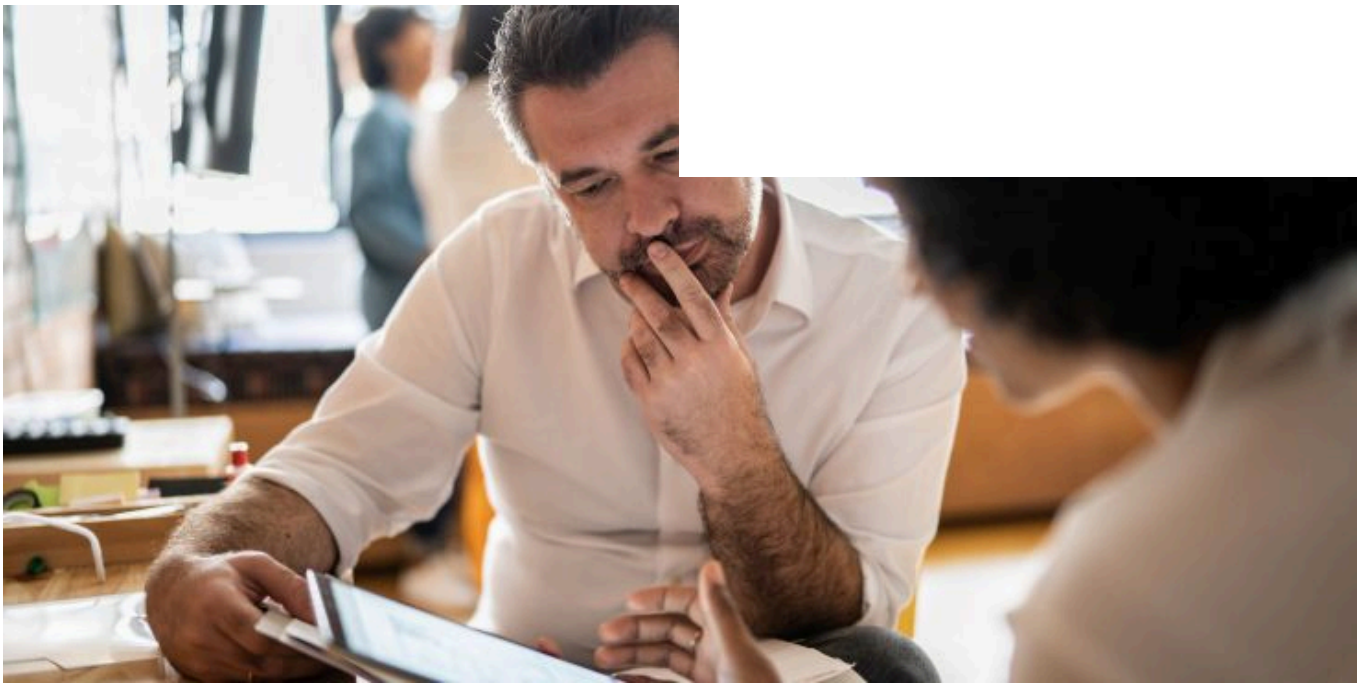
What is Monte Carlo



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Monte Carlo Simulation is a type of computational algorithm that use repeated random sampling to obtain the likelihood of a range of result. of occurring.

Also known as the Monte Carlo Method or a multiple probability simulation, Monte Carlo Simulation is a mathematical technique that is used to estimate the possible outcomes of an uncertain event. The Monte Carlo Method was invented by John von Neumann and Stanislaw Ulam during World War II to improve decision making under uncertain conditions. It was named after a well-known casino town, called Monaco, since the element of chance is core to the modeling approach, similar to a game of roulette.

Since its introduction, Monte Carlo Simulations have assessed the impact of risk in many real-life scenarios, such as in artificial intelligence, stock prices, sales forecasting, project management, and pricing. They also provide a number of advantages over predictive models with fixed inputs, such as the ability to conduct sensitivity analysis or calculate the correlation of inputs. Sensitivity analysis allows decision-makers to see the impact of individual inputs on a given outcome and correlation allows them to understand relationships between any input variables.

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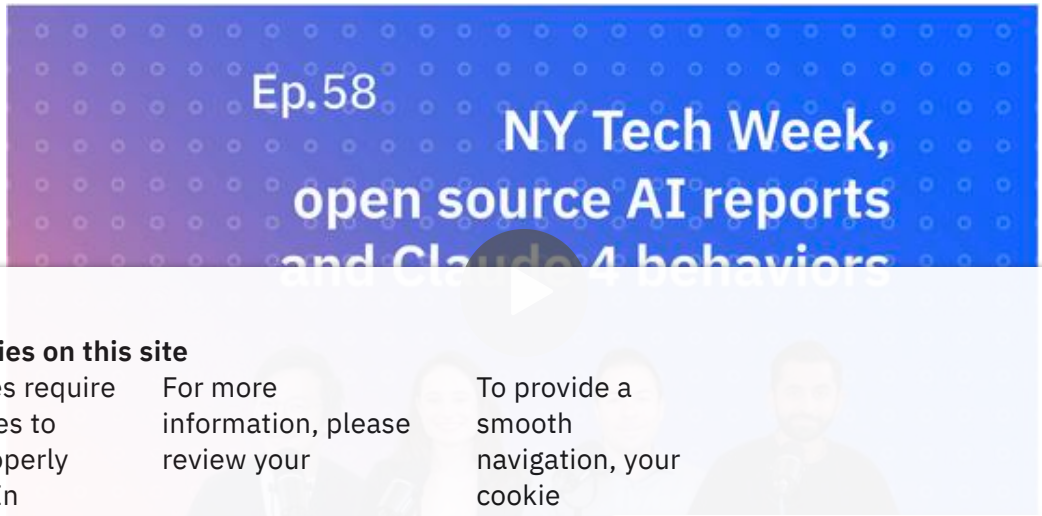
Unlike a normal forecasting model, Monte Carlo Simulation predicts a set of outcomes based on an estimated range of values versus a set of fixed input values. In other words, Monte Carlo Simulation builds a model of possible results by leveraging a probability distribution, such as a uniform or normal distribution, for any variable that has inherent uncertainty. It, then, recalculates the results over and over, each time using a different set of random numbers between the minimum and maximum values. In a typical Monte Carlo experiment, this exercise can be repeated thousands of times to produce a large number of likely outcomes.

Monte Carlo Simulations are also utilized for long-term predictions due to their accuracy. As the number of inputs increase, the number of forecasts also grows, allowing you to project outcomes farther out in time with more accuracy. When a Monte Carlo Simulation is complete, it yields a range of possible outcomes with the probability of each result occurring.

One simple example of a Monte Carlo Simulation is to consider calculating the probability of rolling two standard dice. There are 36 combinations of dice rolls. Based on this, you can manually compute the probability of a particular outcome. Using a Monte Carlo Simulation, you can simulate rolling the dice 10,000 times (or more) to achieve more accurate predictions.

Mixture of Experts | 6 June, episode 58



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How to use Monte Carlo methods

Regardless of what tool you use, Monte Carlo techniques involves three basic steps:

1. Set up the predictive model, identifying both the dependent variable to be predicted and the independent variables (also known as the input, risk or predictor variables) that will drive the prediction.
2. Specify probability distributions of the independent variables. Use historical data and/or the analyst's subjective judgment to define a range of likely values and assign probability weights for each.
3. Run simulations repeatedly, generating random values of the independent variables. Do this until enough results are gathered to make up a representative sample of the near infinite number of possible combinations.

You can run as many Monte Carlo Simulations as you wish by modifying the underlying parameters you use to simulate the data. However, you'll also want to compute the range of variation within a sample by calculating the variance and standard deviation, which are commonly used measures of spread. Variance of given variable is the expected value of the squared difference between the variable and its expected value. Standard deviation is the square root of variance. Typically, smaller variances are considered better.

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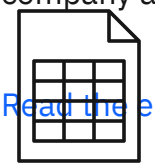

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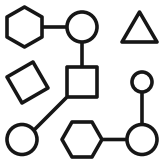

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