Image Classification using Neural Networks

Deepali Sharma

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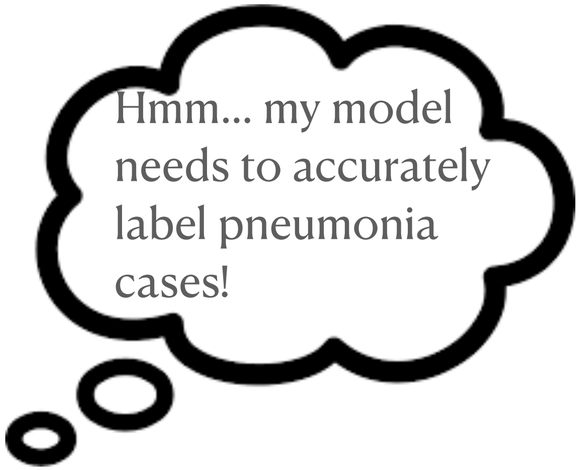
• Stakeholder:

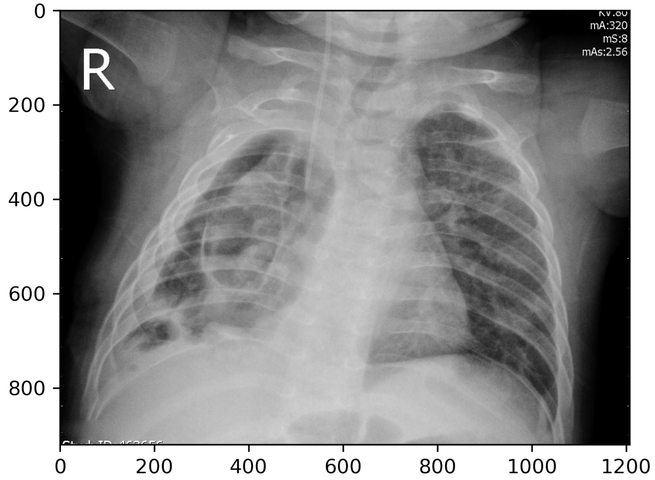
- Piedmont Healthcare Group

We need a data scientist who can make job easier for our radiologists

• Business Problem:

- Label **accurately** the chest X-rays as belonging to **pneumonia** or **normal** class

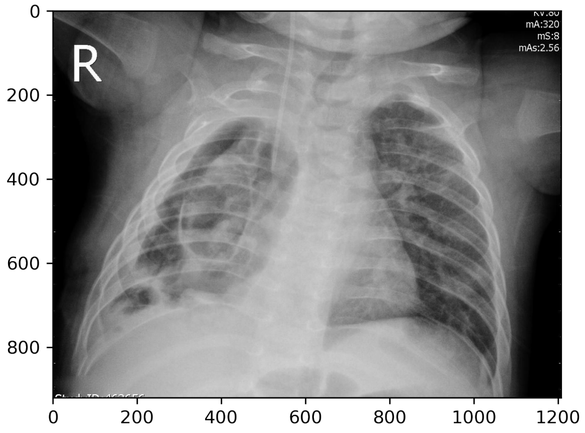




Data:

- Data is obtained from Kaggle
  - Contains 5856 validated chest X-ray images classified into **normal** and **pneumonia** classes

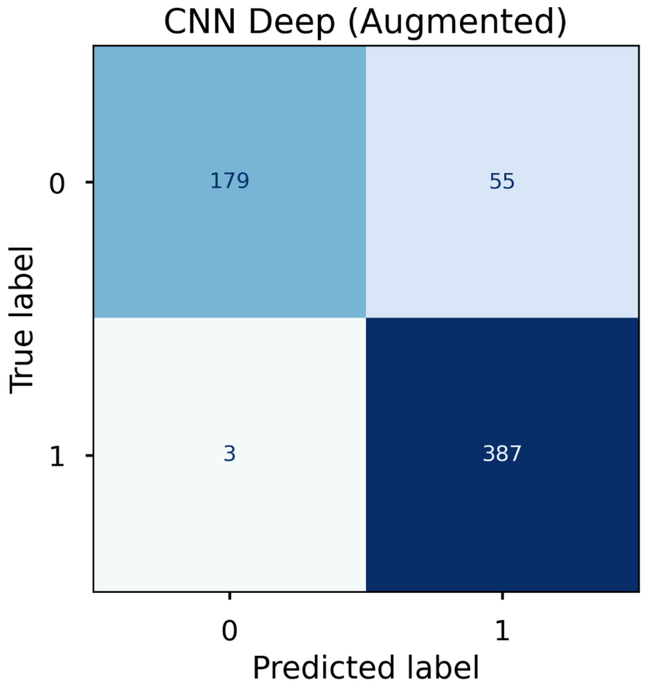
Goal:



- **Goal** is to build an **image classification neural network** that would accurately label the X-ray images. **Maximize** the **true positives** for pneumonia
  - will reduce the **workload** of radiologists.
  - will **avoid any lag** in **treatment**, **patient care**, and **minimize** the **diagnosis time**

Results from the Best Model:

- RECALL:
  - **correct true predictions** for a given class (TP/(TP+FN))
- PRECISION:
  - correct true predictions out of all predictions (TP/(TP+FP))



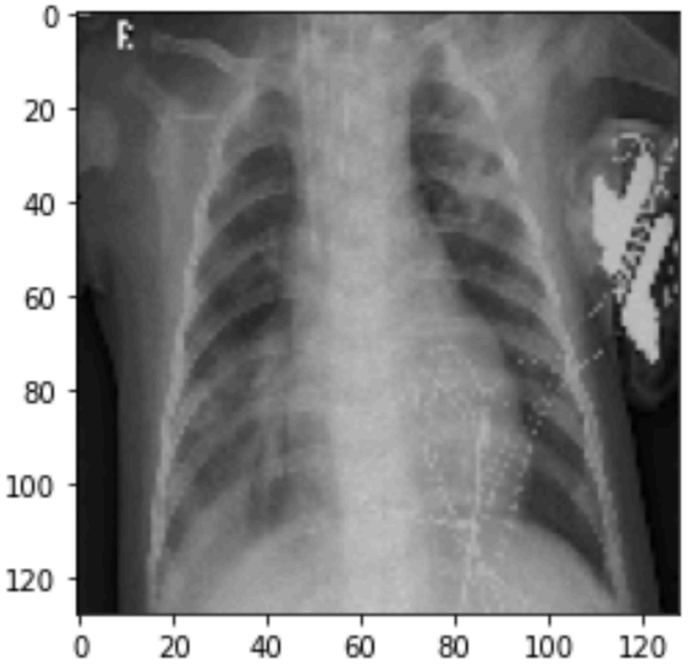
CNN Model with layers trained on augmented data

	Pneumonia	Normal
RECALL	**99%**	76%
PRECISION	88%	98%

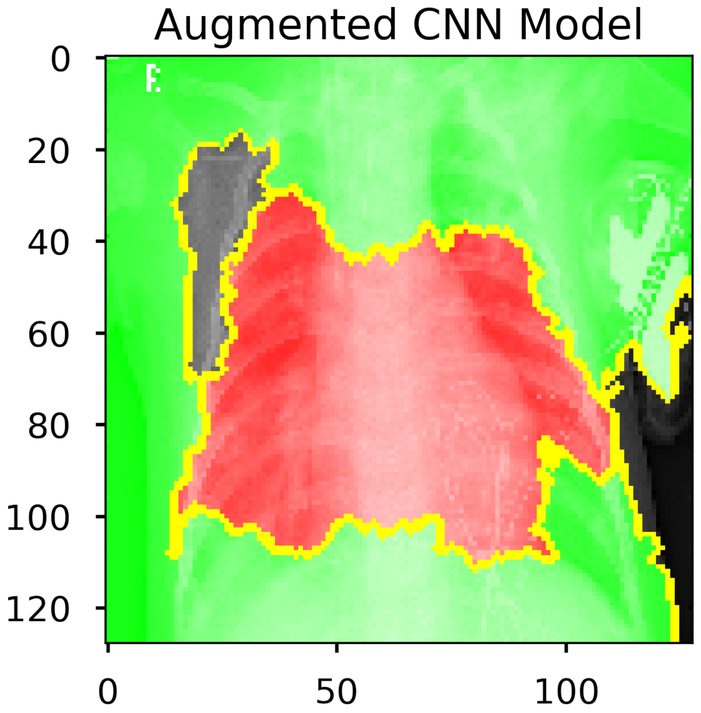
Only 3 out of 390 pneumonia cases are mis-labeled!

**FP(False Positives), TP(True Positives), FNFalse Negatives), TN(True Negatives)*

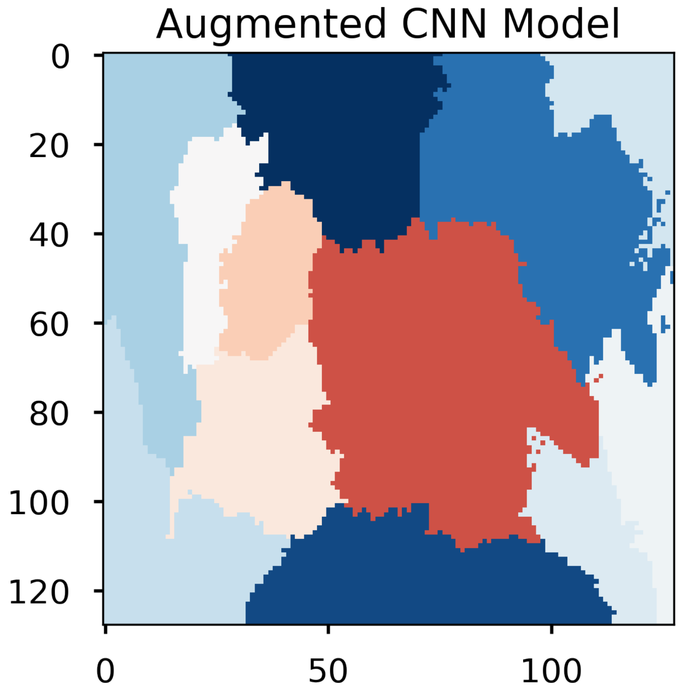
Example showing model work under the hood!



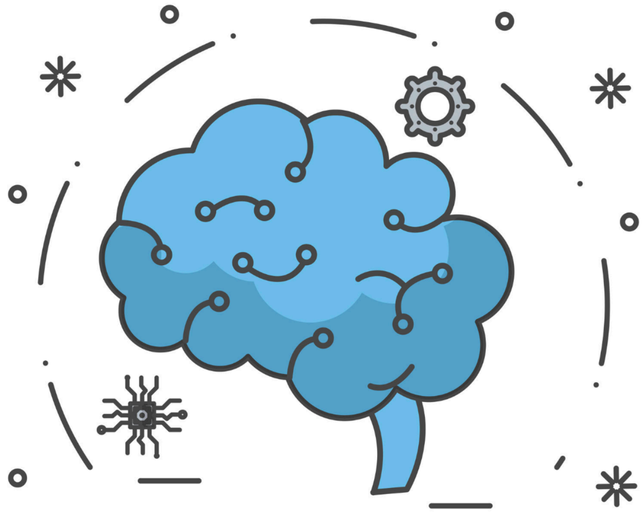
Original image



Mask Boundaries:
Towards (Green);
Against(Red)

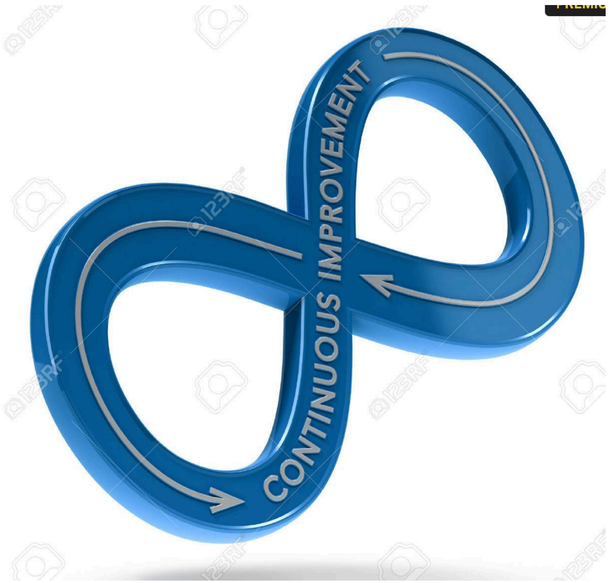


Heatmap: the **more blue** it is, the higher the **positive impact**!



Recommendations

- Use **neural nets** to classify X-ray images.
- Will yield **faster diagnosis, early intervention, reduction** in **waiting times.**



- Probably run model with **weights** in training to take into account **class imbalance.**
- Go deeper with labeling pneumonia cases as **bacterial/viral .**
- **Crop images** to get rid of unnecessary details

- **Deepali Sharma**: email:(deeps.sharma@gmail.com, deepali@rcf.rhic.bnl.gov)
- **Linkedin:** https://www.linkedin.com/in/deepali-sharma-a83a126/
- **GitHub**: https://github.com/deepssharma