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CS 3190 Quiz 2

CLT: n iid RV $X_1, X_2, \dots, X_n$ $\quad X_i \sim f$

$\bar{x} = \sum_{i=1}^{n} X_i$ converges to a Normal distribution with $\mu = E[X_i]$ & Variance $\frac{\sigma^2}{n}$

PAC: $P[\,|\bar{X} - E[\bar{X}]| \geq \varepsilon\,] \leq \delta$

Markov Inequality: $P[X > \alpha] \leq \frac{E[X]}{\alpha}$

Chebyshev Inequality: $P[\,|X - E[X]| \geq \varepsilon\,] \leq \frac{Var[X]}{\varepsilon^2}$ $\quad \delta$

Chernoff-Hoeffding: $P[\,|\bar{X} - E[\bar{X}]| > \varepsilon \leq 2\exp\left(\frac{-2\varepsilon^2 n}{\Delta^2}\right)$

For $AB = C$, $C_{ij} = \sum_{k=1}^{d} A_{ik} B_{kj}$

$A \in \mathbb{R}^{n \times d}$ $\quad x \in \mathbb{R}^d$ $\Rightarrow$ $y = Ax \in \mathbb{R}^n$

Vectors: $\|v\| = \|v\|_2 = \sqrt{\langle v, v \rangle}$, $\quad \|v\|_p = \left(\sum_{i=1}^{d} |v_i|^p\right)^{1/p}$ $\quad v \in \mathbb{R}^d$

$\|v\|_\infty = \max_{i \in [1,d]} |v_i|$

Matrices: spectral norm: $\|A\|_2 = \max_{\substack{x \in \mathbb{R}^d \\ x \neq 0}} \frac{\|Ax\|_2}{\|x\|_2} = \max_{\substack{y \in \mathbb{R}^n \\ y \neq 0}} \frac{\|yA\|_2}{\|y\|_2}$

Frobenius norm: $\|A\|_F = \sqrt{\sum_{i=1}^{n} \sum_{j=1}^{d} A_{ij}^2}$