Neural Network

Deep Learning Competition

Diagnose COVID-19 and Pneumonia cases using chest X-Ray Images.

Team: 28

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Preprocessing

- Labeling classes, Normal = 0, Covid19 = 1
- Read each image, resize the image, interpolation cubic to be sharper.
- Create Contrast Limited Adaptive Histogram Equalization [CLAHE]
to enhance the visibility level of pneumonia clouds in the X-ray images
if needed.
- Concatenate image data with its label value.
- Shuffle the Data.
- Data augmentation (Image Generator), rescale, rotation, shear, zoom,
Flip, shift.
- Train Data: 80%, Validation Test: 20%.

Hyper parameters

- EPOCHS = 20
- Learning Rate = 0.005
- Batch Size = 8

- Optimizer: Adam
- Loss: Binary Cross entropy
- Activation Function on all layers: Relu
- Activation Function on last layer: Sigmoid

1st Model

- All Conv Layers (3x3), Stride = 1, No padding
- MaxPool2D (2,2)

- **Full Model**

Conv-MaxPool2D
Conv-conv-MaxPool2D
Conv-conv-MaxPool2D
FC (512)-FC (128)- FC (64)- dropout
FC (1)

- Filters: 32, 64,64, 128,128
- Dropout: 20%

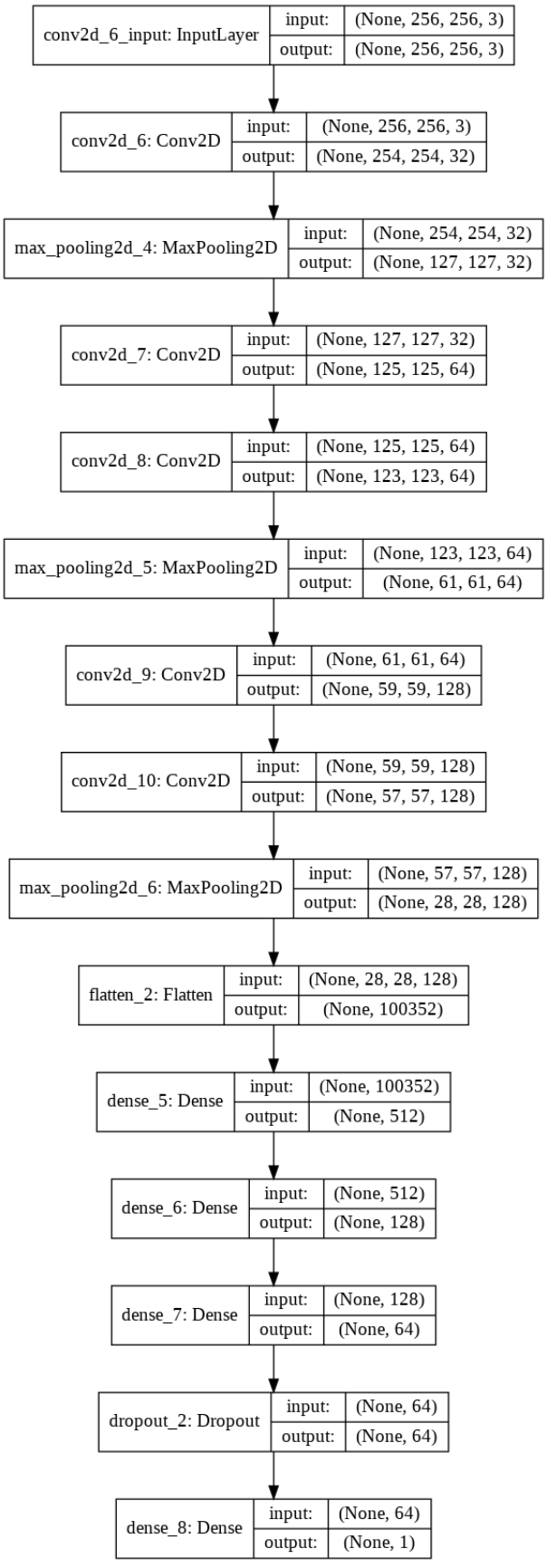
- **Private Score:** 0.80434

(No CLAHE in Preprocess)

- **Private Score:** 0.78260

(CLAHE in Preprocess)

- Tested on different dropout values but the same result.



2nd Model

- All Conv Layers (3x3), Stride = 1, No padding
- MaxPool2D (2,2)

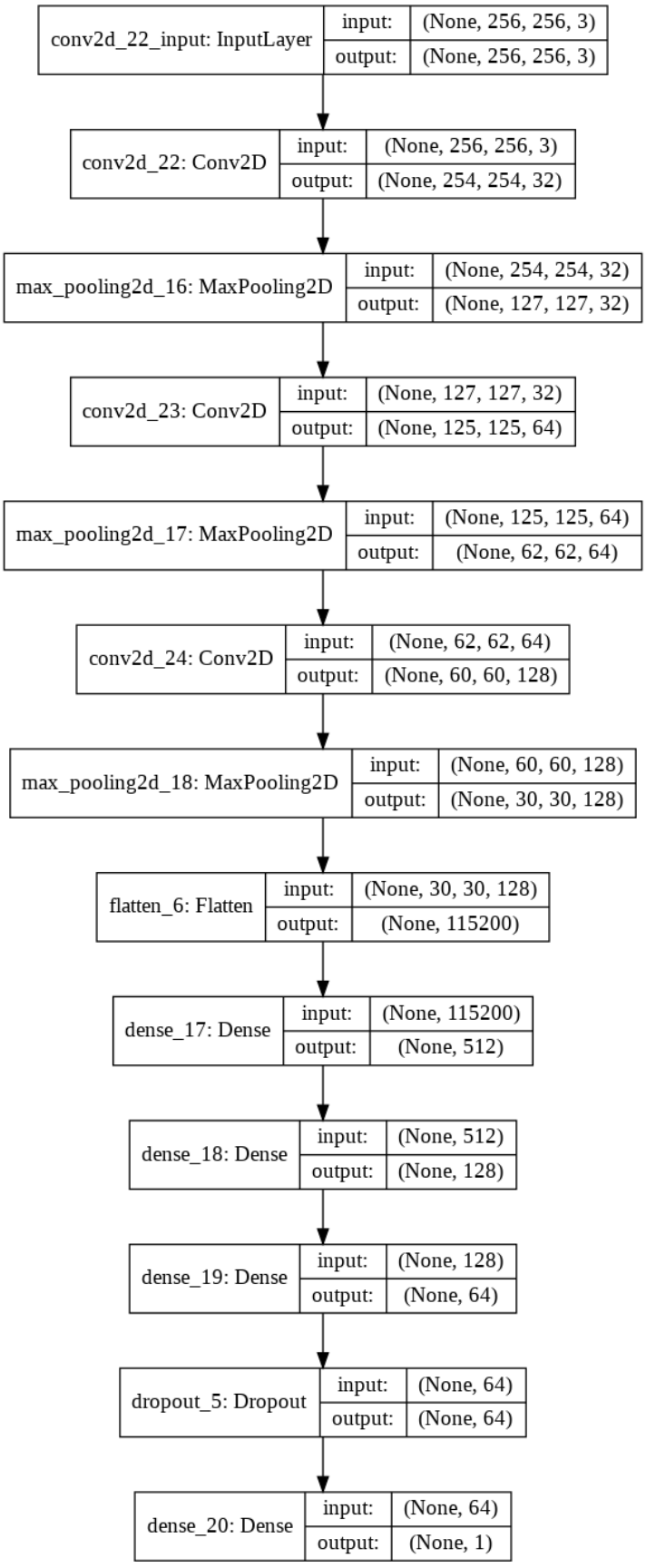
- Simplest Module
Conv-MaxPool2D
Conv-MaxPool2D
Conv-MaxPool2D
FC-FC-dropout-FC

- Dropout: 20%

- **Private Score:** 0.79710
(No CLAHE in Preprocess)

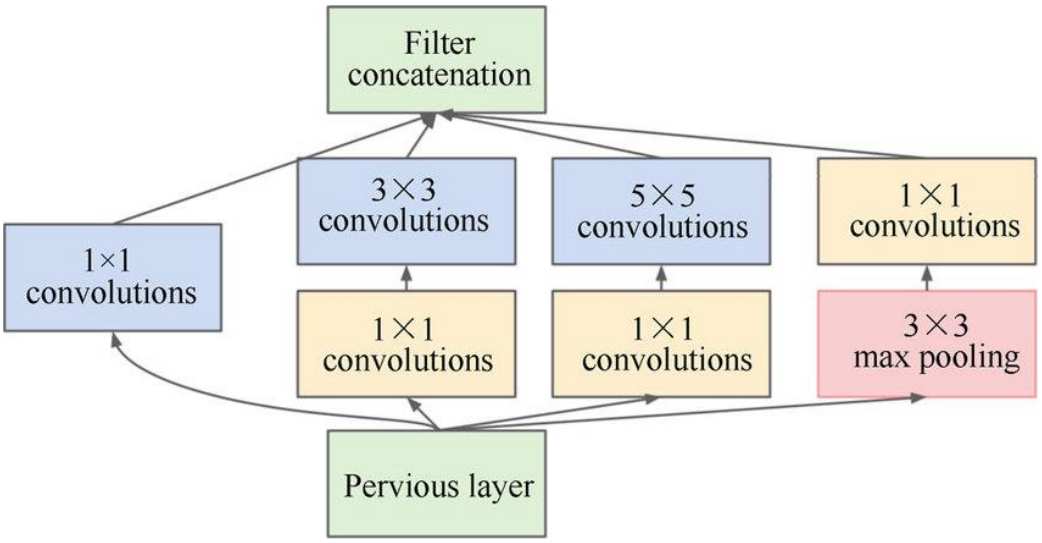
- **Private Score:** 0.78985
(CLAHE in Preprocess)

- **Public Score:** 0.89613
(CLAHE in Preprocess)



3rd Model: Semi Google Net

• Implementing Inception Module



• Similar to Google Net but not fully, this model has 2 inception module only

• Same start and End with
Conv7-pool3-Conv3-pool3

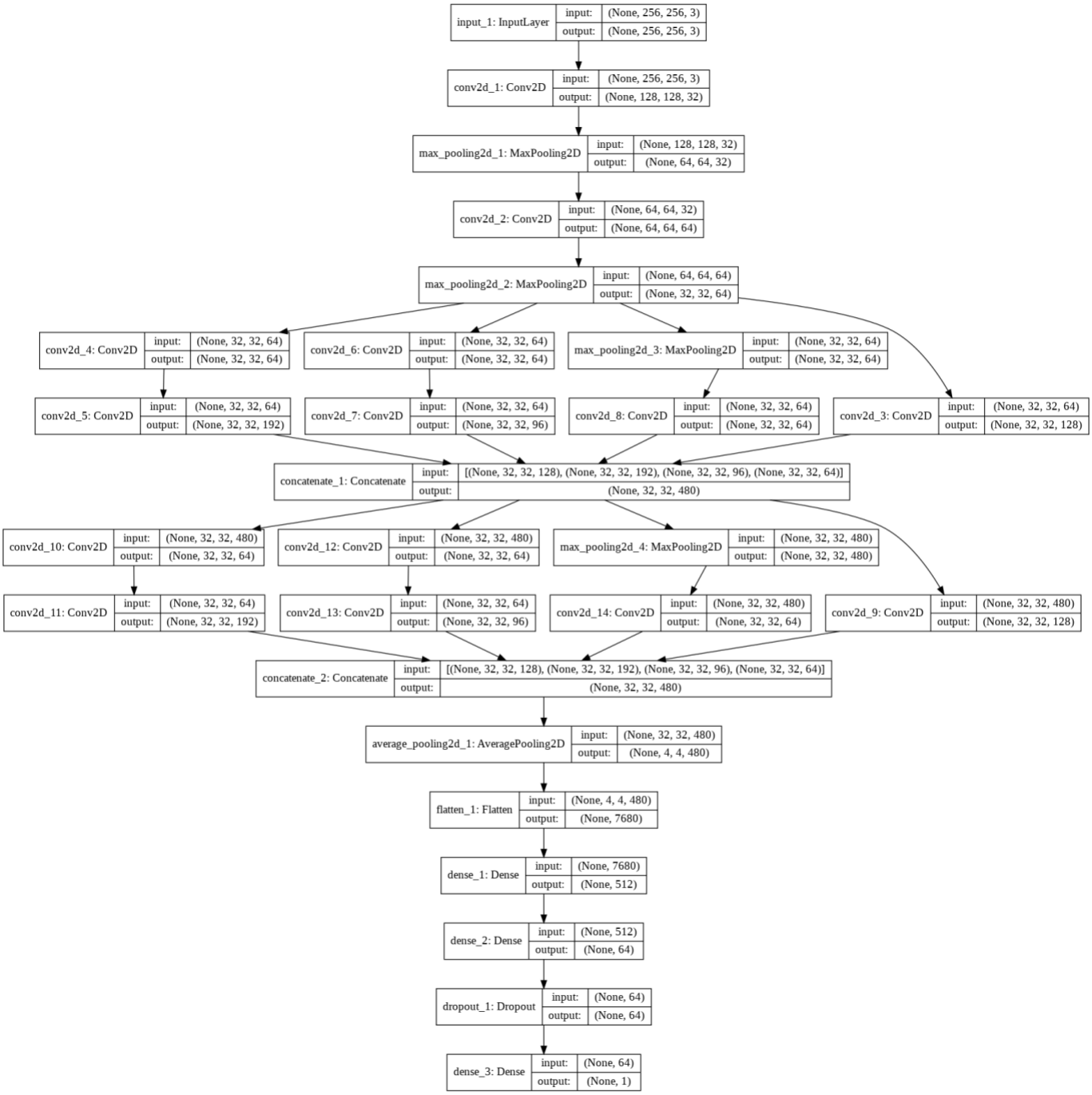
• End with Avg. pooling

• **Inception Module**:

Concatenate [Conv1, Conv3, Conv5, Pool] on last index
Bottleneck for Conv3 and Conv5 by using Conv1

• **Full Module:**

Conv7-Pool3-Conv3-Pool3
2 Inception Modules
Avg. pool
FC (512)-FC (64)-Dropout-FC (1)



- **Private Score:** 0.81884 (No CLAHE in Preprocess)
- **Private Score:** 0.82971 (CLAHE in Preprocess)

4th Model: Semi VGG

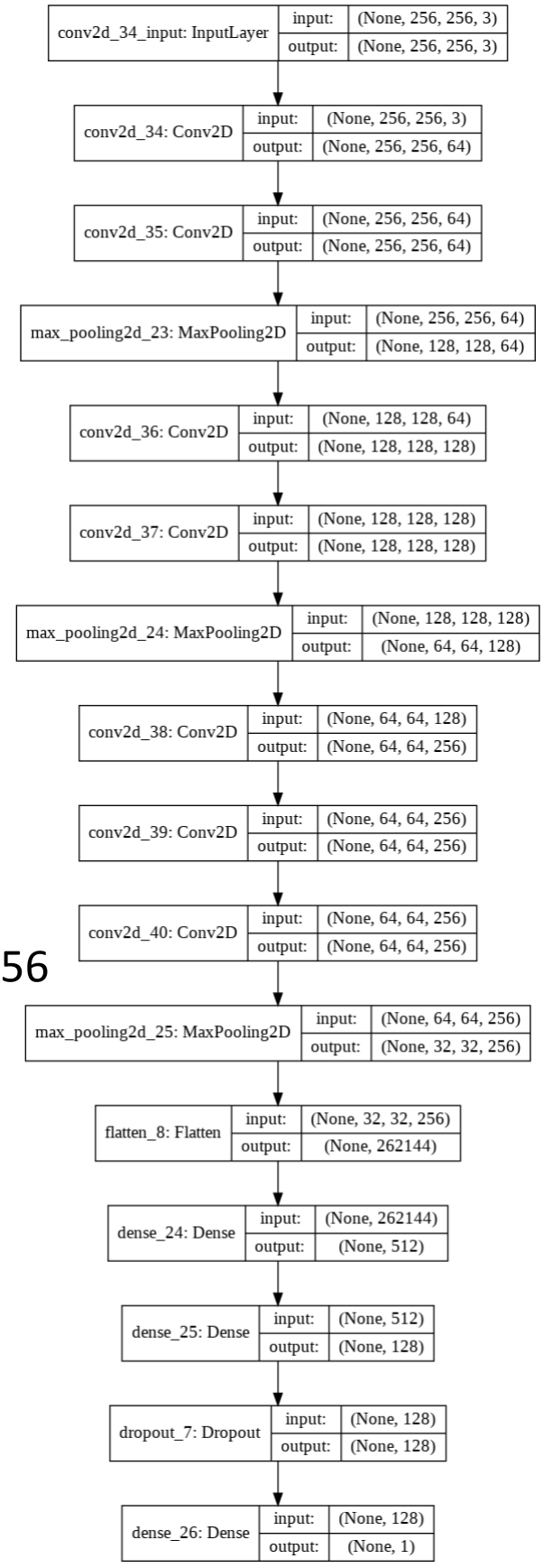
- All Conv Layers (3x3), Stride = 1, same padding (Zeros)
- MaxPool2D (2,2), Stride = 1
- 10 layers from VGG,
  But MaxPool2D stride = 1.

- **Full Model**:
Conv-Conv-MaxPool2D
Conv-Conv-MaxPool2D
Conv-Conv-Conv-MaxPool2D
FC (512)-FC (128)-dropout
FC (1)

- Filters: 64,64, 128,128, 256,256,256
- Dropout: 20%

- **Private Score:** 0.80072
(No CLAHE in Preprocess)

- **Private Score:** 0.73188
(CLAHE in Preprocess)



5th Combined Models

- Model 1, Model 2, Model 4 (Semi VGG).
- Take the result from all models and the most frequent.
- That has the most votes
- **Private Score:** 0.80072
(No CLAHE in Preprocess)
- **Private Score:** 0.83333
(CLAHE in Preprocess)