<u>**Weekly report of lessons**</u>

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The topics covered: Bayesian Likelihood ,Posterior probability, Extended Bayesian Theorem ,Random Variable,Expectation,Variance , Probability Distribution (Binomial , Bernoulli ,Poisson , Gaussian),Estimating accuracy of hypothesis ,Central Limit theorem, k fold cross validation.

Summary topic wise :
- Likelihood in bayes' theorem is about an infinite set of possible probabilities, given an outcome . It is given as $P(Evidence/Hypothesis)$.
- A posterior probability, is the revised or updated probability of an event occurring after taking into consideration new information.
- We can extend Bayes' theorem taking into consideration more probability events. Suppose that the events $B1, ..., Bn$ are conditionally independent given A. Let $\neg A$ denote the complement of A.

$$= P(A|B_1, ..., B_n) = \frac{P(B_1,...,B_n|A) * P(A)}{P(B_1,...,B_n)}$$

$$= \frac{[P(B1|A) * ... * P(Bn|A) * P(A)]}{[P(B1|A) * ... * P(Bn|A) * P(A) + P(B1|\neg A) * ... * P(Bn|\neg A) * P(\neg A)]}$$

- A random variable is a variable whose value is unknown or a function that assigns values to each of an experiment's outcomes .There are two types of random variables, discrete and continuous.
  -Discrete :A discrete random variable has a countable number of possible values. The probability of each value of a discrete random variable is between 0 and 1.
  -Continuous :A continuous random variable is a random variable where the data can take infinitely many values. For any continuous random variable with probability density function f(x), we have that:

$$\int_{all\ x} f(x)\, dx = 1$$

- The expected value (or mean) of X, where X random variable, is a weighted average of the possible values that X can take, each value being weighted according to the probability of that event occurring. For discrete random variables it is calculated by summation and for continuous random value expectation is calculated by integration.Denoted ny E(X)
- Variance of random variable $X = (X - E[X])^2$
- Bernoulli Distribution takes the value 1 with probability p and the value 0 with probability $1 - p$. A binomial distribution can be thought of as simply the probability of a SUCCESS or FAILURE outcome in an experiment or survey that is repeated multiple times .
- Poisson Distribution : $P(x = k) = \frac{\lambda^k e^{-\lambda}}{k!}$ Gaussian Distribution : $f(x) = \frac{1}{\sigma\sqrt{2\pi}} e^{0.5(\frac{x-\mu}{\sigma})^2}$
- With 95% probability, $E_D(h)$,lies between $E_S(h) \pm 1.96 \sqrt{\frac{E_s(h)(1-E_s(h))}{n}}$
- The central limit theorem (CLT) is one of the most important results in probability theory. It states that, under certain conditions, the sum of a large number of random variables is approximately normal .
- In K fold cross validation, we split the data-set into k number of subsets(known as folds) then we perform training on all the subsets but leave one(k-1) subset for the evaluation of the trained model. In this method, we iterate k times with a different subset reserved for testing purpose each time .

Preparedness for the upcoming Quiz : Fair(According to my preparedness level till 2nd Oct ,I believe will perform better after revising things).