INDENTIFYING PNEUMONIA BY IMAGE-BASED DEEP LEARNING

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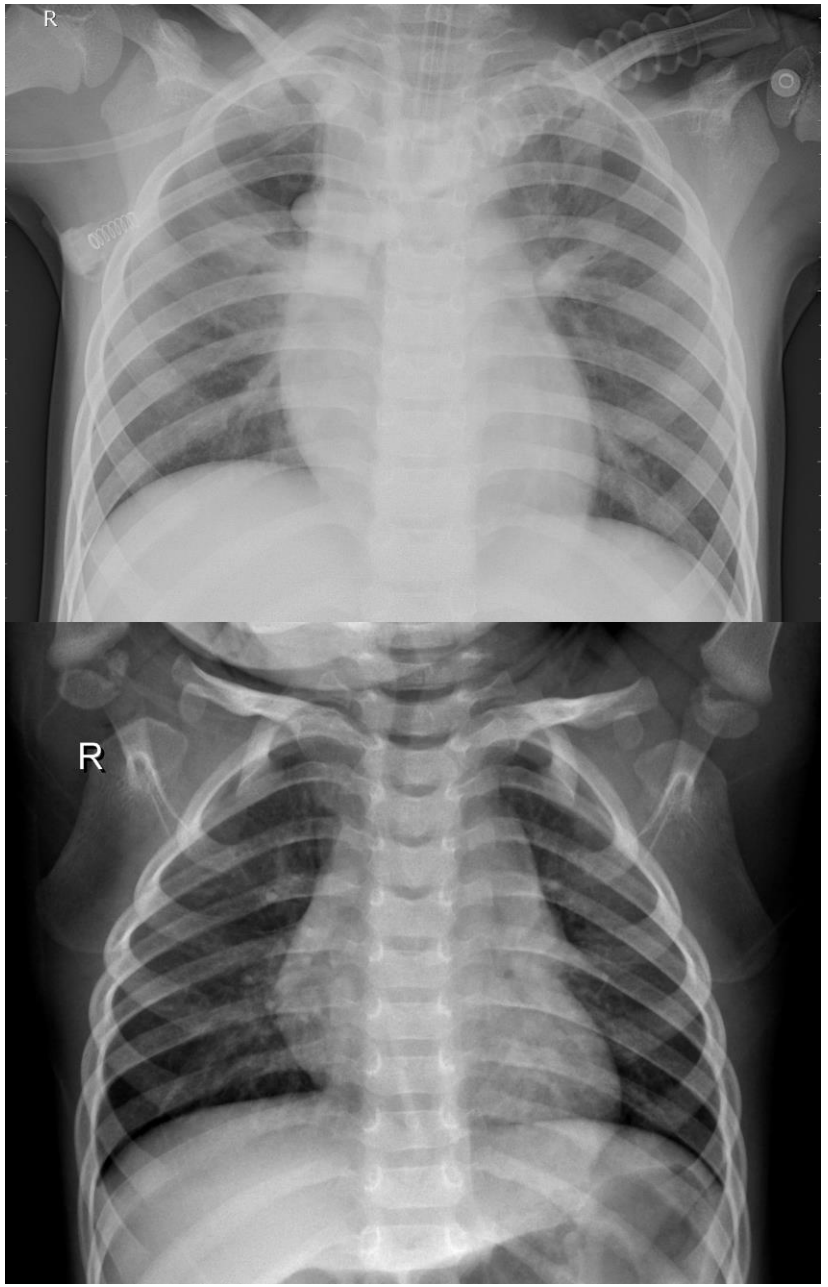
PNEUMONIA AND X-RAY

- X-Ray imaging – identifying pneumonia
- Pneumonia is one of the complications of COVID-19
- A lot of Chest X-Ray Images are being made nowadays
- Classifier that could identify pneumonia from X-ray images could be useful – decision trees
- So I am to build such classifier

CHEST X-RAY IMAGES

- In total 5863 images
- Available on kaggle



Pneumonia

3 : 1 ratio

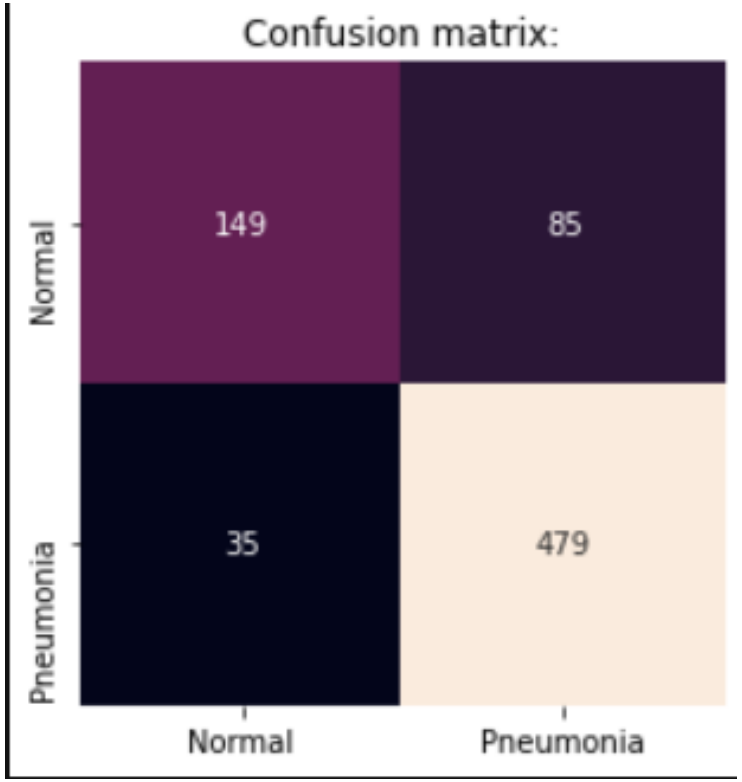
Normal

WHY I CHOSE THIS PROJECT

- Pneumonia is in "popular" now
- Such classifier could be useful
- But most importantly, I always wanted to do a DL project to learn how it works

FIRST NETWORK

- 10 layers
- **Parameters:** 2.242561
- 84% accuracy
- Data augmentation was vital



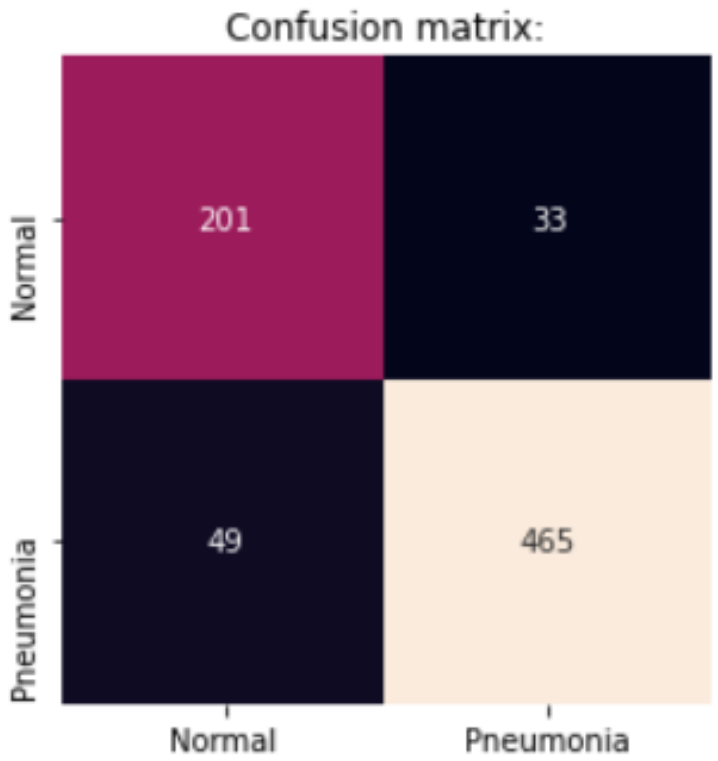
Model: "sequential"

Layer (type)	Output Shape	Param #
conv2d (Conv2D)	(None, 198, 198, 64)	1792
max_pooling2d (MaxPooling2D)	(None, 99, 99, 64)	0
conv2d_1 (Conv2D)	(None, 97, 97, 64)	36928
max_pooling2d_1 (MaxPooling2	(None, 48, 48, 64)	0
conv2d_2 (Conv2D)	(None, 46, 46, 64)	36928
max_pooling2d_2 (MaxPooling2	(None, 23, 23, 64)	0
flatten (Flatten)	(None, 33856)	0
dense (Dense)	(None, 64)	2166848
dropout (Dropout)	(None, 64)	0
dense_1 (Dense)	(None, 1)	65

Total params: 2,242,561
Trainable params: 2,242,561
Non-trainable params: 0

SECOND NETWORK

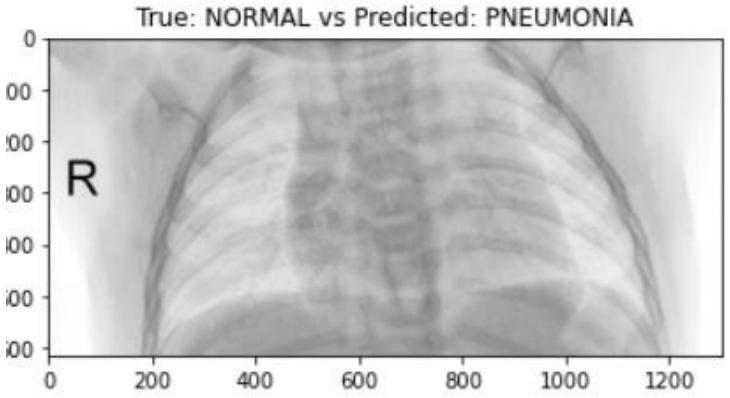
- **180 layers**
- densenet169
- **Parameters:** 13.118017
- 89% accuracy

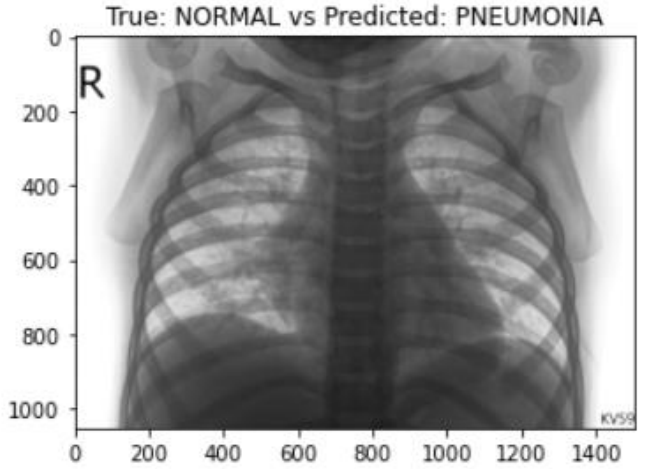


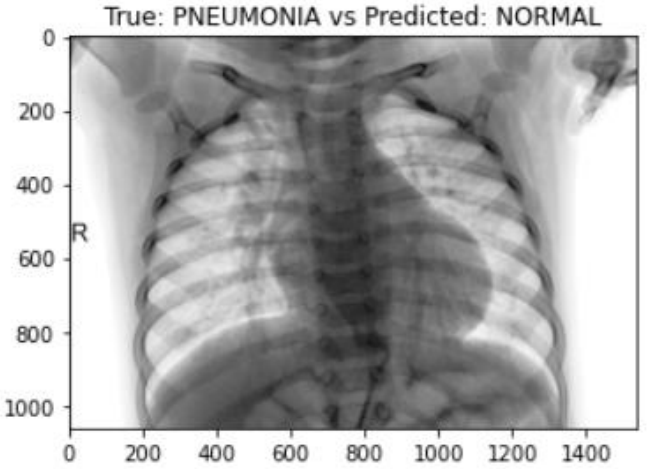
Model: "sequential_1"

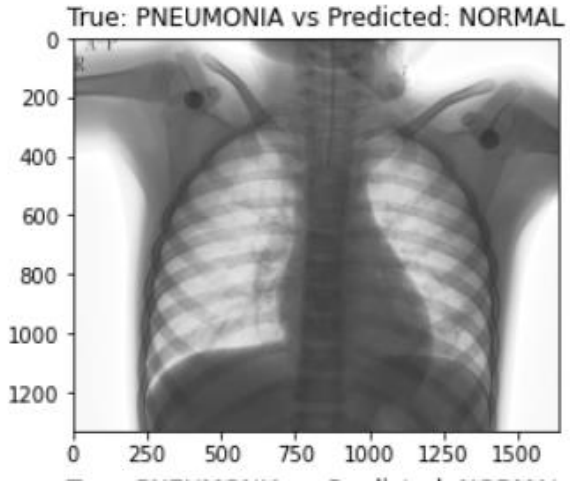
Layer (type)	Output Shape	Param #
densenet169 (Functional)	(None, 6, 6, 1664)	12642880
global_average_pooling2d (Gl	(None, 1664)	0
batch_normalization (BatchNo	(None, 1664)	6656
dense_2 (Dense)	(None, 256)	426240
dropout_1 (Dropout)	(None, 256)	0
batch_normalization_1 (Batch	(None, 256)	1024
dense_3 (Dense)	(None, 128)	32896
dropout_2 (Dropout)	(None, 128)	0
dense_4 (Dense)	(None, 64)	8256
dropout_3 (Dropout)	(None, 64)	0
dense_5 (Dense)	(None, 1)	65

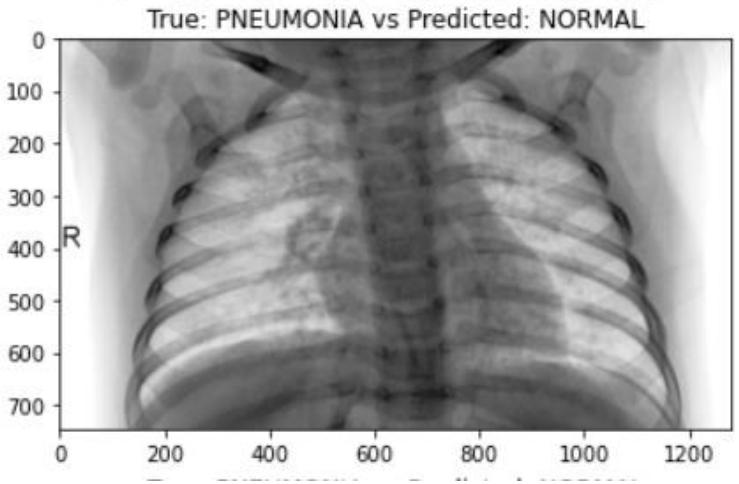
Total params: 13,118,017
Trainable params: 471,297
Non-trainable params: 12,646,720

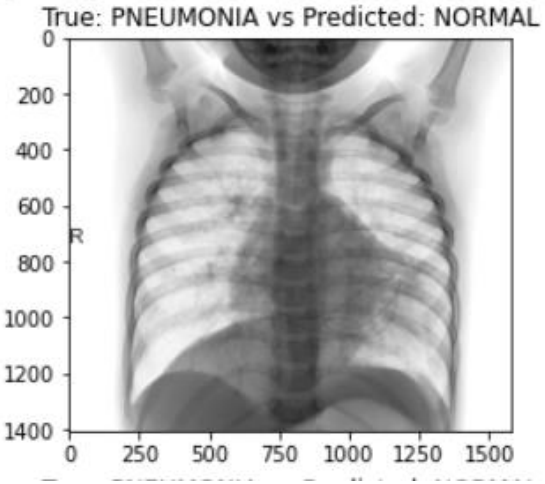

True: NORMAL vs Predicted: PNEUMONIA
R


True: NORMAL vs Predicted: PNEUMONIA
R


True: PNEUMONIA vs Predicted: NORMAL
R


True: PNEUMONIA vs Predicted: NORMAL


True: PNEUMONIA vs Predicted: NORMAL
R


True: PNEUMONIA vs Predicted: NORMAL
R

TO SUM UP

- It's not that easy to tell if someone has pneumonia just by looking at their chest Xray
- Pneumonia != Pneumonia
- Way more complex network and only 5% more accuracy
- The dataset is small for DL and imbalanced (3:1 ratio)
- All in all 89% accuracy seems acceptable considering (way more than I would get)

THANK YOU FOR YOUR ATTENTION!!!