

# Reading 7 : AI ML Challenges

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1. (a) Which of LeNet or ResNet has higher accuracy?

**Ans:** I think ResNet will possess higher accuracy as the error of Resnet is lower than LeNet. However, sometimes if you don't have the actual values of error's there is a higher chance that well calibrated model may have higher accuracy which does not apply here.

1. (b) Which one is better calibrated, and how can you tell?

**Ans :** Clearly, LeNet is better calibrated of the two. Because as in the reliability diagrams, the bins of LeNet are more near to the diagonal lines than the ResNet. Technically, a perfectly calibrated model would have predicted probabilities that match the true probabilities, resulting in a diagonal line on the reliability diagram. So, for ResNet it is evident from the diagram that there is a gap between the predicted output and the actual outputs. In other words, the model is over-confident. Hence, the model for LeNet is more calibrated than ResNet.

2. Imagine that a test set contains 60% rainy days and 40% sunny days, and you have a baseline classifier that always predicts a posterior probability of  $P(\text{rain}) = 0.6$ . If we translate probabilities  $\geq 0.5$  as a prediction of "rain" (or "sun" if  $< 0.5$ ),

(a) What would be the test accuracy of this model?

**Ans:** The Accuracy of the model would be around 52 %. The model will correctly predict rain with a probability of 0.6 for the 60% of the test set that is rainy and will predict sun incorrectly with a probability of 0.4. The model will predict rain incorrectly with a probability of 0.6 and correctly with a probability of 0.4 for the 40% of the test set that is sunny. Therefore, upon calculating , it should give an accuracy of 52 percent.

$$\text{Acc} = (0.6 \times 0.6) + (0.4 \times 0.4) = 0.36 + 0.16 = 0.52$$

(b) Would it be well calibrated or poorly calibrated? (You may want to sketch a reliability diagram for yourself to think about this - you don't need to submit it.)

**Ans:** I think that the model classifier will be a poorly calibrated. The baseline classifier, which predicts a probability of 0.6 for every instance regardless of learning on their features consistently assigns the same probability (0.6/0.4) to every occurrence. This means that the baseline classifier is not making use of any information from the input features and is essentially just guessing the outcome based on the class distribution in the training set. The predicted probabilities are therefore inconsistent with the actual frequencies of the classes, and it is unable to reflect the original distribution of the classes.

3. *The calibration methods described in this paper modify the posterior probabilities generated by a model. So does BBSC. Could the calibration methods in this paper also correct for label shift that occurs in the test set? (Consider: is the calibration method influenced by the test set or test set predictions, like BBSC?)*

**Ans:** I think they can potentially be doing the label shift correction intermittently. As the method modify the posterior probabilities trying to match the true probabilities there is a chance that they could also happened to correct the label shift as well. But, this cannot be sure as the primary goal of the method is different and hence, there could be possible situations where this does not hold true leading to a need of more sophisticated techniques dedicated to address the label shift issue.

4. *Reflect on your work for the course over the past week. What did you do that was effective and increased your knowledge? What could you do or change to increase what you gain from this course? Is there anything about this course you are anxious / worried about? (There are no wrong answers here; this is your chance to maximize what you get out of the course and to let me know about any concerns.)*

**Ans:** My last week was dedicated to reading text around the assignment 3. The previous paper that was provided was a good help to understand the primary concept but however on YouTube there are a lot of videos that helped me understand the concepts of label shift and covariate shift which had these nice animations of datasets. Our class discussion was also really helpful along with our discord channel to primitively handle the issues that I faced someone had already asked that in the channel so it was resolved automatically. I do not think I could have done anything other than this and tried my best to do on this assignment. I am not anxious about anything in this course yet at least.