Pneumonia Image Classification Project

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Preface

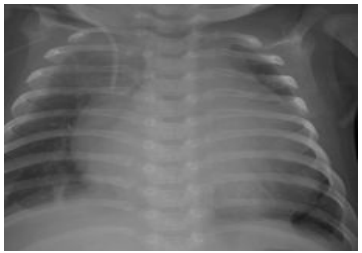
- Pneumonia causes 1.5 million visits to the E.R in the United States (2018)
- Pneumonia causes 13.4 deaths per 100,000 / 43,881 deaths.
  - https://www.cdc.gov/nchs/fastats/pneumonia.htm

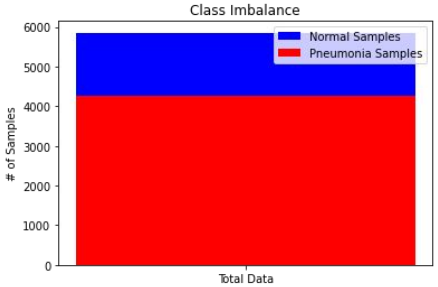
- Using machine learning and deep neural networks we can teach a computer how to recognize pneumonia and give our doctors another tool in their toolbelt for combating this deadly disease.

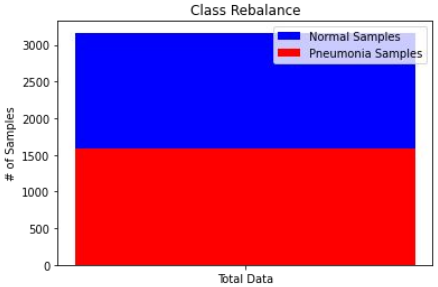
Data & Models

Normal X-Ray

Pneumonia X-Ray







- **3 models with a finetune on each were performed. A baseline fully connected model. A convolutional model and lastly a pretrained model.**

- **These models extrapolate weighted data from each pixel and use it to compare against the classes.**

- **The finetune models are set to jump off with the best metrics it has achieved so far, and to stop learning if no progress is made after 10 attempts.**

Results

- All of our models improved on their finetune
- MLP was used as a baseline model
- CNN can understand spatial relation as it performed better than MLP
- Pretrain model to test transfer learning.

Metrics	Loss	Accuracy	Precision	Recall
MLP Original	26.40%	88.40%	87.30%	89.87%
MLP Finetune	25.46%	89.87%	89.87%	89.87
CNN Original	17.15%	94.09%	93.36%	94.94%
CNN Finetune	12.09%	96.20%	96.60%	95.78%
Pretrain Original	18.42%	92.83%	94.32%	91.14%
Pretrain Finetune	16.23%	94.09%	99.06%	89.03%

Recommendations

- CNN Finetune Model recommend for deployment
- Use in conjunction with licensed medical practitioner
- Technology can be further used for other types of image classification

Future Work

- Explore more dimensionality in image augmentation to see if any more useful data can be extrapolated
- Explore in greater depth the tuning of the model and how each metric and loss function impacts the result
- Input more image data to see how this model performs on a larger dataset
- Create a function to evaluate whether or not someone has pneumonia with a confidence and accuracy rating. Greater understanding of decision metrics needed.

Thank You

Any Questions???