COMPSCI 762 2022 S1 Week 4 Solution

Luke Chang

April 8, 2022

Question 1

- Check Week 2 lecture slides from page 40 to 48.
- When the number of samples is small, we should consider leave-one-out.
- When the number of samples is very large, we must consider the cost of training, and how well the model scale with larger data.

Question 2

- The weather is either Shower or Clear. This is a binary classification task. Let Shower be **P**ositive and Clear be **N**egative:

		Predicted		
		P	**N**	**Total**
Actual	**P**	4	1	5
	N	3	2	5
	Total	7	3	**10**

- Acc. $= \frac{6}{10} = 0.6$
- Precision (P) $= \frac{\text{TP}}{\text{TP+FP}} = \frac{4}{4+3} \approx 0.571$
- Recall (R) $= \frac{\text{TP}}{\text{TP+FN}} = \frac{4}{4+1} \approx 0.8$
- $F_1 = 2\frac{P \times R}{P+R} = 2 \times \frac{0.571 \times 0.8}{0.571+0.8} \approx 0.667$
- **Note:** A model with high Recall may also has high FPR (Type I Error).
- ROC curve:

		Thresholds					
Class	**Prediction**	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**1**
P	0.95	1	1	1	1	1	0
N	0.85	1	1	1	1	1	0
P	0.78	1	1	1	1	0	0
P	0.66	1	1	1	1	0	0
N	0.6	1	1	1	1	0	0
P	0.55	1	1	1	0	0	0
N	0.53	1	1	1	0	0	0
N	0.52	1	1	1	0	0	0
N	0.51	1	1	1	0	0	0
P	0.4	1	1	1	0	0	0

- Counting TP and FP:

Table 1: Counting TP and FP

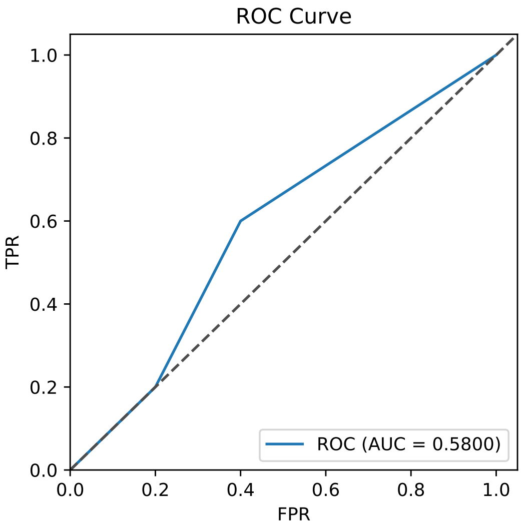
Threshold	**0**	**0.2**	**0.4**	**0.6**	**0.8**	**1**
TPR	1	1	1	0.60	0.2	0
FPR	1	1	1	0.4	0.2	0

- Sort the results:

Table 2: Sort the results

Threshold	**1**	**0.8**	**0.6**	**0.4**	**0.2**	**0**
TPR	0	0.2	0.6	1	1	1
FPR	0	0.2	0.4	1	1	1

- Final ROC plot:



- AUC is the area under the ROC curve. We can use *Riemann sum* to compute it.

Question 3

- After we find the optimal parameters for the model using CV, we have to train the model one more time with all data points.
- Since we have already selected the model, we don't need to do a train-test split. We want to use all the data to train our model before shipping it.
- The actual test set is hidden from us. When we submit the model, Kaggle will report a ranking score. However, we can not access the test set.
- **Note:** Decision Tree does not scale well with very large data set. We will learn neural network later in this course, which scales better with larger data set.