PROBABILITY 3 : Probability Symbols

Is in / Is Not in / For All

Here we focus on whether something is or isn't in a set as well as how For All is used. First let's cover again what a set is. A Set is a collection of elements which are normally numbers.

The symbol $\in$ represents that something is in a set. For example $2 \in \{1, 2\}$ means that 2 is in the set that follows.

The symbol $\notin$ represents that something isn't in a set. For example $3 \notin \{1, 2\}$ means that 3 is not in the set.

The symbol $\forall$ stands for "For All". It can be used in many ways. $\forall$ x > 1, x2 > x means that for all values of x x^2 is greater than x. We could also say $\forall x \in A$: x is Even, which means for all x in A such that x is even.

Supersets & Subsets

Then we have supersets and subsets. If we have 2 sets then the Superset contains all values found in the Subset, or more.

The symbol $\subset$ translates into "Is a Subset", so $C \subset B$ means C is a Subset of B. $\not\subset$ means "Not a Subset. So $\{8, 9\} \not\subset B$ means {8, 9} is not a subset of B.

We also can define Superset declarations. $A \supset B$ means A is a Superset of B. $B \not\supset A$ means B is not a Superset of A.

A Power Set is made up from all subsets, which includes an empty set, individual elements as well as the complete set.

Unions & Intersections

$A \cup B$ stands for the union of sets A and B. It would be equal to all the values found in both sets. So $\{1, 2, 3, 4\} \cup \{5, 6\}$ equals {1, 2, 3, 4, 5, 6}. The symbol stands for $\cap$ which is intersection. It returns the values the sets have in common. So $\{1, 2, 3, 4\} \cap \{3, 4\}$ equals {3, 4}.

Other Symbols

These are other symbols you'll likely see. We can find the difference between sets, which are the values found in one set, but not the other. Cardinality returns the number of values in a set. The symbol | stands for such that. With it we can say $\{a \mid 1 < a < 4\} = \{ 2, 3 \}$ which says the set { 2, 3 } is true such that the value a is greater than 1 and less than 4.

$\exists a \mid a < 4$ translates into there exists a such that a is less than 4. $a = b \therefore b = a$ translates into if a = b therefore b = a. We can also use comparison operators such as = to compare sets.

Thinking About Probabilities

Now let's think about probabilities. Mutually exclusive sets don't have overlapping elements.

Conditional probabilities deal with how likely something is to occur when something else does. for example let's say we are calculating the probability that a mammal is a dolphin. If we know that the mammal in question is a fish we can see that the probability increases greatly.

However it is important to understand that the probability of A given B is not equal to B given A. For example while the probability that A is a dolphin given B is a fish, that does not have the same probability as you have a fish given A is a dolphin.

A Real Example : Exercise Survey

Here we will use some of what we learned to calculate the number of people that exercise every day. Here is our table.

	NO EXERCISE	DID EXERCISE	TOTAL
MEN	78	22	100
WOMEN	83	17	100
TOTAL	161	39	

As we can see from this data, P(A | B) is not equal to P(B | A). P(A | B) gives us the probability of men that exercise. Meanwhile P(B | A) is the % of exercisers that are men. These numbers are completely different.

Let's now go on and calculate the probability of total people that exercise. The formula is P(Exercise) = % Men who Exercise * % Men + % Women who Exercise * % Women. This works out to 22/100 * 100/200 + 17/100 * 100/200 = .11 + 0.085 = .195 = 19.5%.

That's it for now. In the next video we'll continue on our journey to master probabilities, which is but a part of the Math of Machine Learning.