

# Ep 6 - Introduction to Probability

Dec 1,2023

## What is Probability?

Probability is the study of uncertainty and the likelihood of events occurring. It quantifies the uncertainty associated with random experiments. It is a mathematical concept that ranges from 0 (indicating impossibility) to 1 (indicating certainty), with values in between representing different degrees of likelihood.

## Where is Probability Used?

1. **Gambling and Games of Chance:** Probability is foundational in understanding the odds in games like poker, roulette, or dice games.
2. **Insurance and Risk Assessment:** Insurance companies use probability to assess risk and determine premiums based on the likelihood of events like accidents or health issues.
3. **Weather Forecasting:** Meteorologists use probability to forecast the likelihood of different weather conditions.
4. **Stock Market and Finance:** Investors use probability to assess the likelihood of different market outcomes and make informed investment decisions.
5. **Quality Control and Manufacturing:** Probability is used to analyse defects and deviations in manufacturing processes.

## What is the use of Probability in Data Science and Machine Learning?

1. **Statistical Inference:** Probability is fundamental in statistical inference, helping quantify uncertainty and estimate parameters based on sample data.
2. **Machine Learning Models:** Many machine learning algorithms use probability. For example, in classification tasks, algorithms like logistic regression output probabilities for different classes.
3. **Bayesian Inference:** Bayesian methods in data science use probability to update beliefs about hypotheses as new evidence becomes available.
4. **A/B Testing:** Probability is used to assess the statistical significance of observed differences in A/B testing, where different versions of a product or strategy are compared.
5. **Risk Assessment and Decision Making:** Probability plays a crucial role in assessing risks and making decisions under uncertainty.

6. **Natural Language Processing:** In applications like sentiment analysis, probability is used to assign probabilities to different sentiment labels based on the analysis of text data.
7. **Monte Carlo Simulations:** Probability is fundamental in Monte Carlo simulations, a technique used in data science for modelling the probability of different outcomes in complex systems.

## What Differentiates Statistics from Probability?

Statistics	Probability
It deals with the analysis and interpretation of data that has already been collected.	It deals with predicting future outcomes based on uncertainty.
It focuses on summarizing data, making inferences, and drawing conclusions.	It quantifies the likelihood of events occurring.
It is used in exploratory data analysis, data visualisation and principal component analysis.	In machine learning, probability is often used in algorithms like Bayesian networks.

[Probability vs Likelihood](#)

[Why Probability of 0 Does Not Mean Impossible](#)