CHEATSHEET FOR DISTRIBUTIONS

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Discrete Probability Dist.

(i) Bernoulli's distribution

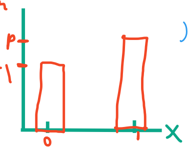
$PMF = P(X=r) = p^r (1-p)^{n-r}$

where $r = 0, 1$

$CDF = P(X \le r) = \begin{cases} 0, & k<0 \\ 1-p, & k=0 \\ 1, & k>0 \end{cases}$

Mean $= p$

Variance $= p(1-p)$



(ii) Binomial Distribution -

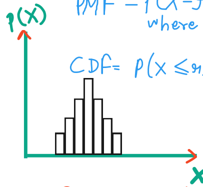
$PMF = P(X=r) = {}^nC_r\, p^r (1-p)^{n-r}$

where p = prob. of success

$CDF = P(X \le r) = \sum_{i=0}^{r} {}^nC_i\, p^i (1-p)^i$

Variance $= np(1-p)$

Mean $= np$



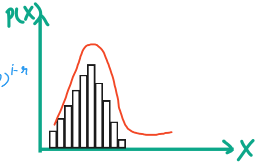
(iii) Negative Binomial Distribution

$PMF = P(X=k) = \binom{k-1}{r-1} p^r\, 1-p^{k-r}$

where r = no. of success

$CDF = P(X \le k) = \sum_{i=r}^{k} \binom{i-1}{r-1} p^r (1-p)^{i-r}$

Mean $= \frac{r}{p}$, variance $= \frac{r(1-p)}{p^2}$



(iv) Poisson Distribution

$PMF = P(X=r) = \frac{e^{-\lambda} \cdot \lambda^r}{r!}$

$CDF = P(X \le r) = \sum_{i=0}^{r} \frac{e^{-\lambda} \lambda^i}{i!}$

Mean $= \lambda =$ Variance

(v) Hyper-geometric Dist.

$PMF = P(X=k) = \frac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}$

$\boxed{\text{mean} = \frac{n}{N} \cdot K}$

$CDF = P(X \le k) = \sum_{i=0}^{k} \frac{\binom{K}{i}\binom{N-K}{n-i}}{\binom{N}{n}}$

Variance $= k \cdot \frac{n}{N} \cdot \frac{N-K}{N} \cdot \frac{N-n}{N-1}$

(vi) Geometric Distribution

$PMF = P(X=r) = p(1-p)^{r-1}$

$CDF = P(X \le r) = \sum_{i=0}^{r} (1-p)^{i-1} = 1-(1-p)^i$

Mean $= \frac{1}{p}$, Variance $= \frac{1-p}{p^2}$

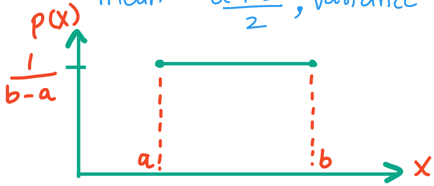
Continuous Prob. Dist.

(i) Uniform Distribution -

$PDF = f(x) = \frac{1}{b-a}$

$CDF = P(a \le x \le b) = \frac{x-a}{b-a}$

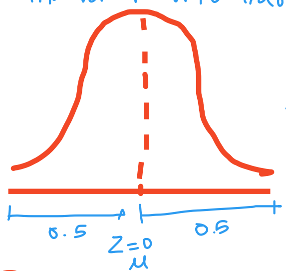
Mean $= \frac{a+b}{2}$, Variance $= \frac{(b-a)^2}{12}$



(ii) Normal Distribution

$PDF = f(x) = \frac{1}{\sqrt{2\pi}\,\sigma} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^2}$

Standard Normal Variate $= z = \frac{x-\mu}{\sigma}$



$\int_{-\infty}^{\infty} f(x)\,dx = 1$

At $x = \mu$, $z = 0$

(iii) Exponential Distribution

$PDF = f(x) = \lambda e^{-\lambda x}$

$CDF = F(x) = 1 - e^{-\lambda x}$

Mean $= \frac{1}{\lambda}$, Variance $= \frac{1}{\lambda^2}$