AutoML Modeling Report

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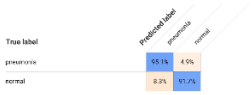
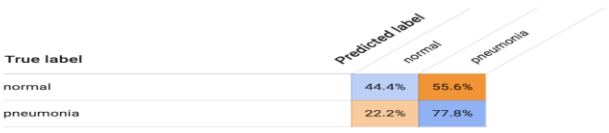
Binary Classifier with Clean/Balanced Data

Train/Test Split How much data was used for training? How much data was used for testing?	There are 300 images of pneumonia and 299 images of normal in the dataset. Out of them, 476 images were used in training, 67 in validation and 56 in test.
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?	Confusion matrix describes the performance of classification model on test data. The table shows how often the model classified each label correctly, and which labels were most often confused for that label. The four cells represent TP, TN, FP, FN. The TP for pneumonia class is 87.5% and FP rate for normal class is 12.5% 
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 tells us what portion of positive identifications are actually correct. A high precision model produces fewer false positives. On the other hand, recall tells us what portion of actual positives was identified correctly. A high recall model produces fewer false negatives. The model achieved a precision of 92.9% and recall of 92.9%.
Score Threshold When you increase the threshold what happens to precision? What happens to recall? Why?	When you increase the score threshold, the precision goes up and recall seems to decrease. This is because when you increase the score threshold you want to be more confident when you make a prediction. Hence by increasing the score threshold, your will classify fewer images but it will have lower risk of misclassifying the images.

Binary Classifier with Clean/Unbalanced Data

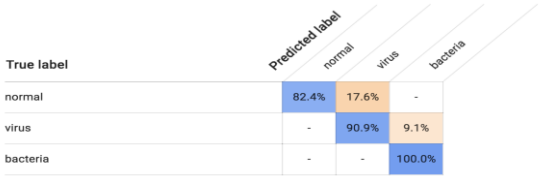
Train/Test Split How much data was used for training? How much data was used for testing?	A total of 399 images were present in dataset. Out of them 304 were used in training, 42 in validation and 53 in test.
Confusion Matrix How has the confusion matrix been affected by the unbalanced data? Include a screenshot of the new confusion matrix.	The TP % went up for pneumonia. Earlier all the normal images were classified correctly. But now there seems to be a slight dip in % to 91.7%. 
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)?	Both precision and recall went up to 94.3%
Unbalanced Classes From what you have observed, how do unbalanced classed affect a machine learning model?	Unbalanced data introduces bias. Model will have a bias towards predicting the label that has more data in training. As you can see from the results, we did not change the no of images for pneumonia but decreasing the no of normal images lead to increase in no of TP for pneumonia. As a test, I took 10 images, 5 each from normal and pneumonia and saw how well model was performing. On pneumonia images, the model did really well as it got all 5 images right with very high confidence. Whereas on normal images it classified 3 out of 5 images correctly. But the confidence on correctly classified images was not high. So it achieved an accuracy of 80%.

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 you see from the confusion matrix, the model total confuses in predicting and performs really bad. 

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 highest recall?	The precision and recall values went to a very low value of 61.1%. The highest precision and recall values were observed with clean and unbalanced data.
Dirty Data From what you have observed, how does dirty data affect a machine learning model?	Machine learning model clears struggles to find patterns among classes as the data is mixed up. Model sees same patterns in both labels and hence performs poorly.

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.	Model is most likely to confuse with normal class. It also confuses a little bit about virus label. Model will not confuse about bacteria class as can be seen from confusion matrix. We can add more images to each class as there only 100 images for each class now. 
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 and recall are calculated foreach class individually and by taking an average of them you get precision and recall values for whole model. Precision for normal, virus and bacteria classes are 82.4%, 90.9%, 100%. Similarly for recall divide the value of TP by sum of the column. Hence precision and recall values for whole model are 91.7%(((82.4+90.9+100)/298)*100.0) and 89.2% respectively.
F1 Score What is this model's F1 score?	Model's F1 score is 0.90.