64.msi</a>
Windows ARM64 MSI installer	GnuPG Signature	<a href="#">OpenVPN-2.5.5-i602-arm64.msi</a>

(2) 接著下載要匯入的設定檔，下載連結：

<https://www.dropbox.com/s/p8uukyhf4xi22vd/GPU-research.ovpn?dl=0>

## How to use SSH to connect to GPU (VPN)

(3) 匯入方式: 至 openvpn 的 config 目錄, 以win平台來說會在 %USERPROFILE%\OpenVPN\config 之後以管理權限(因要對 routing table 增加資料)啟動 openvpn 以進行連線

(4) 然後以 ssh client(如 pietty...等)連至所屬的 container IP,可 sudo 成 root.



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# File transfer

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# Install FileZilla

(1) SCP

(2) Download and Install <https://filezilla-project.org/> port : 22







# Anaconda env

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# Install anaconda

#更新apt sudo apt update

#安裝curl sudo apt install curl

# 下載 Anaconda 安裝檔案

curl -O [https://repo.anaconda.com/archive/Anaconda3-2019.10-Linux-x86\\_64.sh](https://repo.anaconda.com/archive/Anaconda3-2019.10-Linux-x86_64.sh)

bash Anaconda3-2019.10-Linux-x86\_64.sh

# 生效conda 指令

conda init

source ~/.bashrc

export PATH=~/anaconda3/bin:\$PATH

#查看環境 conda info --env

#建立新環境 conda create --name myenv python=3.8

#啟動新環境 source activate myenv

---

# Pytorch

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# Install pytorch GPU

(1) <https://pytorch.org/>

PyTorch Build	Stable (1.10.2)	Preview (Nightly)	LTS (1.8.2)	
Your OS	Linux	Mac	Windows	
Package	Conda	Pip	LibTorch	Source
Language	Python	C++ / Java		
Compute Platform	CUDA 10.2	CUDA 11.3	ROCm 4.2 (beta)	CPU
Run this Command:	<code>conda install pytorch torchvision torchaudio cudatoolkit=10.2 -c pytorch</code>			

(2) Old version : <https://pytorch.org/get-started/previous-versions/>

**conda install pytorch==1.7.0 torchvision==0.8.0 torchaudio==0.7.0  
cudatoolkit=10.1 -c pytorch**

(3) Test :

```
import torch
```

```
torch.cuda.is_available()
```



**True**

# install pytorch

URL: <https://pytorch.org/get-started/locally/>

write the code in the terminal in virtual enviroment:

```
pip3 install torch torchvision torchaudio --index-url https://download.pytorch.org/whl/cu118
```

(1) <https://pytorch.org/>

(2) Old version : <https://pytorch.org/get-started/previous-versions/>

```
conda install pytorch==1.7.0 torchvision==0.8.0 torchaudio==0.7.0 cudatoolkit=10.1 -c pytorch
```

```
C:\Users\bsplab>ssh 310553043@172.30.17.71
310553043@172.30.17.71's password:
Welcome to Ubuntu 18.04.3 LTS (GNU/Linux 4.4.0-143-generic x86_64)
```

```
* Documentation:  https://help.ubuntu.com
* Management:    https://landscape.canonical.com
* Support:        https://ubuntu.com/advantage
```

This system has been minimized by removing packages and content that are not required on a system that users do not log into.

To restore this content, you can run the 'unminimize' command.

```
Last login: Wed Mar  9 07:15:36 2022 from 192.168.249.46
```

```
$ bash
```

```
(base) 310553043@c007:~$ conda activate myenv
```

```
(myenv) 310553043@c007:~$ python
```

```
Python 3.7.11 (default, Jul 27 2021, 14:32:16)
```

```
[GCC 7.5.0] :: Anaconda, Inc. on linux
```

```
Type "help", "copyright", "credits" or "license" for more information.
```

```
>>> import torch
```

```
>>> torch.cuda.is_available()
```

```
True
```

```
>>> exit()
```



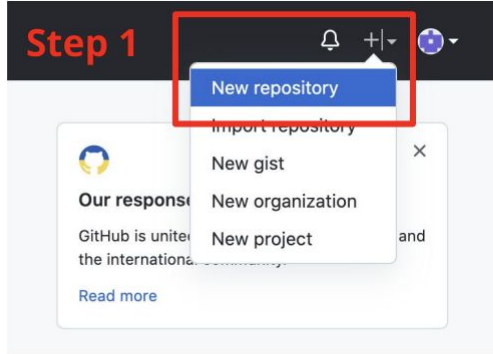
# GITHUB

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# Create a repository



## Create a new repository

A repository contains all project files, including the revision history. Already have a project repository elsewhere? [Import a repository.](#)

Owner \*

zoerjhung

Repository name \*

LAB1

Step 2. Name it

Great repository names are short and memorable. Need inspiration? How about [vigilant-octo-fortnight](#)?

Description (optional)

Detect Pneumonia from chest X-Ray images

Step 3. Describe it



Public

Anyone on the internet can see this repository. You choose who can commit.



Private

You choose who can see and commit to this repository.

Initialize this repository with:

Skip this step if you're importing an existing repository.

☒ Add a README file

This is where you can write a long description for your project. [Learn more.](#)

Step 4. Add a README file

☐ Add .gitignore

Choose which files not to track from a list of templates. [Learn more.](#)

☐ Choose a license

A license tells others what they can and can't do with your code. [Learn more.](#)

This will set `main` as the default branch. Change the default name in your [settings](#).

Create repository

Step 5

# Create a repository: This is what you get

The screenshot shows a newly created GitHub repository named 'LAB1' by user 'zoerjhung'. The repository is public and contains a single initial commit on the 'main' branch. The commit includes a 'README.md' file. The repository's description is 'Detect Pneumonia from chest X-Ray images'. The right sidebar shows repository statistics: 0 stars, 1 watcher, and 0 forks. The 'About' section also displays the repository name and description.

zoerjhung / LAB1 Public

Pin Unwatch 1 Fork 0 Star 0

<> Code Issues Pull requests Actions Projects Wiki Security Insights Settings

main 1 branch 0 tags

Go to file Add file Code

zoerjhung Initial commit 93d7444 now 1 commit

README.md Initial commit now

README.md

## LAB1

Detect Pneumonia from chest X-Ray images

### About

Detect Pneumonia from chest X-Ray images

Readme 0 stars 1 watching 0 forks

### Releases

No releases published  
[Create a new release](#)

# Upload your files

zoerjhung / LAB1 Public

<> Code Issues Pull requests Actions Projects Wiki Security Insights Settings

main 1 branch 0 tags

Go to file Add file Code

Create new file  
Upload files

**Step 1**

zoerjhung Initial commit

1 commit

README.md Initial commit now

README.md

## LAB1

Detect Pneumonia from chest X-Ray images

**About**

Detect Pneumonia from chest X-Ray images

Readme

0 stars

1 watching

0 forks

**Releases**

No releases published

[Create a new release](#)

# Upload your files

LAB1 /



Drag files here to add them to your repository

Or [choose your files](#)

**Step 2. Upload your files here**



## Commit changes

Add files via upload

Add an optional extended description...

☒ Commit directly to the `main` branch.

☐ Create a new branch for this commit and start a pull request. [Learn more about pull requests.](#)

**Step 3**

Commit changes

Cancel