

What is the difference between statistics and probability?

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Statistics and probability are two branches of mathematics that are often used to analyze and interpret data. While they are closely related, there are distinct differences between the two.

Statistics is the study of collecting, organizing, analyzing, and interpreting numerical data. It involves the use of various methods, such as data sampling, hypothesis testing, and regression analysis, to draw conclusions and make predictions about a population based on a sample. Statistics is commonly used in fields such as economics, psychology, and sociology to understand and make decisions based on data.

On the other hand, probability is the study of chance and uncertainty. It deals with the likelihood of events occurring and the mathematical rules that govern them. Probability is used to quantify the chances of various outcomes in a given situation, such as rolling a dice or flipping a coin. It also helps in making predictions and decisions based on the likelihood of different outcomes.

In summary, statistics is concerned with analyzing data and drawing conclusions, while probability is focused on understanding and quantifying the likelihood of events. Both are important in making informed decisions and understanding the world around us.

Statistics vs. Probability: What's the Difference?

Probability and statistics are two fields that both use data to answer questions, but they do so in slightly different ways.

The field of probability uses existing known data to predict the likelihood of future events.

Example: If 3 out of 5 marbles in a bag are red, what is the probability of picking two red marbles in repeated pulls without replacement?

The field of statistics uses data from a sample to draw

inferences about a larger population.

Example: We collect a random sample of 50 turtles and measure each of their weights. We then use the sample data to infer a range of values that are likely to contain the true mean weight of all turtles in this population.

Keep reading to see how statistics and probability are used in real-world scenarios.

The Use of Statistics in the Real World

Here are a few examples of how statistics is used in real-world scenarios.

Example 1: Confidence Intervals

Statisticians working in finance often use confidence intervals to estimate the true value of different financial metrics.

For example, a statistician may collect data for the annual income of 200 randomly selected households in a certain city and then use this sample data to construct a income of all households in this city.

By using data from a sample, the statistician can draw

inferences about the overall population of interest.

Example 2: Hypothesis Testing

Statisticians working in clinical settings often use hypothesis tests to determine if a new drug causes improved outcomes in patients.

For example, a biostatistician may administer a blood pressure drug to 30 patients for one month and then administer a second blood pressure drug to the same 30 patients for another month.

Then, they may perform a to determine if there is a statistically significant difference in blood pressure reduction between the two drugs.

By using sample data, the statistician can draw conclusions about these two drugs in the overall population.

The Use of Probability in the Real World

Here are a few examples of how probability is used in real-world scenarios.

Example 1: Predicting Natural Disasters

Suppose it's known that the probability of a category 5 hurricane hitting a certain coastal area in a given year is .02.

Knowing this, a local government can predict the of these types of hurricanes will hit in the next 10 years:

$P(\text{at least one success}) = 1 - P(\text{failure in a given trial})^n$
 $P(\text{at least one success}) = 1 - (0.98)^{10}$
 $P(\text{at least one success}): 0.18293$

The probability that at least one of these types of hurricanes will occur in the next 10 years is 0.18293.

By using existing known data, the local government can predict the likelihood of future events.

Example 2: Card Games

Professional poker players often use probability to predict the likelihood that certain cards will be flipped during a game.

For example, there are 4 kings in a standard deck of 52 cards.

Suppose the poker player knows that 3 kings have been

dealt in the first 26 cards dealt already.

They can then calculate the probability of being dealt a king on the next card:

$$P(\text{king}) = \text{number of kings} / \text{number of cards left} \\ P(\text{king}) = 1 / 26 \\ P(\text{king}) = .038$$

The probability that a king is dealt on the next card is roughly .038.

By using existing known data, the poker player can predict the likelihood of a specific future event.

Conclusion

Statistics and probability are two fields that both use data to answer questions, but they do so in different ways.

The field of probability uses existing known data to predict the likelihood of future events.

The field of statistics uses data from a sample to draw inferences about a larger population.

Additional Resources

The following articles explain the importance of statistics in various fields:

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