Recitation1

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1 Introduction

We also reviewed three important concepts of probability that will be repeatedly used in this class: *Random Variables*, *Probability Mass/Density Functions (pmf/pdf)* and *Expectation*.

Random Variables is a variable whose value is subject to variations due to chance or randomness. You can think of a random variable $X\colon \Omega \to E$ as a measurable function from the set of possible outcomes Ω to some set E. For all practical purposes, X is a real-valued function (i.e. $E = R$). The probabilities of different outcomes or sets of outcomes (events) are given by the probability measure P with which Ω is equipped. X describes some numerical property that outcomes in Ω may have. E.g. the number of heads in a random collection of coin flips; the height of a random person, etc.

Probability Mass/Density Function (pmf/pdf) of a random variable X (usually denoted as $f_X(x)$) is a function that describes the relative likelihood for this random variable X to take on a given value x i.e. $f_X(x) = P(X = x)$. If the random variable X is discrete, the function is called *Probability Mass Function*, else if the random variable X is continuous, the function is called *Probability Density Function*.

Expectation or expected value of a random variable X (usually denoted as $E[X]$) is intuitively the long-run average value of repetitions of the experiment it represents. The experiment being drawing a value of the random variable under the probability mass/density function associated with it. Mathematically, $E[X] = \int_{-\infty}^{\infty} x f_X(x)\,\mathrm{d}x$ for the continuous case (in discrete case, you simply replace the integral with summation). As an example, you can verify that the expected value of a dice roll is 3.5.

Suggested further reading:

http://web.stanford.edu/class/cme308/OldWebsite/notes/chap2.pdf