MAT247 - Probability with Computer Applications

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Chapter 1

Lecture 1

1.1 Stats vs Probability

Statistics

- Reverse Probability
- Making observations and then based on probability we describe the original model
- Critique whether a model is correct

Probability

- How likely based on a theoretical situation, for example a coin toss has a 50/50 chance of one of the outcomes.
- We know all the parameters.

1.2 To do Well

- Understand the formulas
- Make sure to the hard questions
- Office hours in HS 386

1.3 Useful Terminology

Definition 1 (Random Experiment)
A process of gathering data or observations. We can perform the experiment multiple times so long as the conditions aren't changed and the outcome of each experiment is random, we don't know what the result will be, though we know the set of possible outcomes.

Examples

- Rolling a die, and observing the number on the top face.
- Rolling n dice and observing the resulting pair of numbers.
- Drawing 3 cards from a deck of cards
- Asking a professor how old they are

Definition 2 (Sample Space)
This is the set of all possible outcomes/results from a random experiment , we denote this set as

$$\Omega \text{ or } S$$

The sample space depends on the outcome of interest.

Note 1
If our outcome of interest is say, whether after flipping a coin it is heads or tails, we don't care how many times it turned in the air before landing on the ground.

Examples

1. $S = \{n \in \mathbb{N} : 1 \leq n \leq 20\}$. All the faces of the dice.
2. $\Omega_1 = \{$ True , False $\}$
3. $\Omega_2 = \mathbb{R}^{\geq 0}$. If they are precise in their measurement, though more likely to any hour between 0 and 10.

Definition 3 (Event)
Any subset of our sample space of interest.

- *Simple Event: One with exactly one outcome*
- *Compound Event: One with multiple outcomes*

Simple Event

- flipping a coin, and observing whether it has landed on it's edge (that's possible!)

Compound Event

- flipping 3 coins, and observing whether at least one has landed on it's edge.

Definition 4 (Complement)
The complement of an event A is the event consisting of outcome that are nto in A. We denote this as A^c .
For example: *the complement of our previous example, that would be if no, coin has landed on it's edge.*