EECS 126: Probability and Random Processes

Discussion 14

Note: Please work on the problems before the discussion session.

Problem 4. Chernoff bound for a Poisson random variable. Let X be a Poisson random variable with parameter λ.

(a) Show that for every $s \geq 0$, we have

$$\mathbf{P}(X \geq k) \leq e^{\lambda(e^s - 1)} e^{-sk}.$$

(b) Assuming that $k > \lambda$, show that

$$\mathbf{P}(X \geq k) \leq \frac{e^{-\lambda}(e\lambda)^k}{k^k}.$$

Problem 7. Suppose that a sequence X_n of random variables satisfies

$$\lim_{n \to \infty} \mathbf{E}\big[|X_n - c|^\alpha\big] = 0,$$

where α is a positive number. Show that the sequence X_n converges to c in probability.

Problem 16. The adult population of Nowhereville consists of 300 males and 196 females. Each male (respectively, female) has a probability of 0.4 (respectively, 0.5) of casting a vote in the local elections, independently of everyone else. Find a good numerical approximation for the probability that more males than females cast a vote.