

CS4770 Pattern Recognition Systems. Monsoon 2006

Home Assignment 0.

Due: July 29, 2006

1. If A, B, C are 3 events and $P(A), P(B), P(C)$ their respective probabilities. Show that:
$$P(A \cup B \cup C) = P(A) + P(B) + P(C) - P(A \cap B) - P(A \cap C) - P(B \cap C) + P(A \cap B \cap C).$$
2. A dart is thrown at a circular dartboard of radius 20cm. Assume that the location that the dart lands is a uniform continuous distribution, that is, the probability that it lands in a region of the dartboard is proportional to the area of that region.
 - (a) What is the probability that the dart falls within 5cm of the center of the target?
 - (b) What is the probability that the dart falls within 10cm of the center of the target?
 - (c) What is the probability that the dart falls within 5cm of the edge of the board?
3. Two fair dice are tossed, one red and one green. What is the probability that they show the same number? Explain your answer in terms of outcomes in a sample space.
4. Explain the following probability distributions: **Uniform, Poisson, Normal**. Give the expression for their mean, variance, $E[x^2]$.
5. Let X be a continuous random variable with density function
 $f(x) = 2x$ for $0 \leq x \leq 1$ and 0 otherwise. Find $E[X]$, $E[X^2]$, and *Variance* (X).
6. Suppose a number X is chosen randomly and uniformly from the interval $[-10, 10]$. Determine $P(X^2 > 4)$.