Predicting Pneumonia for Mt. Sinai Hospital: Deep Learning Approach

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Overview

Business Problem

Data

Modeling / Evaluation

Conclusion

Business Problem

Mount Sinai Hospital

- Pneumonia detection is easy
- Problem is false positive
- Mt. Sinai needs **a new detection method** to decrease false positive pneumonia detections

Data

- 5863 Lung X-Rays
  - 1381 Normal Lungs
  - 4482 Pneumonic Lungs
- Guangzhou Hospital for Women and Children
- Kaggle
- Different Processing Techniques applied

X-Ray Images of Normal Lungs

Normal 1

Normal 2

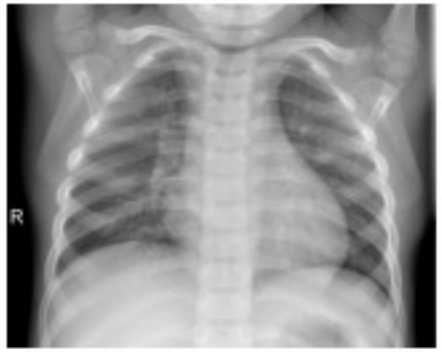
Normal 3

Normal 4

Normal 5

Normal 6

Normal 7



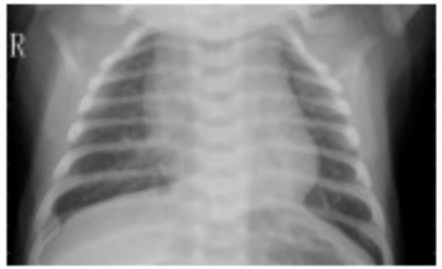
Normal 8

Normal 9

Normal 10

X-Ray Images of Pneumonic Lungs

Pneumonia 1

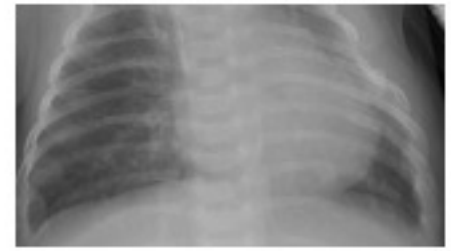


Pneumonia 2

Pneumonia 3

Pneumonia 4

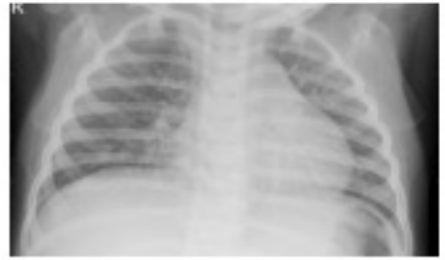
Pneumonia 5



Pneumonia 6

Pneumonia 7

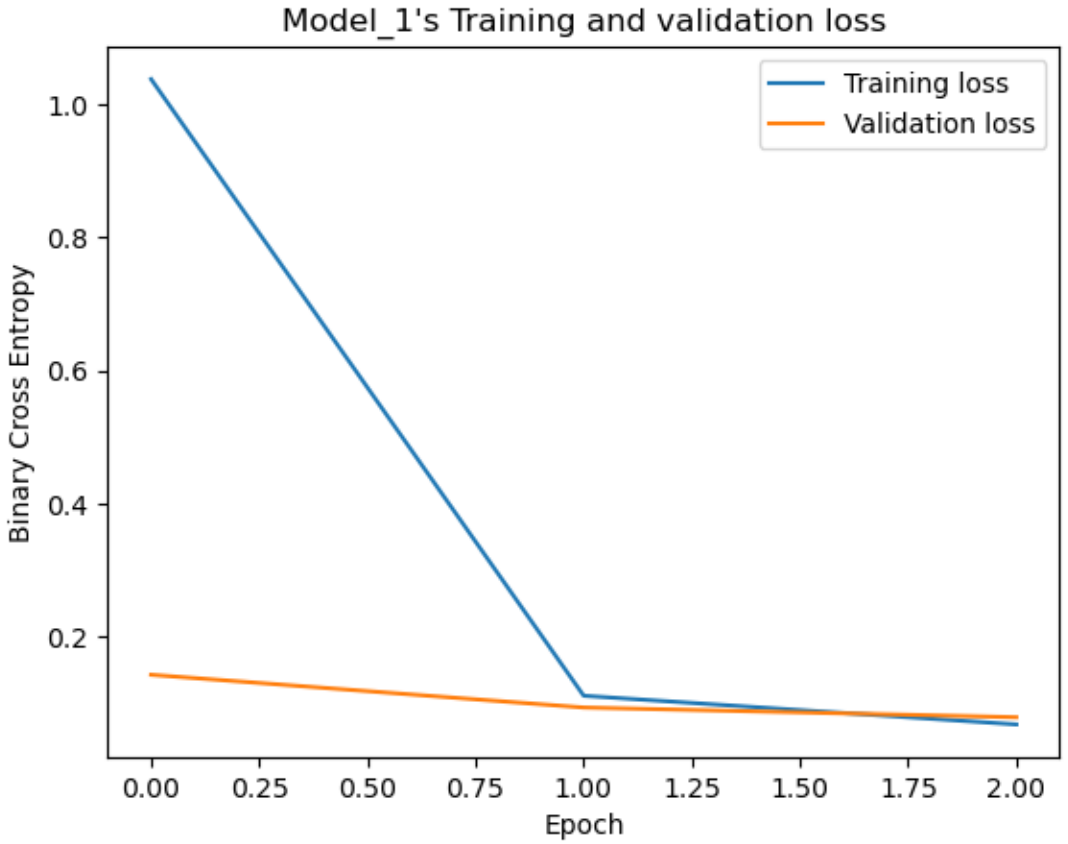
Pneumonia 8

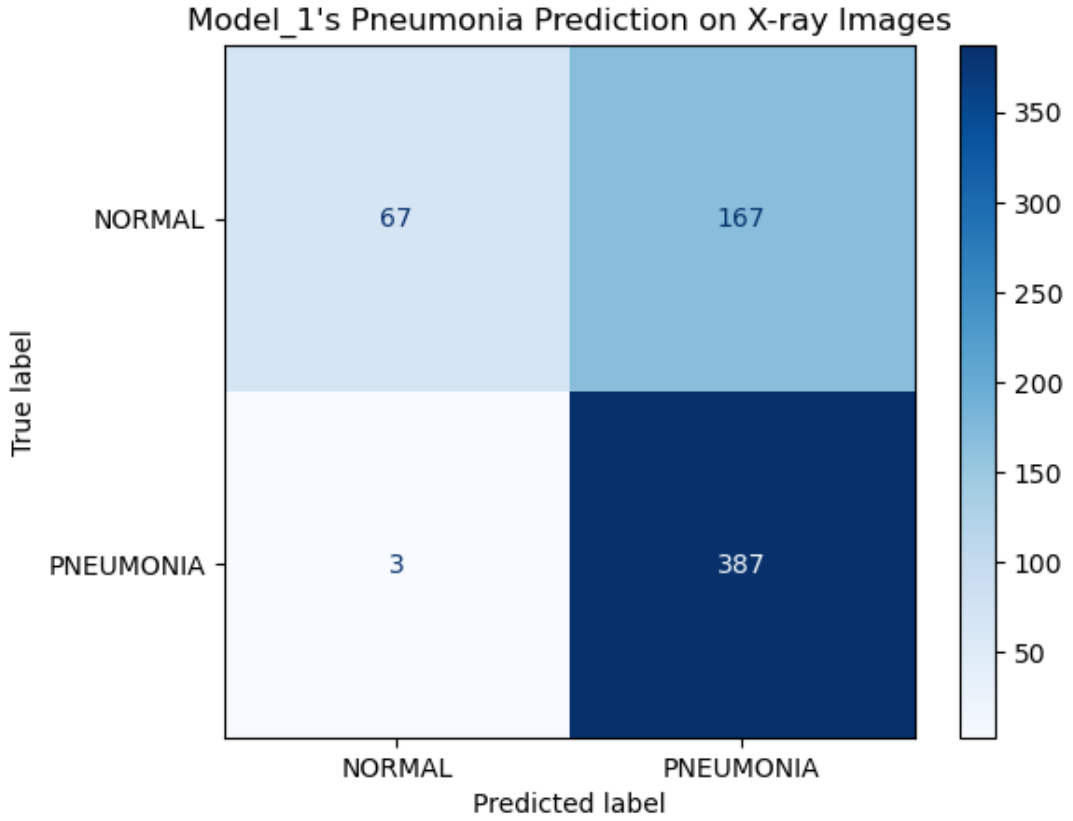


Pneumonia 9

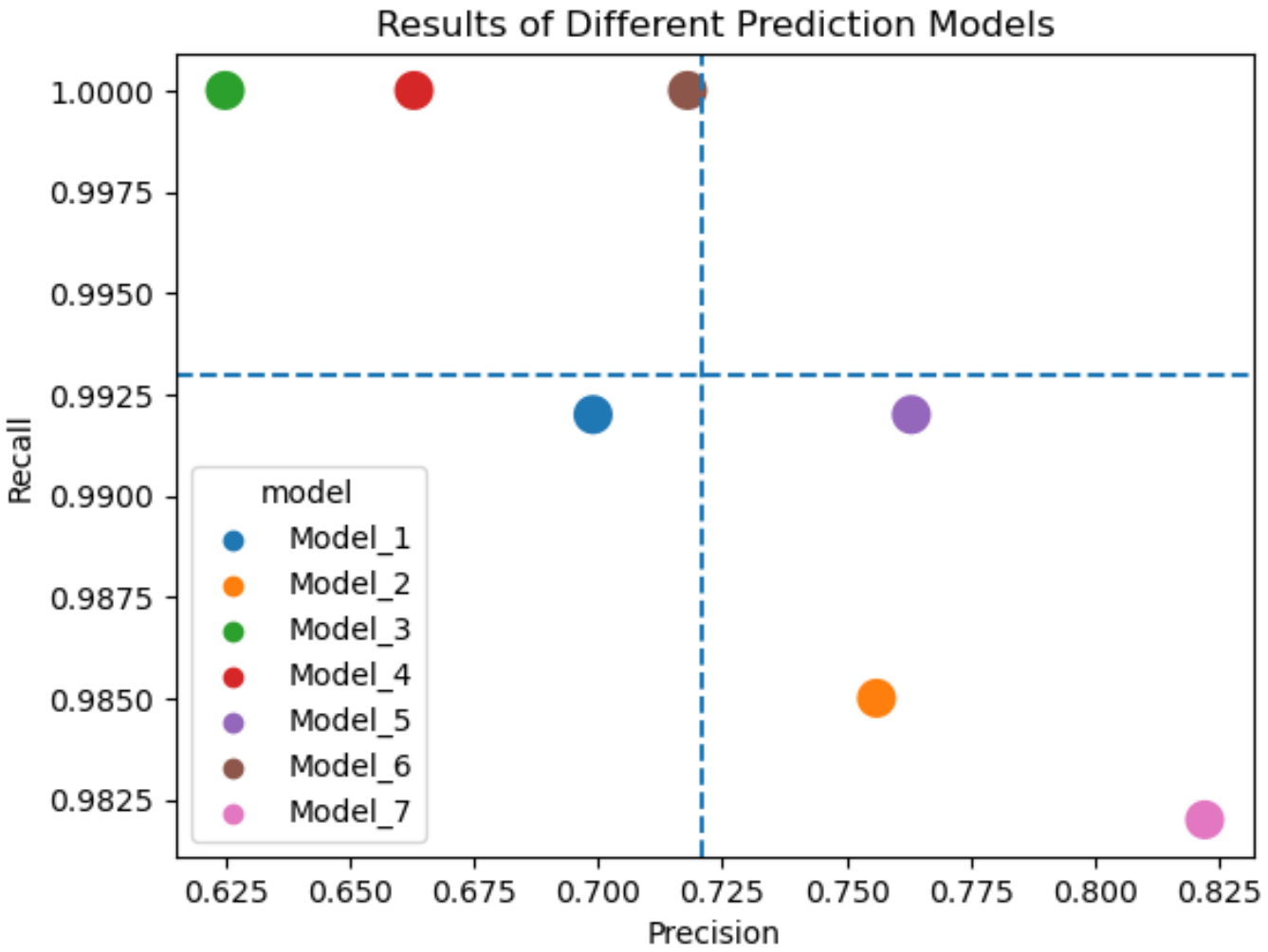
Pneumonia 10

Modeling - Baseline

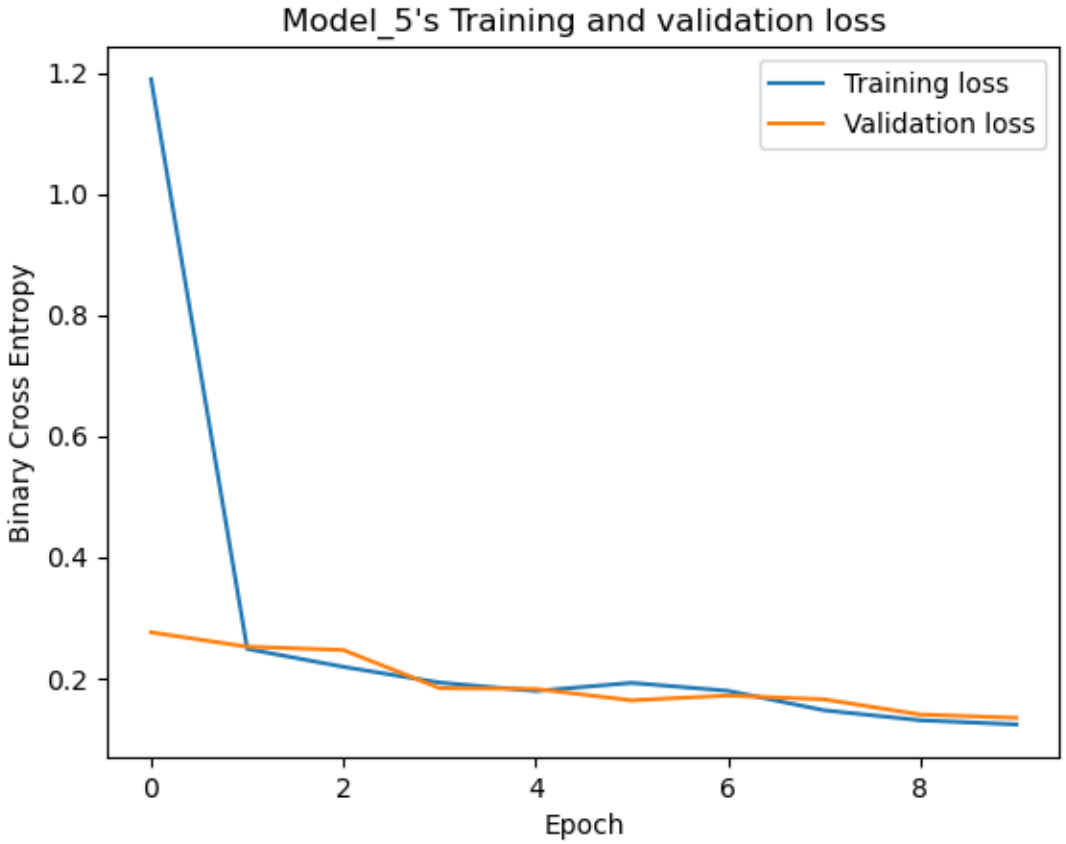


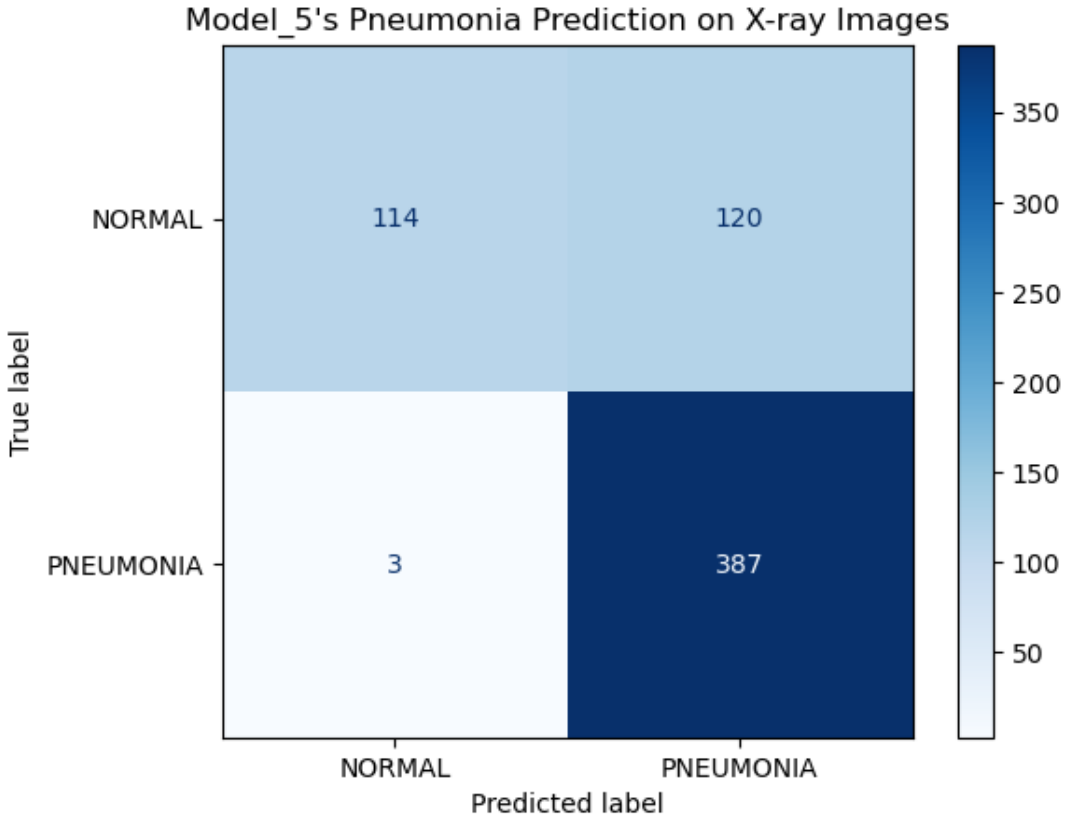


Model Performances



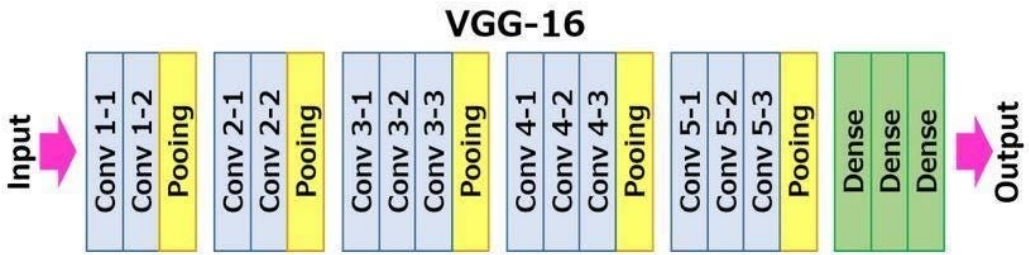
Modeling – Final Model (Fifth)





Modeling – Final Model (Fifth)

- VGG-16
- Flatten
- Dense (512)
- Dropout(0.5)
- Sigmoid

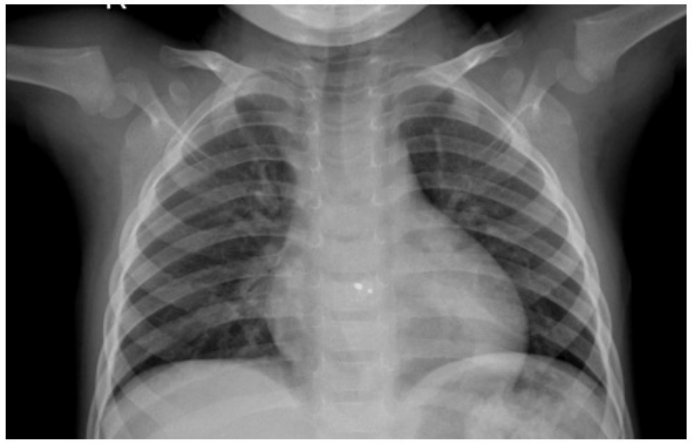


Evaluation – False Negatives

False Negative

False Negative

False Negative



Conclusion

- Retained the Recall
- Improved the Precision by 0.075

Recommendation

- Roll out subscription services to smaller hospitals
- Apply this model to other lung infection dieseases

Next Steps

- Gather more data
  - More data on men’s lung x-ray images
  - More data on races other than Asian
- Try different Fine-Tuning

Thank you!

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- https://github.com/jaeheonk817