Cross-Entropy as a loss function

What are loss functions?

loss functions provide the corrections to the model outputs and thus improve the model predictions.

Need of Cross-Entropy

For multi-class classification, the cross-entropy loss function is used, which basically tells our model in which direction the prediction is closer to the ground truth.

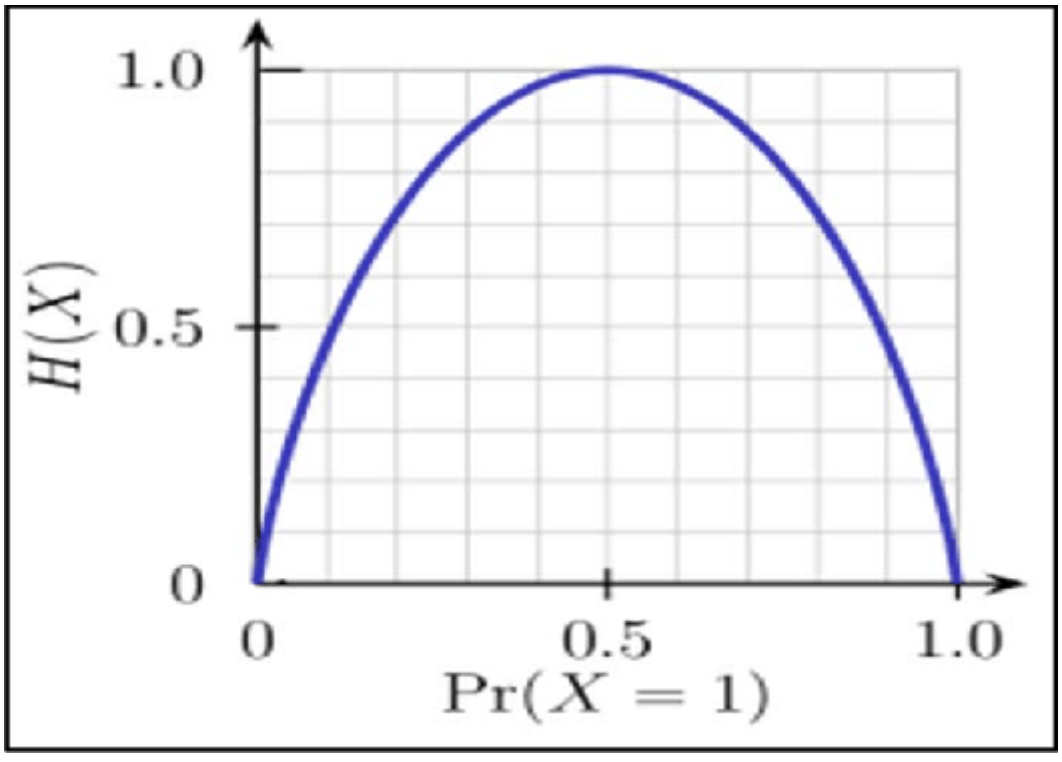
What is Entropy?

Entropy is defined as the randomness or measuring the disorder of the information being processed in Machine Learning. Further, in other words, we can say that entropy is the machine learning metric that measures the unpredictability or impurity in the system.

Entropy can be defined mathematically using the probability distribution denoted as H. when we are talking about the categorical variables the formula looks like this

$$\mathrm{H}(X) = -\sum_{i=1}^{n} \mathrm{P}(x_i) \log \mathrm{P}(x_i)$$

NOTE: value of Entropy lies between 0 and 1



What is Cross - Entropy?

Cross entropy is simply defined as the `measure of surprise` between the true and predicted observations.
More formally, Cross-entropy is a measure of the difference between two probability distributions for a given random variable or set of events.

$$Cross\ Entropy = -\sum_{i-1}^{n} observed_{(i)} * log(predicted_{(i)})$$

Here,

- n is the number of output classes.
- $observed_{(i)}$ probability is = 1 if the value is True, 0 otherwise.
- $predicted_{(i)}$ probability is predicted by the model.

A nice example about this can be read in this article:

- Binary Cross Entropy
- Multi-class cross-entropy / categorical cross-entropy

Q- Is Cross-Entropy same as that of Log-loss?

ANS: Although Cross Entropy and log loss have different origins, in Machine learning, both of them converge to the same results.

A good question about Cross entropy is asked here

Read the question here