



Probability Distributions: Discrete

Introduction to Data Science Algorithms Jordan Boyd-Graber and Michael Paul SEPTEMBER 27, 2016

- New grader: Aditya Thyagarajan
- HW1 grading nearly done
- Will appear in Moodle (waiting for late days)

- Random variables take on values in a sample space.
- This week we will focus on *discrete* random variables:
 - Coin flip: $\{H, T\}$
 - Number of times a coin lands heads after *N* flips: {0,1,2,...,*N*}
 - Number of words in a document: Positive integers {1,2,...}
- Reminder: we denote the random variable with a capital letter; denote a outcome with a lower case letter.
 - E.g., X is a coin flip, x is the value (H or T) of that coin flip.

- A discrete distribution assigns a probability to every possible outcome in the sample space
- For example, if X is a coin flip, then

$$P(X = H) = 0.5$$

 $P(X = T) = 0.5$

 Probabilities have to be greater than or equal to 0 and probabilities over the entire sample space must sum to one

$$\sum_{x} P(X=x) = 1$$

0!

If $n! = n \cdot (n-1)!$ then 0! = 1 if definition holds for n > 0.

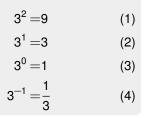
 n^{0} Example for 3: $3^{2} = 9$ (1) $3^{1} = 3$ (2) $3^{-1} = \frac{1}{3}$ (3)

 n^0

Example for 3:

0!

If $n! = n \cdot (n-1)!$ then 0! = 1 if definition holds for n > 0.



- There are many different types of discrete distributions, with different definitions.
- Today we'll look at the most common discrete distributions.
 - And we'll introduce the concept of parameters.
- These discrete distributions (along with the continuous distributions next) are fundamental
- Regression, classification, and clustering