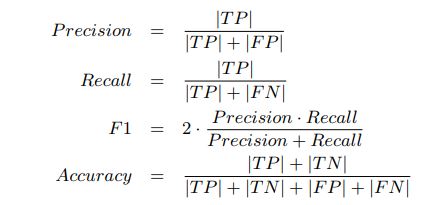
Chapter 15 Caselet- Model Evaluation Techniques

Data Mining and Predictive Analytics by Larose & Larose

Deployment of data mining models usually represents a capital expenditure and investment on the part of the company. If the models in question are invalid, then the company's time and money are wasted. That is why we need different evaluation techniques to validate a model. This somewhat works like a “filter” which trims the sophisticated , yet irrelevant models which often depicts the business setting in a skewed manner.

Predictive Modeling works on constructive feedback principle. You build a model. Get feedback from metrics, make improvements and continue until you achieve a desirable accuracy. Evaluation metrics explain the performance of a model. An important aspects of evaluation metrics is their capability to discriminate among model results.

Popular evaluation techniques includes metrics like *Accuracy, Sensitivity, Specificity and Decision Cost/Benefit Analysis*, sometimes measured by following quantities: (T=True, F=False & P=Positive & N=Negative. Eg, TP denotes True Positive Rate, wh measures the proportion of positives that are correctly identified as such. )



In real case scenarios, the standard theoretical metrics have to be adjusted to make them at par with the practical considerations. Consider, for example, **Tesla**. It is an American company that specializes in electric vehicles, energy storage and solar panel manufacturing based in Palo Alto. Tesla uses following metrics-

1. Confusion Matrix is generally used only with class output models. Same holds for senstivity and specificity.
2. Gain and Lift Charts is mainly concerned to check the rank ordering of the probabilities.
3. Kolmogorov Smirnov Chart is a measure of the degree of separation between the positive and negative distributions.
4. AUC – ROC is again one of the popular metrics used in the industry.  The biggest advantage of using ROC curve is that it is independent of the change in proportion of responders.
5. Gini Coefficient is sometimes used in classification problems. Gini coefficient can be straigh away derived from the AUC ROC number.
6. Concordant – Discordant Ratio is again one of the most important metric for any classification predictions problem.
7. Root Mean Squared Error is the most popular evaluation metric used in regression problems. It follows an assumption that error are unbiased and follow a normal distribution.

For example , Tesla production data is fed into several different key systems. The first major one is in the MES (Manufacturing Execution System). This software essentially is the air traffic controller of the entire production process. It can tell a certain item in the assembly line where it should be heading, keep track of the production orders and quality issues, and collect basic measurements. So, even if the metric has a high precision/recall, other metrics must be consulted to get a holistic overview.

Thus, Having been described by one observer of auto technology as an “iPad on wheels” a reference to the amount of computing power in the mid-range electric car, the Tesla uses analytics and model evaluation techniques across the board to help them strengthen their capabilities and understanding, while also staying on top of product design and innovation.

As a concluding remark, we note that It is of critical importance that these models be evaluated for quality and effectiveness before they are deployed for use in the field. Deployment of data mining models usually represents a capital expenditure and investment on the part of the company. This is as true for Tesla as well as for other companies too. So, this is a very important aspect of the overall business analytics and predictive modelling.