Using AI to Inform Medical Decisions

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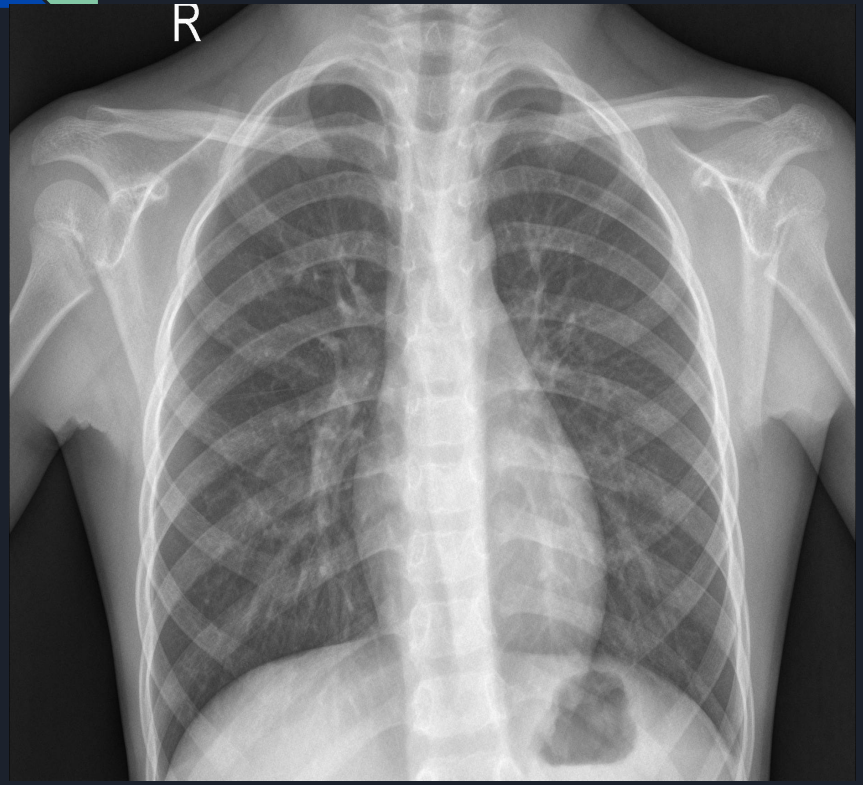
Overview:

- Business Case
- Exploratory Data Analysis
- Modeling
- Further Studies

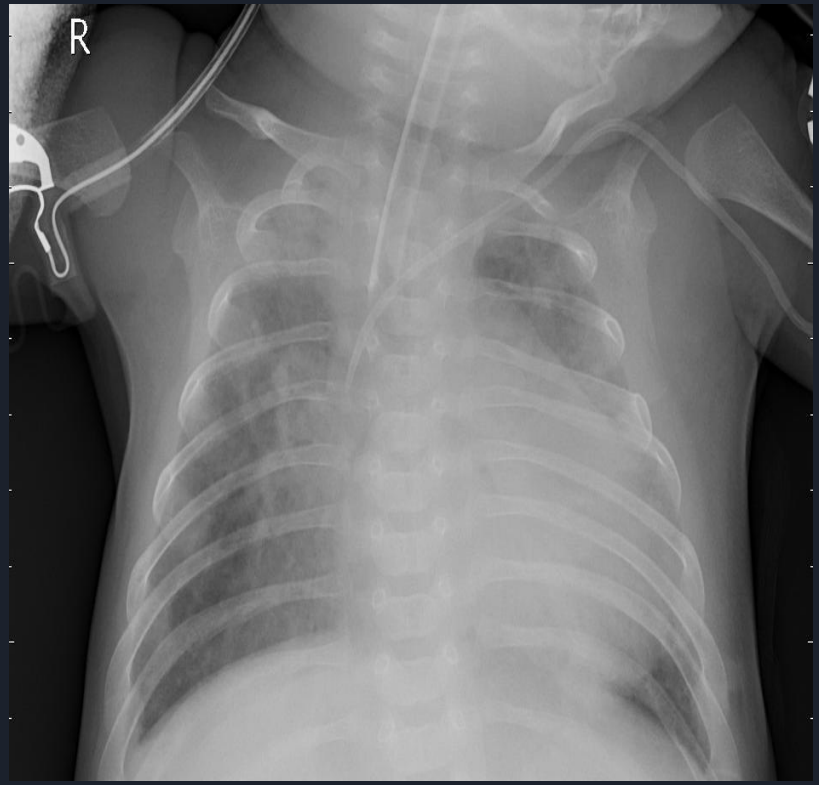
Business Case:

- The goal of the neural network model is to detect abnormalities in chest X-rays
- The secondary goal of the NN model is to assist medical professionals in diagnostic procedures
- “Convolutional neural networks (CNNs) are effective tools for image understanding. They have outperformed human experts in many image understanding tasks” (Sarvamangala & Kulkarni, 2021).

Normal



Pneumonia



Exploratory Data Analysis

- The data I trained the NN model on contain normal and pneumonia X-rays as the 2 classes
- Test data balance : Normal = 37.4% Pneumonia = 62.3%
- Train data balance : Normal = 25.7% Pneumonia = 74.2%

Modeling:

- The baseline model is constructed of two dense layers
- For the model parameters I used Talos library
- Talos ran 216 models with different parameters to find the best model, with a validation accuracy of 96%
- Then I decided to add a CNN and a pooling layer to the structure of the model to improve validation accuracy
- After adding those layers the validation accuracy improved by 1%

Further Studies:

- “A recent publication estimated that by 2020, there will be 200 times more medical information than what a single individual would be able to read in his/her entire life” (Chumbita et al., 2020)
- The goal of the model was achieved with over 95% validation accuracy
- However, the accuracy could be further increased by adding additional CNN and dense layers to the model structure, and then using the best parameters from Talos

Conclusion:

- Utilized NN models in medical X-rays classification
- Improved validation accuracy of the model
- For further research, expand on the NN models to help detect other pathologies
- Thank you

References

- Sarvamangala, D.R., Kulkarni, R.V. Convolutional neural networks in medical image understanding: a survey. *Evol. Intel.* (2021). https://doi.org/10.1007/s12065-020-00540-3
- Chumbita, Mariana et al. “Can Artificial Intelligence Improve the Management of Pneumonia.” *Journal of clinical medicine* vol. 9,1 248. 17 Jan. 2020, doi:10.3390/jcm9010248