Probability and Statistics [1]

Siddharth Kalla [2]

Probability and statistics are closely related and each depends on the other in a number of different ways. These have been traditionally studied together and justifiably so.

For example, consider a statistical experiment that studies how effective a drug is against a particular pathogen. After the experiment has been performed and the results tabulated, what then?

Surely, there should be something useful and tangible that comes out of the experiment. This is usually in the form of probability. Assuming the sample size was large enough and represented the entire population [3] of applicability, the statistics should be able to predict [4] what the probability is of the drug being effective against a pathogen if a person takes it. Thus the experimenter should be able to tell a patient - “If you take this drug, the probability that you will be cured is x%”. This shows the interrelation between probability and statistics.

A lot of statistical analysis and experimental [5] results depend on probability distributions that are either inherently assumed or found through the experiment. For example, in many social science experiments and indeed many experiments in general, we assume a normal distribution for the sample [6] and population. The normal distribution [7] is nothing but a probability distribution.

Thus the relationship between probability and statistics cuts both ways - statistical analysis makes use of probability and probability calculation makes use of statistical analysis.

In general, we are interested to know, what is the chance of an event occurring. For example, what are the chances that it will rain today? This answer is quite complex and involves a lot of calculations, experimentations and observations. After all the analysis, the answer can still be only a probability because the event is so complex that despite the best tools available to us, it is next to impossible to predict it with certainty. Thus one can take data from satellites, data from measuring instruments [8], etc. to arrive at a probability of whether it will rain today.

However, the same problem can also be approached in a different manner. Someone might look at past data and surrounding conditions. If it didn’t rain for many days, the temperatures have been consistently higher but humidity has been consistently lower, he might conclude that the probability of a rain today is low.

These two methods can go hand in hand, and usually do. Most predictions [4] are based not just on the bare facts but also past trends. This is why in sports; analysts look at past records to see how well a team played against the other in the past, in addition to looking at the individual players and their records. A lot of predictions, therefore, involve statistics.Probability

and statistics are therefore intertwined and lots of analysis and predictions that we see daily involve both of them.

Links
[1] https://explorable.com/probability-and-statistics
[2] https://explorable.com/users/siddharth
[3] https://explorable.com/research-population
[4] https://explorable.com/prediction-in-research
[5] https://explorable.com/experimental-research
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