

module_prob1_lecture11

Fri, 1/21 12:32PM 11:08

SUMMARY KEYWORDS

probability, independence, events, clicker question, disjoint sets, concept, independent, mutually, exclusive, module, belonging, check, occur, students, clip, intersection, jim, campus, failing, too much trouble

SPEAKERS

Sumon Majumdar



Sumon Majumdar 00:05

So so far, we've done several applications using independence. I just wanted to get you again comfortable with the idea of using independence, figuring out probabilities of different events. So let's start with the clicker question here. So please attend this clicker question and then resume the video. So hopefully, you didn't have too much trouble with this clicker question this because this is exactly a question like this, which we had done before. And what this asks for is a family again, has three children, what's the probability that exactly one of them at some point? So so in this case, it's either could be this situation, right, where it's a boy and two girls, or the middle one is a boy and the first and the third are girls, or the third is a boy and the first two workers, right? So the probability of this happening is again, half times half times half. That's $1/8$. Right? Similarly, the probability of this is $1/8$, and the probability of this is one. Right? So the total probability that exactly one of them is avoid is the summation of all this, to add them up. That'll be $3/2$. So the answer to this clicker question is going to be C. So I'm going to talk about two other things in this clip related to this idea of independence that we'll be talking about. One is that. So so far, I've told you, okay, these things are independent. Right? So how would you actually go about checking for independence in some data. So let's do an example of that. So in this case, it's this a university sample, and 70% of the students reported living off campus. And 40% of the students reported belonging to some club. And the 20%, who reported that they both lived off campus and belong to a club. So here, so suppose we look at these two events, see is the event that a student belongs to a club, and always the event that the student lives off campus? So the question is, are these two events see No? Are they independent? So that's my question, right? So I want to check if these two events are independent, how would I go about doing? Now the way I'm going to do that is see, I know that if these two events are independent, then the probability of their intersection is just going to be the product of the probabilities. So if I have to check for independence, what I need to check is does this hold in this case? So now let's look at what's the probability of someone being off campus and belonging to a club? Right? So that's 20%. So this is point two. What's the probability of belonging to a club? Right? So 40% reported belonging to some clubs. So this is .4. What's the probability that one is off campus so that 70% So this is point seven. Right? So what we have to check for is whether the product of .4 times .7 whether this is equal 0.2. All right, so obviously, it's not because this is .28, right? So this tour, this is not equal, right. So

that implies that C and O are not independent. So this is how you check for independence, essentially. You check whether this equality holds or not? Right? If it does, then they're independent, if not the unknown. Now, let me end this module with one other thing about independence, something which people often I've seen students get confused over right? The concept of independence and mutually exclusive number I had earlier talked about mutually exclusive events to events, which cannot occur at the same time. So this is a, so in a Venn diagram, it will be two sets, which have nothing in common, right, a and b. So they have nothing in common. These are called disjoint sets or mutually exclusive events, right. So this is also referred to them as disjoint sets. So that's mutually exclusive. Independence, is that one event does not influence the ad. Right? So although you may, at some point think that these two concepts are related, actually, they are not. So and that's what I want to show you, right? So so think of this example, right? So suppose you take two events, one is P, when Jim passes the course, right? And f is the event where Jim fails the course. Now, these two events are mutually exclusive, right? So these two things, they cannot occur at the same time, we cannot at the same time pass the course and fail the course. Right? So these are mutually exclusive. Okay, so that means the probability of P intersection F right, is zero. Now, are the independent. They're not independent. Because if, if, if Jim has passed the course, right? If Jim passes, right, that means that the probability of his failing the course is zero. Right? On the other hand, if Jim does not pass then the probability of Jim failing the course is exactly equal to one. Right? So if whatever happens on P influences whatever happens on F, right, so these are not independent. Right, so these two concepts of independence and mutually exclusive, right, these are not the same concept. Right. So that's the only thing I want to show you here, right? There don't get confused by or independence means mutually exclusive, or vice versa. So I'm going to end the module here. So so just to summarize what we have done in this module, I've introduced the idea of probability. Then I've talked about the two basic, the three basic axioms of probability that probability must lie between zero and one, the probability of the sample space of all the possible outcomes that probabilities one. And lastly, if there are two disjoint sets, and the probability of their union is the sum of the probabilities. Right? So these were the basic three basic axioms of probability. So then I did the rules of probability, there were two main rules that we started with. One is the compliment root, that the probability of the complement of A set is one minus the probability of the set. And secondly, it was that if you're doing the probability of the union of two sets, right, which are not necessarily disjoint, then it's P of A plus P of B minus B of A intersection. Right. And then from there we we move to the concept of relationship between evens. We mostly focus on independence, right. And the main thing to take away from there is if you have the probability of the of a bunch of independent events occurring together, that's just the product or the multiplication of their individual probabilities. And we use this concept to figure out probabilities of events in different contexts in lots of different contexts. And then I then in this particular clip, I showed you how you could check for independence. And then I said that mutually exclusive and independence are not the same. So let me stop this. This clip here, and and this module here, and, and then we're going in the next module, we're going to explore some more concepts related to probe