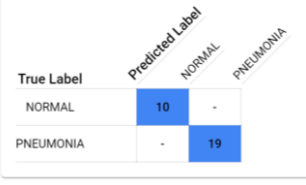# AutoML Modeling Report

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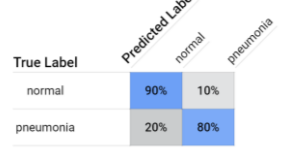
Binary Classifier with Clean/Balanced Data

Train/Test Split How much data was used for training? How much data was used for testing?	- Training data were 200 (100 normal chest x-ray images and 100 pneumonia chest x-ray images). - Testing data were 20 chest x-ray images.
Confusion Matrix What do each of the cells in the confusion matrix describe? What values did you observe (include a screenshot)? What is the true positive rate for the "pneumonia" class? What is the false positive rate for the "normal" class?	 It is measure model performance of predicting right image for right label and helping to implement any necessary improvements if there any confusing data or biases. As the cell shown the model has classify all 20 x-rays images correctly, 100% of pneumonia images classified under pneumonia label (TP), and 0% of normal images classified under pneumonia label (FP).
Precision and Recall What does precision measure? What does recall measure? What precision and recall did the model achieve (report the values for a score threshold of 0.5)?	Precision measures correct prediction and Recall measures identifying actual occurrences objects of the model. The model achieves 100% Recall 100% Precision.
Score Threshold When you increase the threshold what happens to precision? What happens to recall? Why?	score threshold has direct relationship with precision and inverse relationship with recall. So, increasing score threshold will increase precision and decrease recall because it's will reduce number of classified images which will reduce the number of misclassified images.

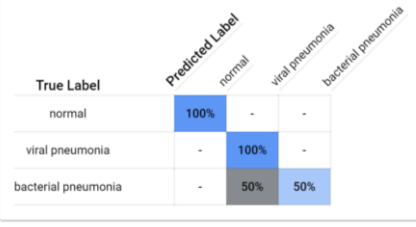# Binary Classifier with Clean/Unbalanced Data

Train/Test Split How much data was used for training? How much data was used for testing?	- Trained data were 265 (100 normal, 194 pneumonia). - Tested data were 29.
Confusion Matrix How has the confusion matrix been affected by the unbalanced data? Include a screenshot of the new confusion matrix.	 Unbalanced data in this model does not impact badly on it's performance, all test Item has been predicted correctly.
Precision and Recall How have the model's precision and recall been affected by the unbalanced data (report the values for a score threshold of 0.5)?	There is no bad impact on recall or precision values, they got 100% on score threshold 0.5
Unbalanced Classes From what you have observed, how do unbalanced classed affect a machine learning model?	Usually it will cause biases which balancing data on each classes by add more data to normal class or delete data form pneumonia class.

Binary Classifier with Dirty/Balanced Data

Confusion Matrix How has the confusion matrix been affected by the dirty data? Include a screenshot of the new confusion matrix.	 As shown, there's dirty balanced data confused the model causes misprediction and bad performing.
Precision and Recall How have the model's precision and recall been affected by the dirty data (report the values for a score threshold of 0.5)? Of the binary classifiers, which has the highest precision? Which has the	It becomes lower, both of precision and recall are 85%. Clean Balanced and Clean Unbalanced have highest value of precision and recall.

highest recall?	
Dirty Data From what you have observed, how does dirty data affect a machine learning model?	ML face difficulty on determining data patterns which will lead to weak ML performance with a lot of wrong predictions and poor quality.

3-Class Model

Confusion Matrix Summarize the 3-class confusion matrix. Which classes is the model most likely to confuse? Which class(es) is the model most likely to get right? Why might you do to try to remedy the model's "confusion"? Include a screenshot of the new confusion matrix.	 The model most likely confuse with bacterial pneumonia class and most likely right with normal and viral pneumonia classes. I add more data for each class equally to test more images to train the model on more data and it get better on data classifying.
Precision and Recall What are the model's precision and recall? How are these values calculated (report the values for a score threshold of 0.5)?	Precision is defined as the number of true positives over all positives and Recall defined as the number of true positives over true positives plus false negatives. For this model precision value is 82.76% and recall value is 80%. Precision value calculated by taking the average of each class and recall value is average of the model. So, precision of normal class is 1, viral pneumonia is 1, bacterial pneumonia is 0.5 and 83% approximately for the model and Recall ((100+100+50)/312) *100) = 80%
F1 Score What is this model's F1 score?	F1= 0.816