



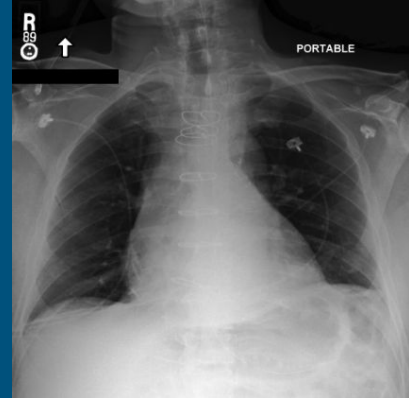
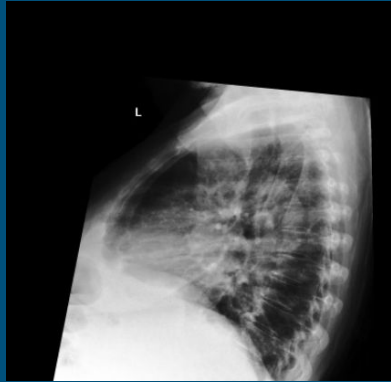
Quarter 3 Update



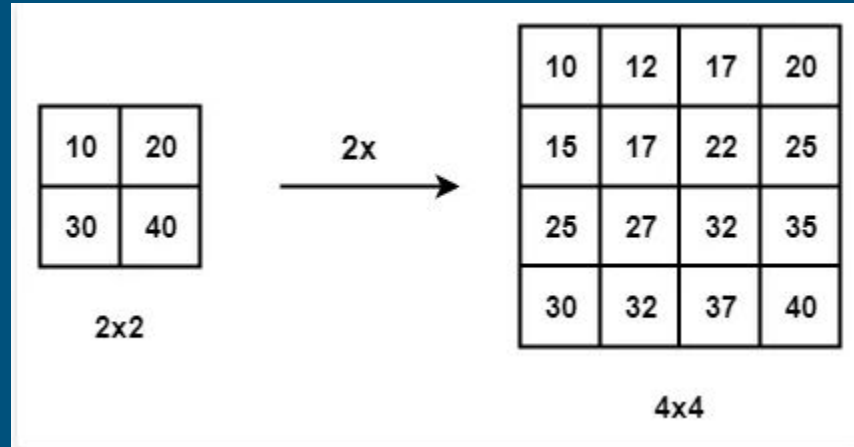
Rohan Bhansali
Avi Komarlingam



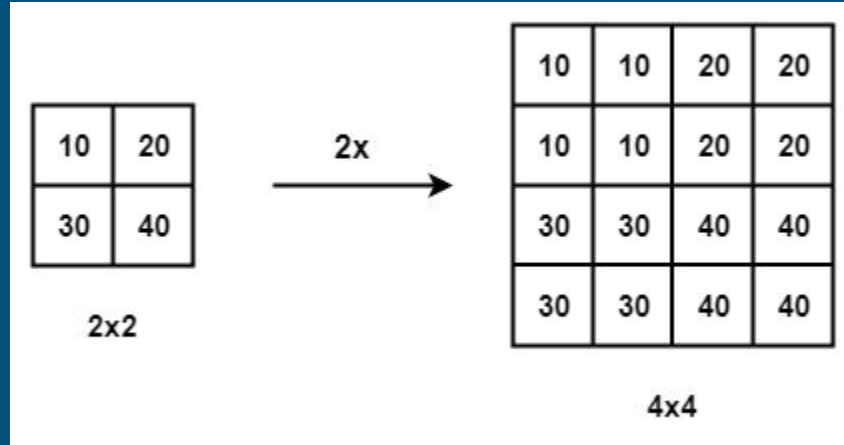
Data Processing



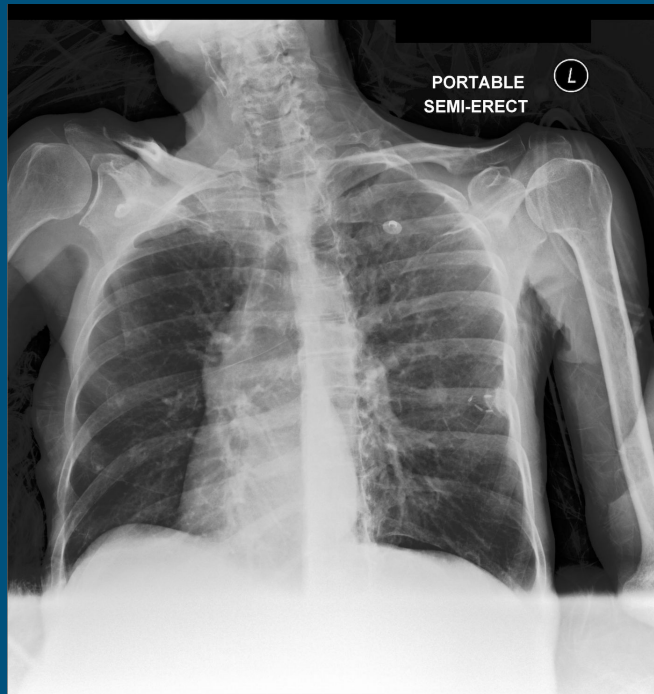
Bilinear Interpolation



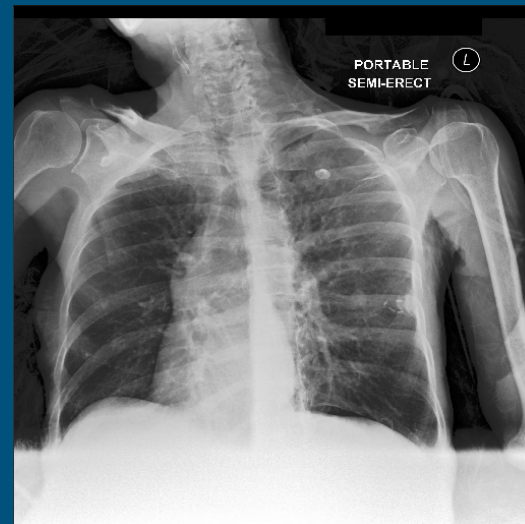
Nearest Neighbor Interpolation



Bilinear Interpolation

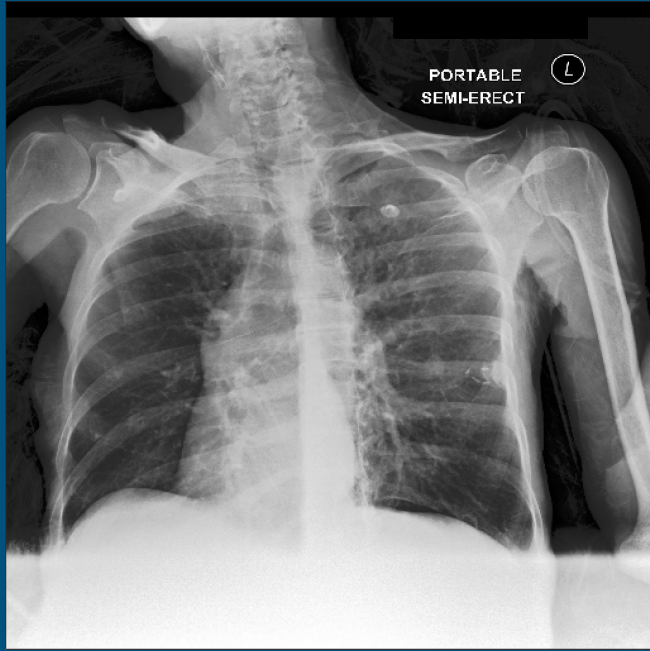


(2539, 2705)

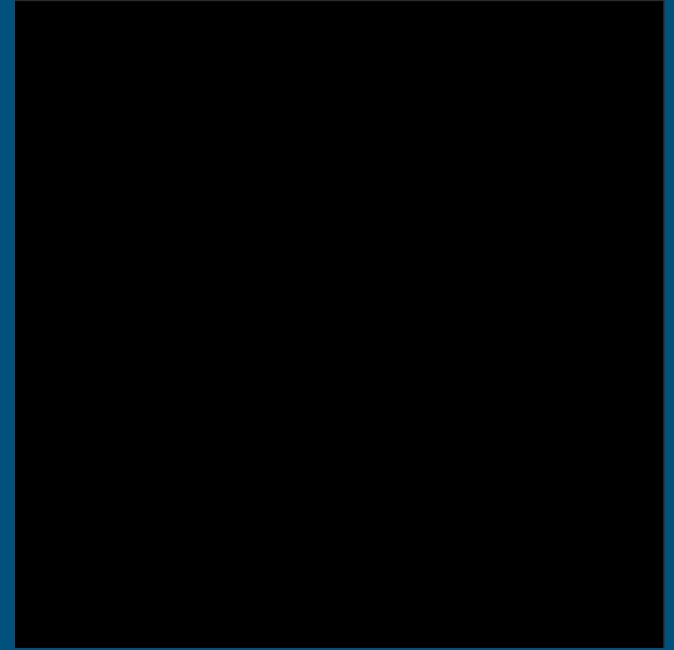


(512, 512)

Pixel Normalization

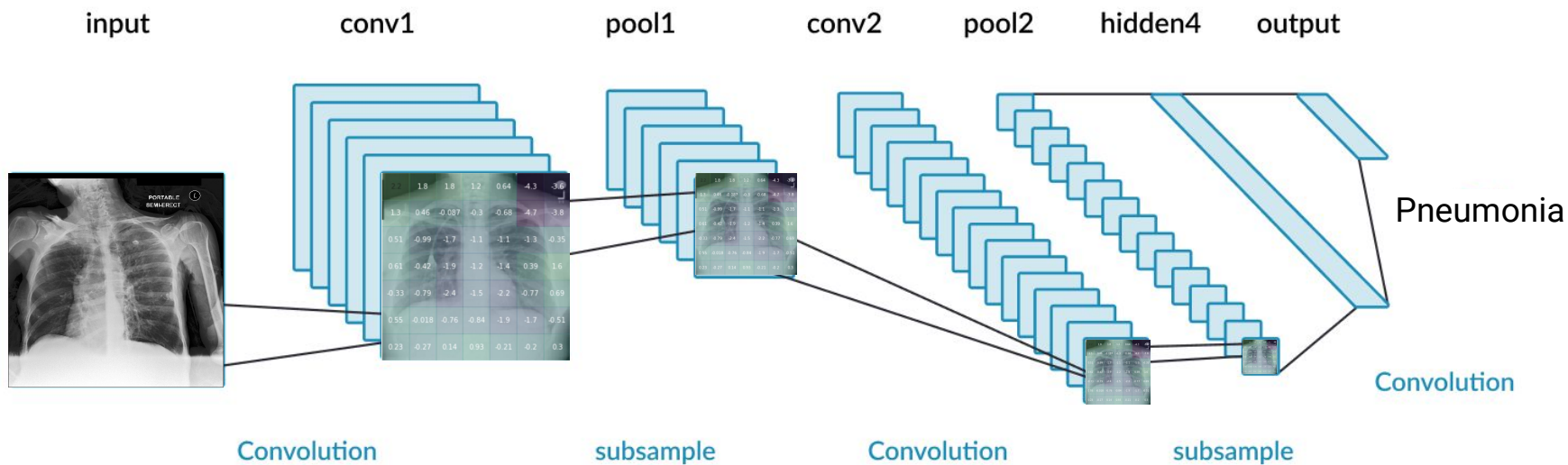


Min: 0.000, Max: 255.000



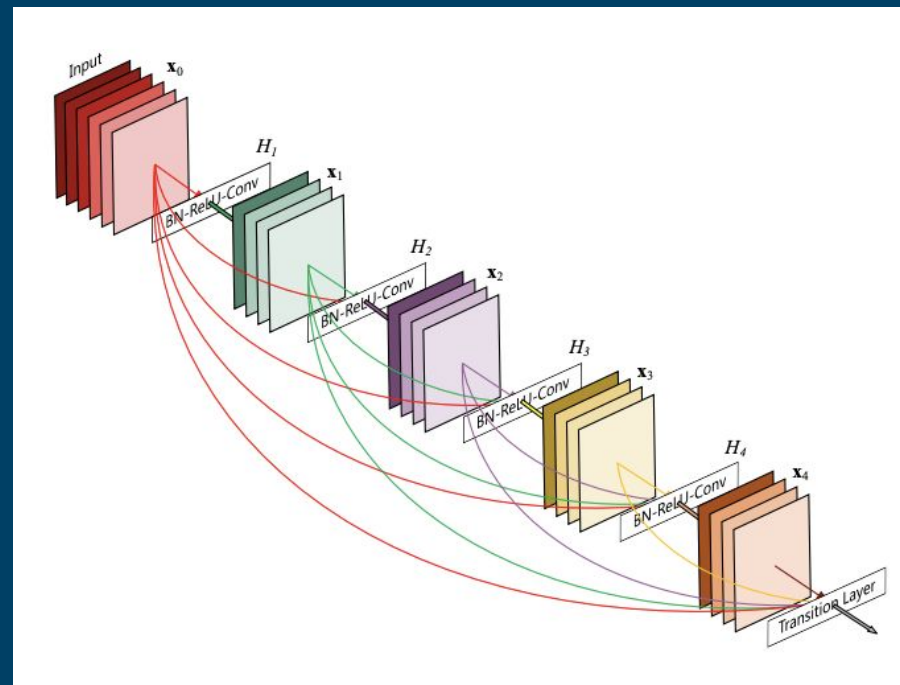
Min: 0.000, Max: 1.000

AP CNNs



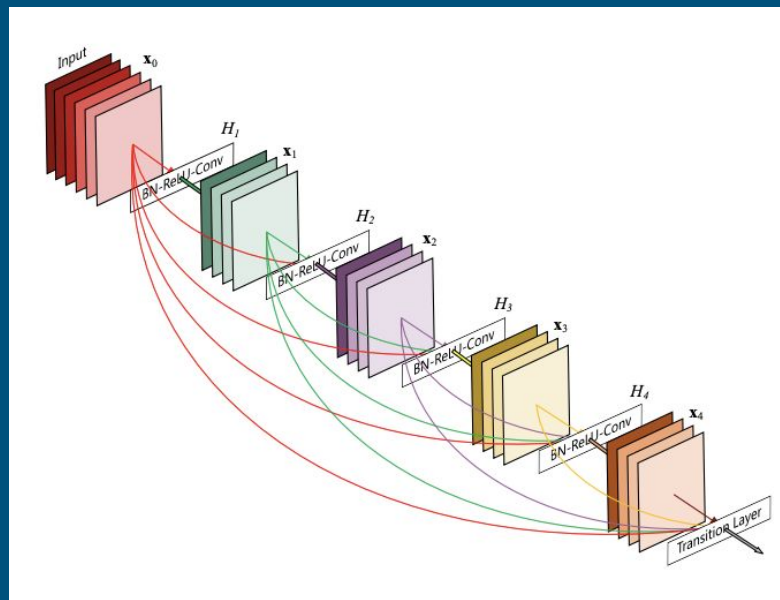
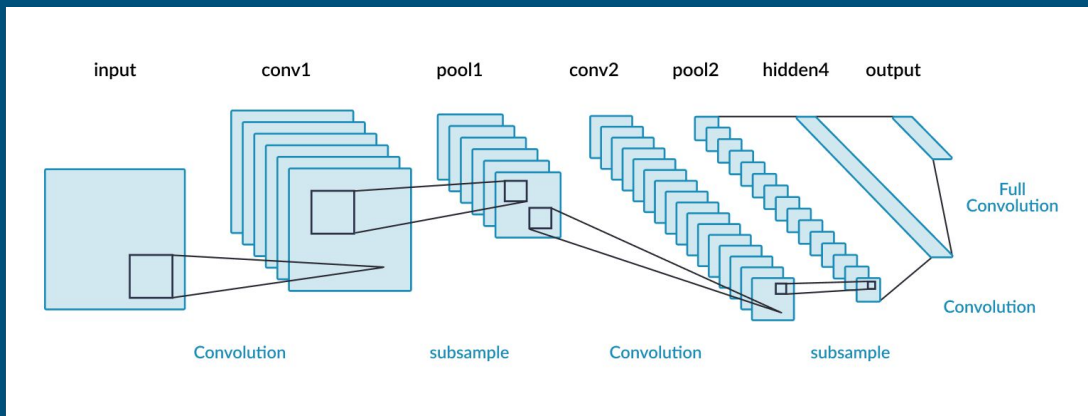
DenseNet

DenseNet Fast
DenseNet-121
DenseNet-161
DenseNet-169
DenseNet-201



DenseNet

- Alleviates the vanishing-gradient problem
- Strengthens feature propagation and reuse
- Substantially reduces the number of parameters



Model Summaries

DenseNet-121

Layers: 121

Epochs: 3

Batch size: 8

Loss function: categorical cross entropy

Accuracy: 92.30%

Time: 2321s/epoch

DenseNet-161

Layers: 161

Epochs: 3

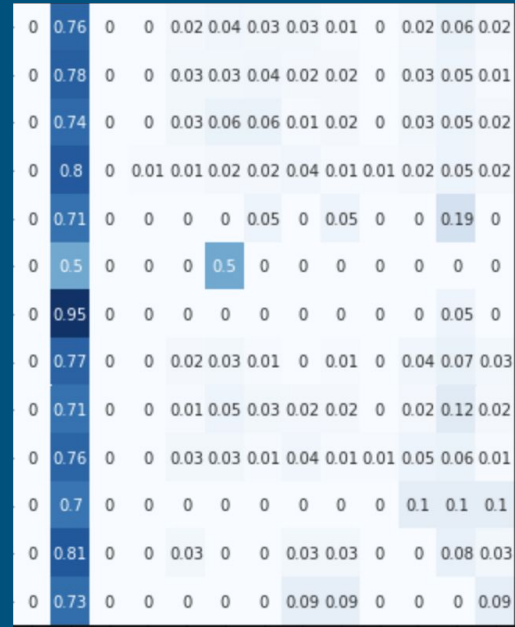
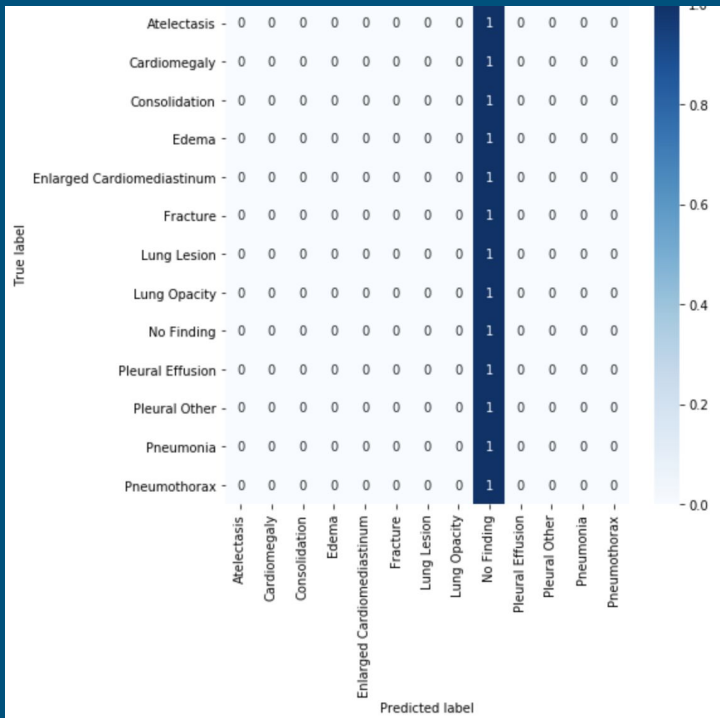
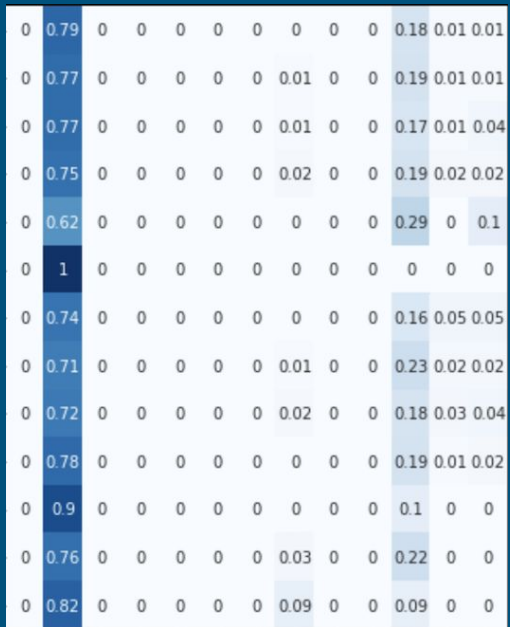
Batch size: 5

Loss function: categorical cross entropy

Accuracy: 92.15%

Time: 3393s/epoch

"Results"

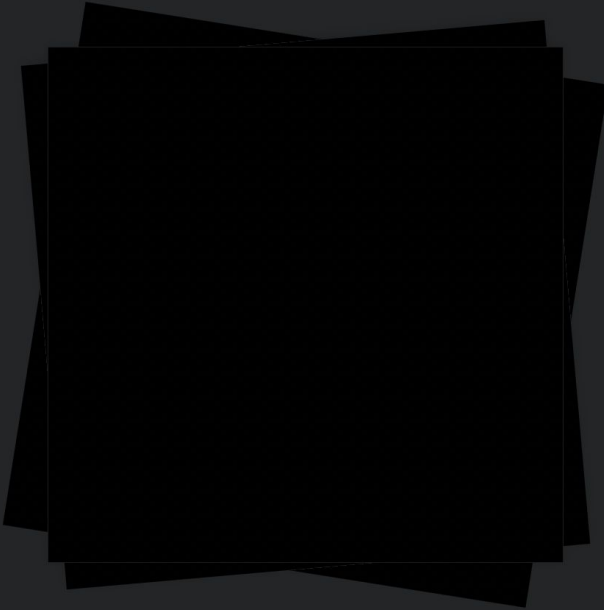


Possible Causes

1. Domination of one class over the others due to overrepresentation

Equalizing Class Sizes

■ Atelectasis	☁ ▶	■ 0b3aa991-...7c36d.jpg	☁
■ Cardiomegaly	☁ ▶	■ 0b3d11ca-...7c651e.jpg	☁
■ Consolidation	☁ ▶	■ 0b4a4744...0a6aae.jpg	☁
■ Edema	☁ ▶	■ 0b4b2e43...b9cbcd.jpg	☁
■ Enlarged C...ediastinum	☁ ▶	■ 0b4bc443...16a166.jpg	☁
■ Fracture	☁ ▶	■ 0b4c43c2-...2262b.jpg	☁
■ Lung Lesion	☁ ▶	■ 0b5ef70c-...3d45e7.jpg	☁
■ Lung Opacity	☁ ▶	■ 0b5f8eb9-...22ade7.jpg	☁
■ No Finding	☁ ▶	■ 0b6a4086...cdeb8e.jpg	☁
■ Pleural Effusion	☁ ▶	■ 0b6f7c0d-...fc8827.jpg	☁
■ Pleural Other	☁ ▶	■ 0b7c365b...4de4a6.jpg	☁
■ Pneumonia	☁ ▶	■ 0b07cc5c-...9a9e32.jpg	☁
■ Pneumothorax	☁ ▶	■ 0b8a2e31-...8686c.jpg	☁
		■ 0b8c0ea9-...93adb5.jpg	☁
		■ 0b8c07ae-...b5f1da.jpg	☁
		■ 0b8d3213...04c3c6.jpg	☁
		■ 00b8fce3-...dd8972.jpg	☁
		■ 0b9afff9-5...8992b3.jpg	☁
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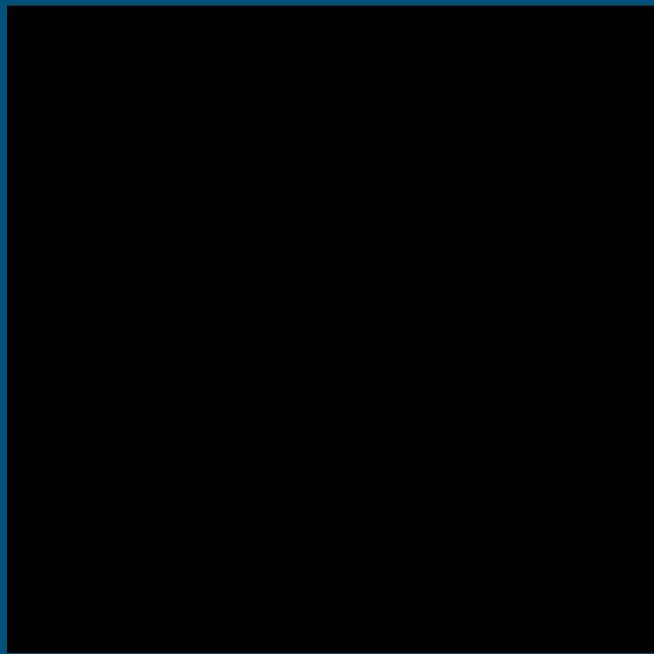


100 items
100 documents - 340 KB

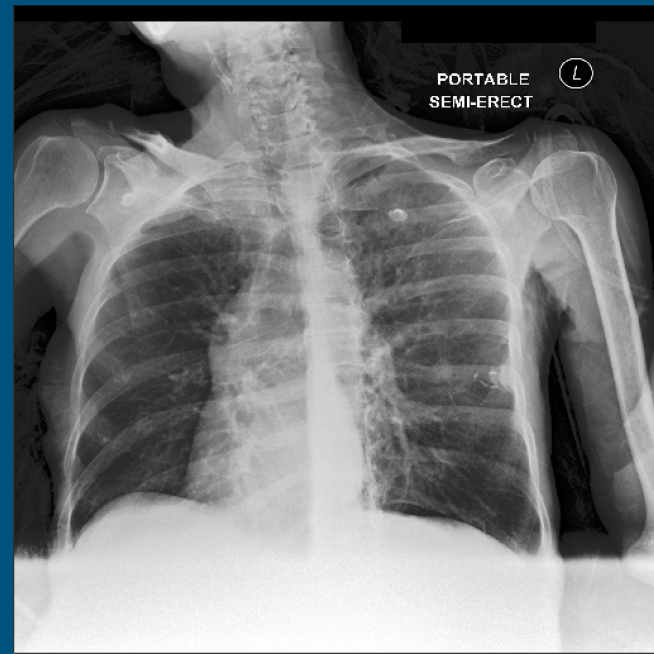
Possible Causes

1. Domination of one class over the others due to overrepresentation
2. Errors in preprocessing images

Pixel Denormalization



Min: 0.000, Max: 1.000



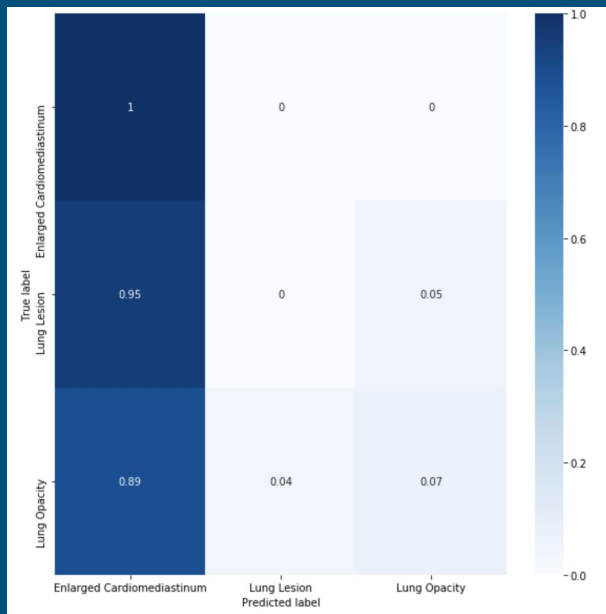
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Possible Causes

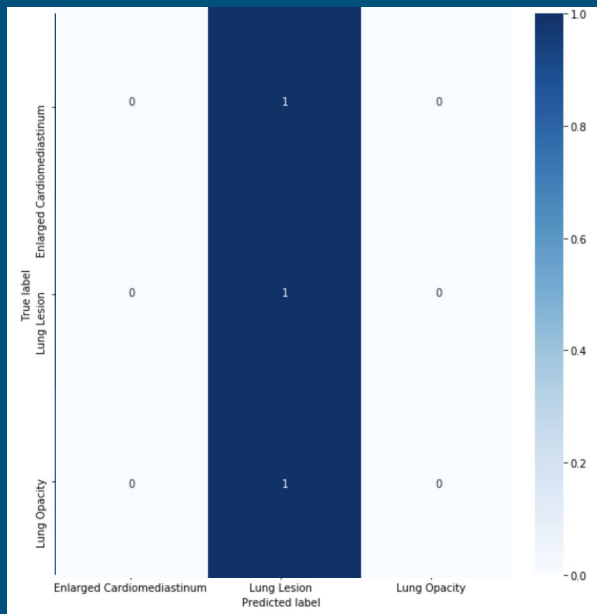
1. Domination of one class over the others due to overrepresentation
2. Errors in preprocessing images
3. Issues with model architecture

Different Model Architectures

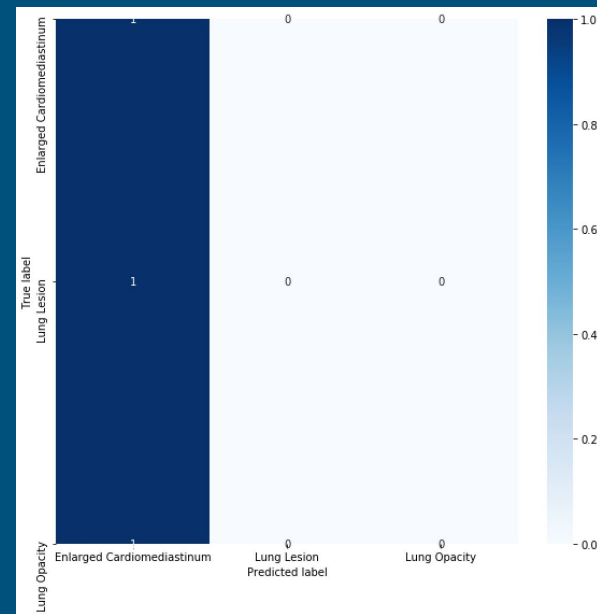
DenseNet-121



ResNet-50



CNN-7



Even More Different Model Architectures

kNN

		Predicted			
		Enlarged Cardiome-diastinum	Lung Lesion	Lung Opacity	Σ
Actual	Enlarged Cardiome-diastinum	51.7 %	38.7 %	9.6 %	551
	Lung Lesion	36.0 %	55.3 %	8.8 %	684
	Lung Opacity	46.9 %	43.0 %	10.1 %	435
	Σ	735	778	157	1670

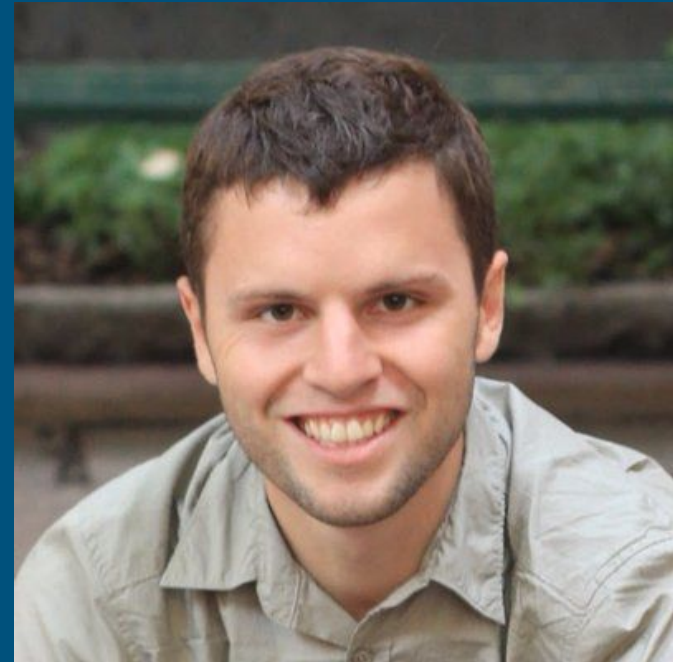
Logistic
Regression

		Predicted			
		Enlarged Cardiome-diastinum	Lung Lesion	Lung Opacity	Σ
Actual	Enlarged Cardiome-diastinum	43.0 %	35.6 %	21.4 %	551
	Lung Lesion	27.2 %	52.5 %	20.3 %	684
	Lung Opacity	32.9 %	38.4 %	28.7 %	435
	Σ	566	722	382	1670

SVM

		Predicted			
		Enlarged Cardiome-diastinum	Lung Lesion	Lung Opacity	Σ
Actual	Enlarged Cardiome-diastinum	53.9 %	22.7 %	23.4 %	551
	Lung Lesion	51.3 %	29.2 %	19.4 %	684
	Lung Opacity	54.5 %	19.5 %	26.0 %	435
	Σ	885	410	375	1670

Scientist Outreach



Future Work

Train and optimize AP, PA, and lateral CNNs



Fuse networks via DualNet architecture



Incorporate patient information (syndromes, history, etc.) into diagnosis