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Probability & Applied Stats

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Chapters 1&4

This paper is going to be explaining every topic we learned about in chapter 1 and 4. In chapter one the textbook starts of by describing what statistics is which is “the practice or science of collecting and analyzing numerical data in large quantities, especially for the purpose of inferring proportions in a whole from those in a representative sample.”. The textbook describes that statistic techniques are employed in almost phase of life. As the chapter progresses it discusses how you can use and visualize data. The best way to do that is to use graphs. In our class we took some time to use data from the textbook to make our own graphs. This technique is very useful for visualizing data and see the differences between data points.

As the chapter progresses it dives into some of the different techniques that are used in statistics. The first technique is the mean. The mean of a data set is adding up all the values in said data set and dividing it by the number of items in the data set to get your mean. Another term used to express mean is the average. Also, the deeper you get into the book they use another term called the expected. The mean can be denoted as . The next type of technique this chapter goes into is the variance. From the textbook the variance is “is a measurement of the spread between numbers in a data set. Investors use the variance equation to evaluate a portfolio's asset allocation.”. The variance can be written out as . One of the next main techniques chapters 1 discuss is the standard deviation. The textbook stated the standard deviation as “a quantity calculated to indicate the extent of deviation for a group as a whole.”. The standard deviation can be denoted by the textbook as . In order to find the standard deviation, you must follow these steps. First get the mean of your data set. Second you must subtract the mean from each value in the data set. Third you must take each value and square it. Once you completed that the next step is to divide by the number of your data set subtracted to one. This is actually how you find the variance of a data set. But to achieve getting the standard deviation the last step will be to take your variance and take the square root of that.

One of the last topics chapters one dives into is the empirical rule. The book describes this as “For a distribution of measurements that is approximately normal (bell shaped), it follows that the interval with end points”. This follows that the mean which can be written as . But it is said that contains 68 percent of the measurements. Now if you were to do this would contain 95 percent of the measurements in the data set. The last rule is if you have a third deviation denoted as this should contain almost all of the measurements in the dataset.

Concluding that chapter one is very important to know for the future topics in this course. All of these topics will be brought up again in a more complicated manor. But if you are able to fully understand how to use the following techniques you will have a much easier time learning the following information for the rest of the course.

Chapter 4 starts off diving into continuous variables and the probability distributions associated with it. The chapter starts off defining what *continuous* means which is a random variable that can take on any value in an interval. In 4.2 the chapter starts to discuss what the distribution function is. The textbook defines the distribution function as “Let Y denote any random variable. The distribution function of Y, denoted by F(y), is such that ”. Now this distribution has three properties. The first property is . The second property is . The property is F(y) is a nondecreasing function of y. [If and are any values such that , then ]. Another definition this section gives us is “A random variable Y with a distribution function F(y) is said to be continuous if F(y) is continuous, for ”. The next type of function the textbook is the density function which can be denoted by. Now the density function has two properties. The first property is . The second property is .

As the chapter progresses it introduces theorem 4.3 it states “if the random variable Y has a density function f(y) and , then the probability that Y falls in the interval [a,b] is ”. Let’s run through an example of getting a constant for a density function. The problem is “Given find the value of c for which f(y) is a valid density function”. To solve this, we can write out . Then from 2 to 0. Once you solve that out you will get . Thus, your answer will be . Next the chapter dives into the expected and variance values. The expected can be written as . Next the chapter dives into the uniform probability distribution. The uniform probability falls in two variables which are . The uniform probability distribution by definition is written out as . In definition 4.7 it describes contents the textbook says, “The constant that determine the specific form of a density function are called parameters of a density function”.

To conclude on chapter 4 this chapter is very calculus II heavy. These topics are a bit complicated if you do not have any previous calculus background. Even though we did not get through lots of chapter four it is still very interesting. But the spoiler alerts the math gets worse and more complex as you dive deeper and deeper into the textbook. Once you dive into the next chapter you start to go overusing integrals in order to find the probability of an event happening. It is crazy to see that you can use these complex mathematical formulas in order to be able to find the probability of an event occurring. Another spoiler alert is that the title of chapter 5 us multivariate probability distribution. I will not go into much detail about what is covered in chapter 5. But I will say it is not fun. It is important to keep in mind that after you complete a chapter most likely the next chapter will build upon previous concepts talked about earlier in the book. So, a lesson to learn is keep up the previous chapters because they will come back to haunt you.