Project presentation, Pneumonia Detection

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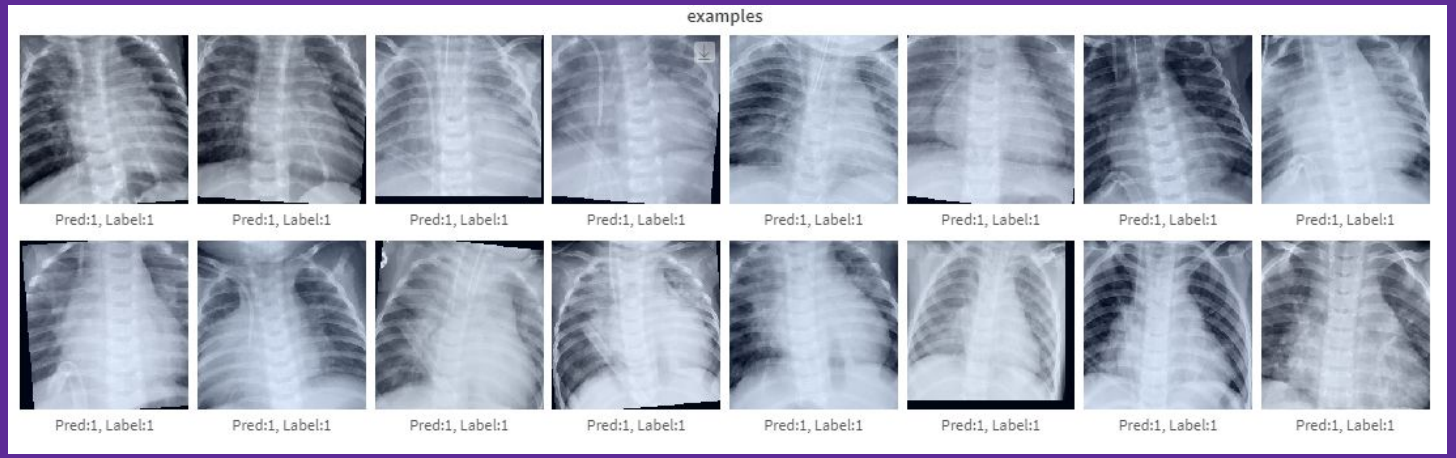
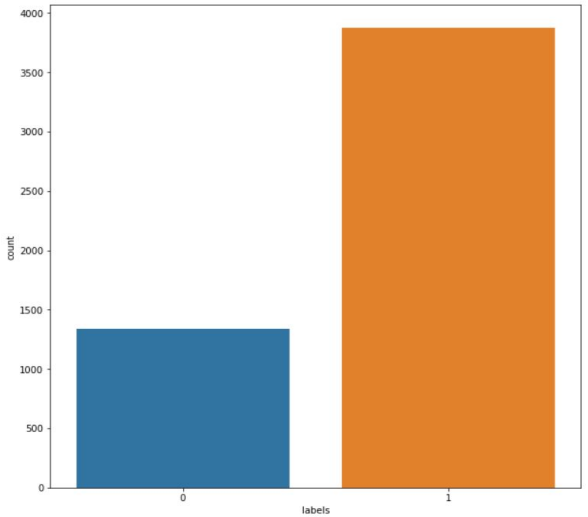


Introduction

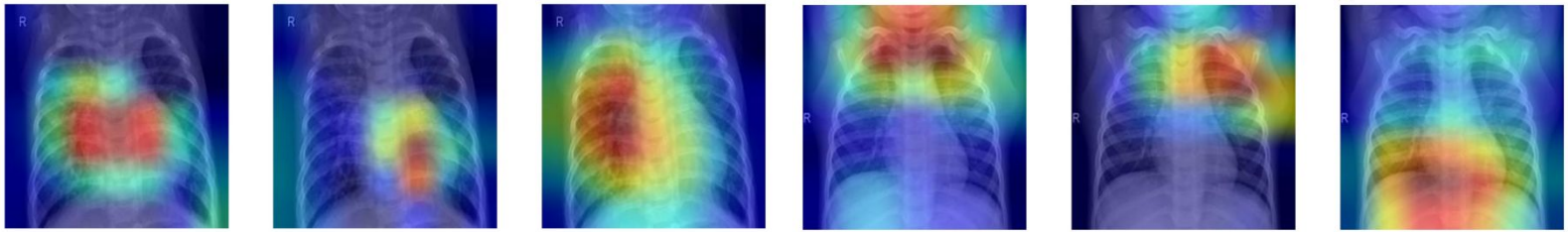
- Brief introduction about the problem
- Information on the dataset
- Kundu R, Das R, Geem ZW, Han G-T, Sarkar R (2021) **Pneumonia detection in chest Xray images using an ensemble of deep learning models.**



Link to paper: **https://doi.org/10.1371/journal.pone.0256630**

Methods

- Transfer Learning (GoogleNet,ResNet,DenseNet)
- GradCam, t-SNE for Visualization
- Performance metrics: f1-Score, Accuracy, AUROC, Confusion Matrix



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Implementation

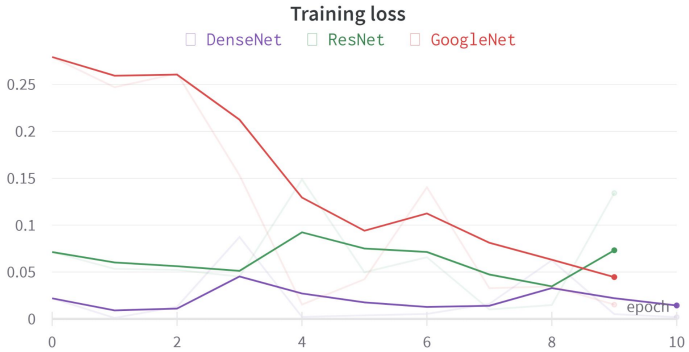
- Best network hyperparameters
- Split of dataset; 80/11/9

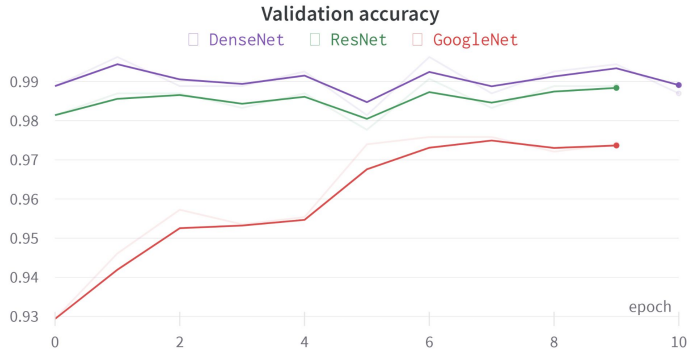
Model architecture	Loss function	Optimizer	learning-rate	Batchsize	Epochs
Googlenet	Cross entropy	Adam	1e-5	32	10
ResNet50	Cross entropy	Adam + `weight_decay = 0.01`	1e-5	16	10 (early stopping: 5)
DenseNet	Cross entropy	Adam	1e-5	32	10

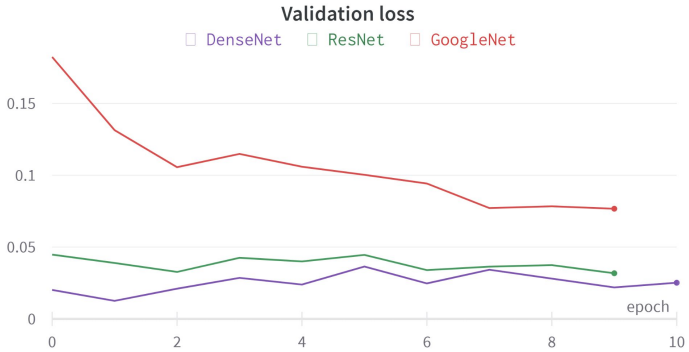
Results

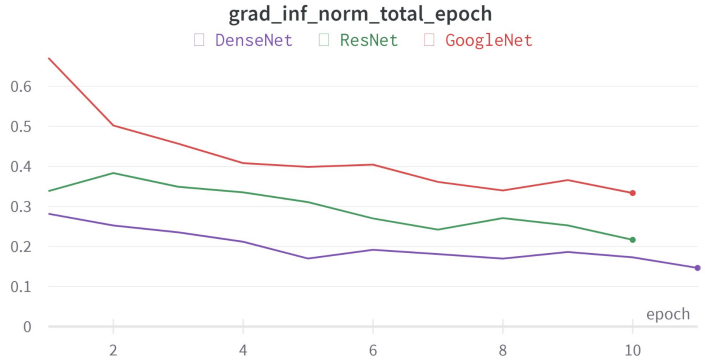
Model architecture used	Training time [model]	Computational performance	loss testing	Accuracy testing	F1	AUROC
GoogleNet	21.9 min	See part 1.2	0.443	0.8798	0.8622	0.9620
ResNet50	18,4 min	See part 1.2	0.706	0.9183	0.9108	0.9666
DenseNet	20.3 min	See part 1.2	0.466	0.8766	0.8574	0.9716

Result 1.1 - plot over performance for the different models

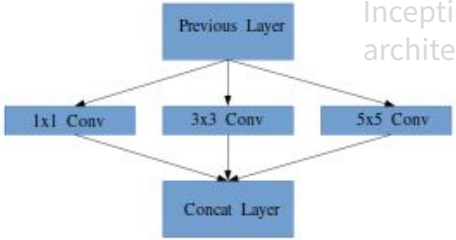




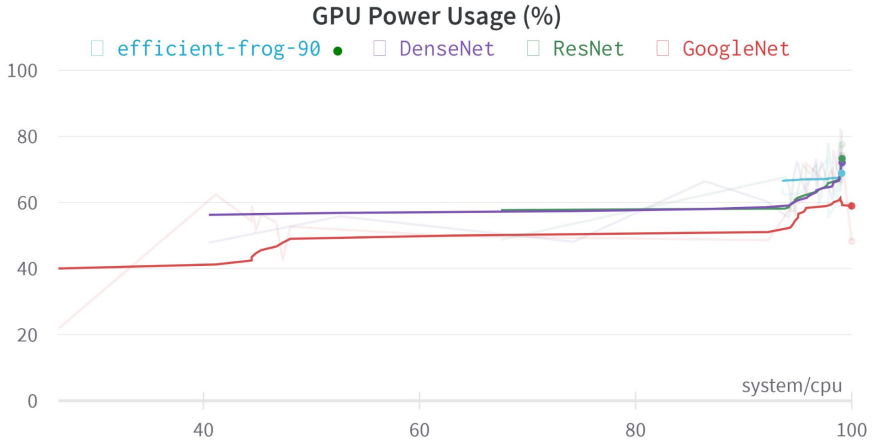


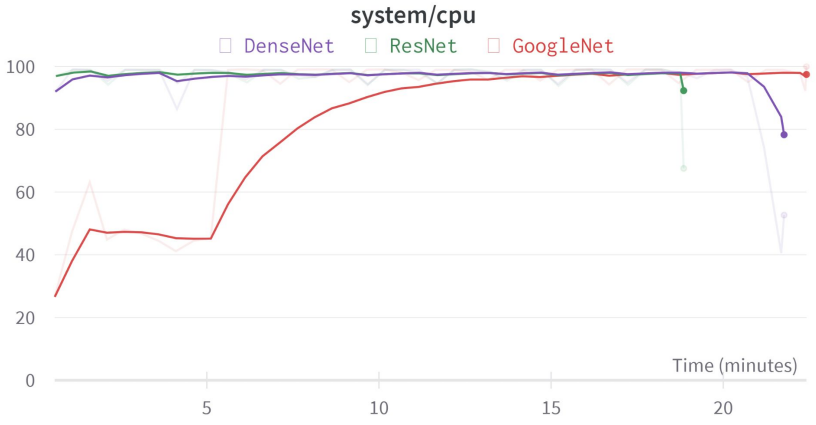


Result 1.2 - plot over computational performance for the different models



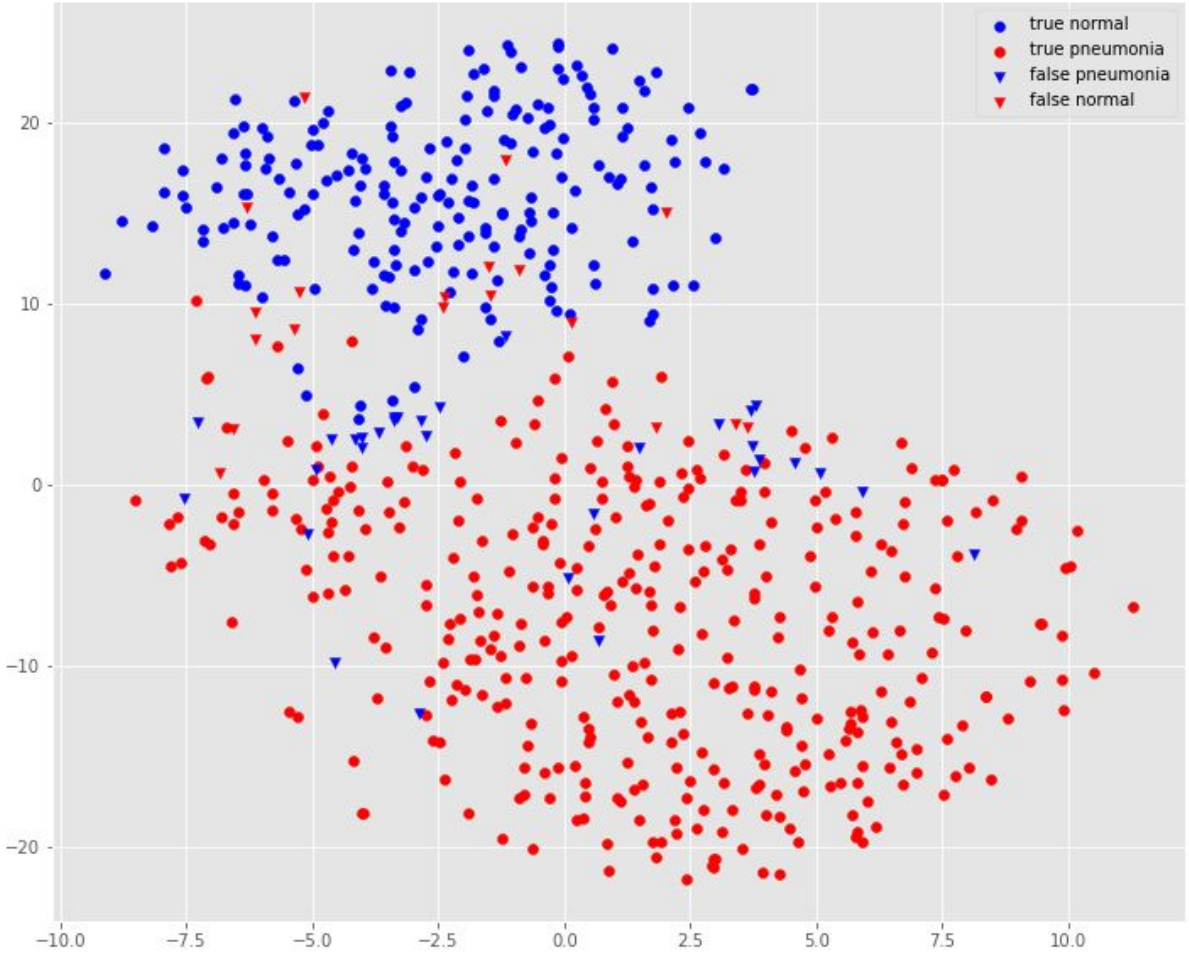
Inception and sparsely connected architecture





Result 2 - tSNE

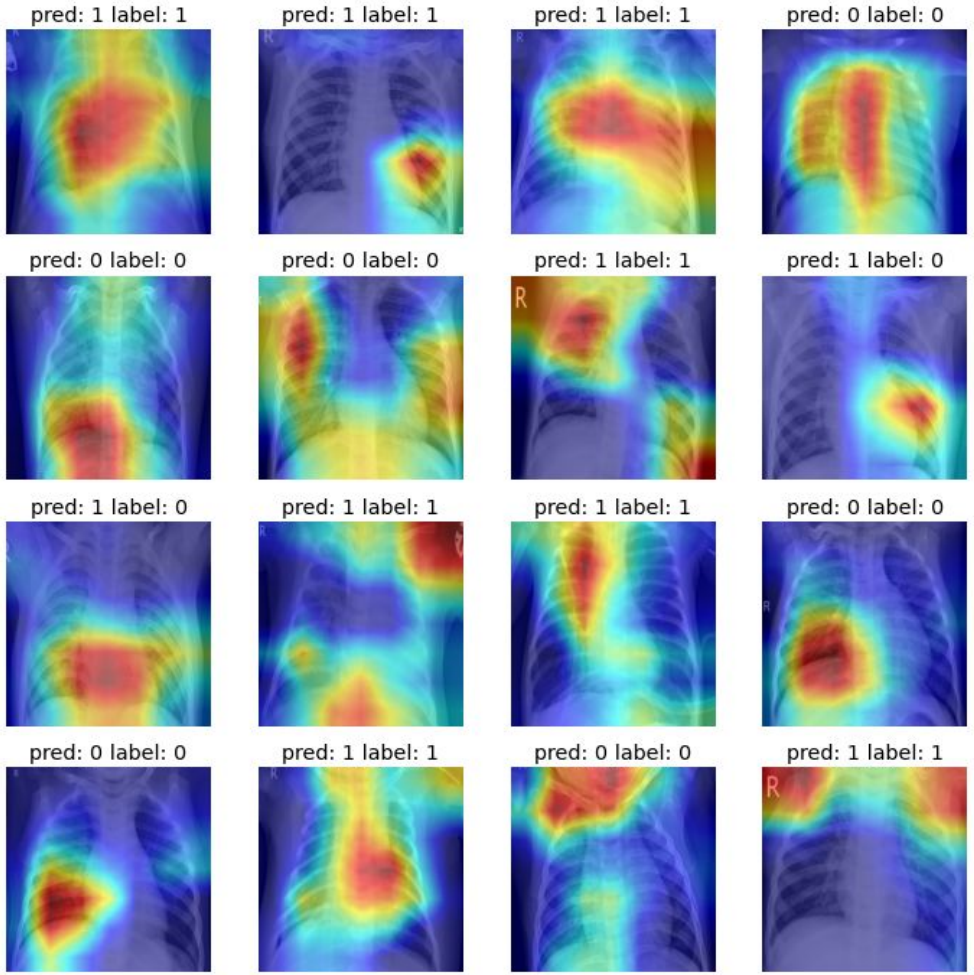
- applied before classifier
- only weak clusters



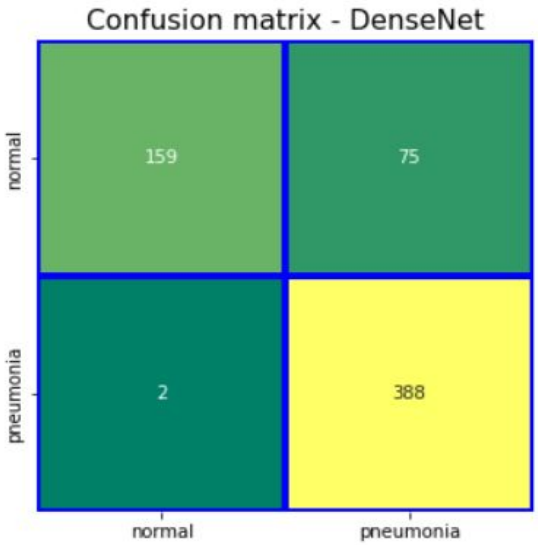
Result 3 - GradCAM

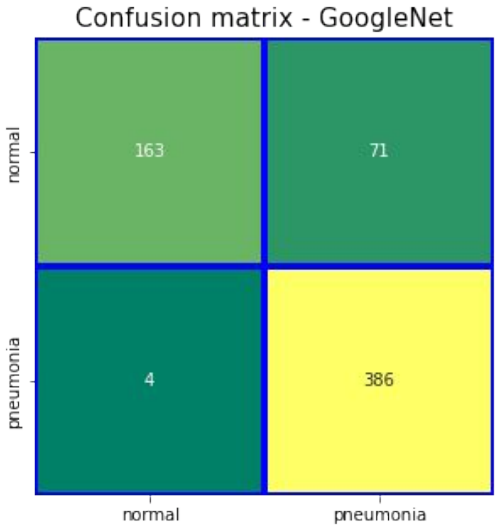
- red overlay: large gradient
- blue overlay: small gradient

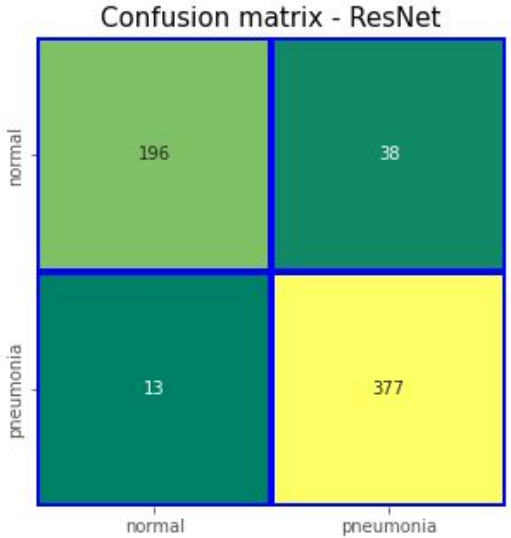
- Network mostly looks at lungs, but sometimes only on small parts in the image



Result 4 - confusion matrix for the models







Learning outcomes and conclusion from result

- Data augmentation should be used carefully
- How to cope with data imbalance
- Importance of visualization
- Performance metrics (other than accuracy)
- Some models are more difficult to set up for transfer learning

Questions?

Github link: https://github.com/1aut/advanced_deep_learnig_exercise_1/tree/master/project

(not fully completed by now)