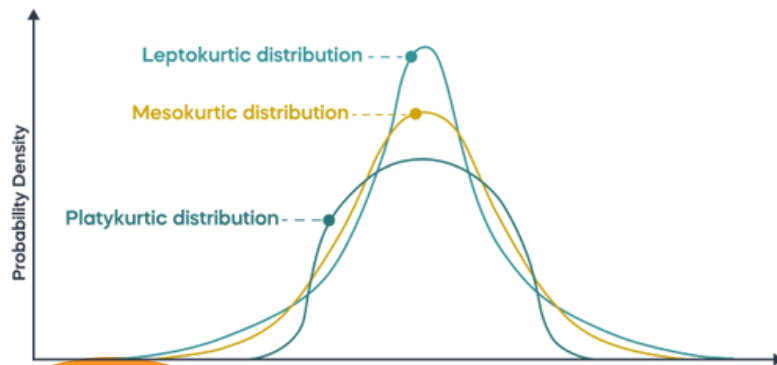


# STATISTICS

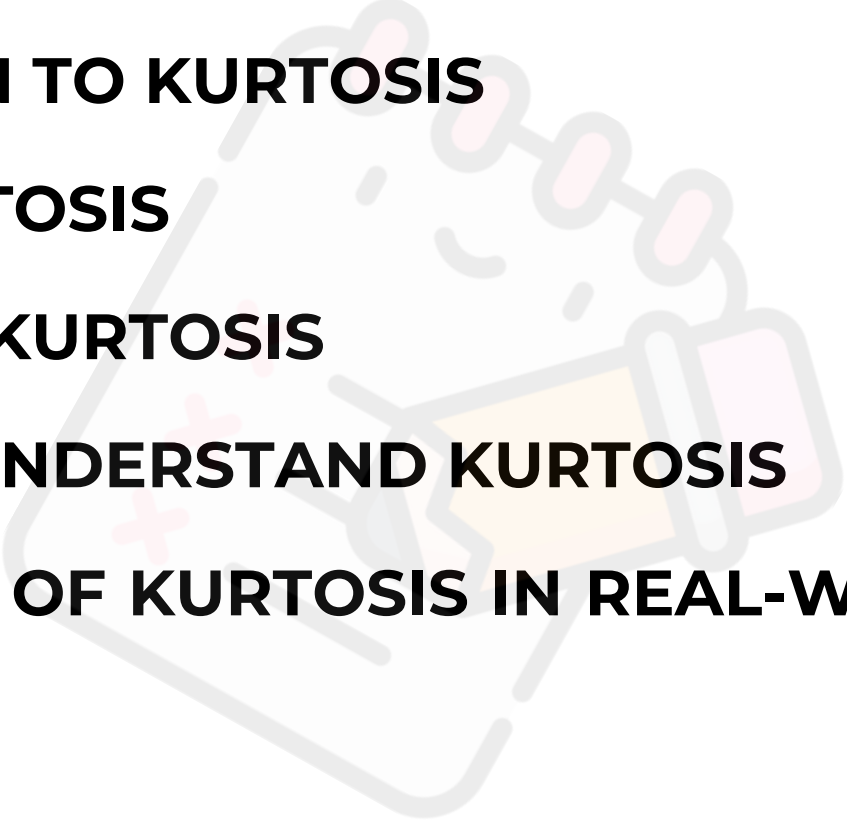

## DESCRIPTIVE STATISTICS

### Measure Of Shape : Part 2





# Agenda

- **INTRODUCTION TO KURTOSIS**
  - **TYPES OF KURTOSIS**
  - **CALCULATING KURTOSIS**
  - **ANALOGY TO UNDERSTAND KURTOSIS**
  - **APPLICATIONS OF KURTOSIS IN REAL-WORLD SCENARIOS**
- 
- 

# WHAT IS KURTOSIS

- Statistical measure that describes the **shape of a distribution's tails** relative to its overall shape.
- It indicates whether the data points in a distribution are more or less concentrated in the tails (i.e., the extremities).
- Kurtosis is sometimes **confused** with a measure of the peakedness of a distribution. **Kurtosis measures “tailedness,” not “peakedness.”**

# KURTOSIS

## FORMULA

$$\text{kurtosis} = \frac{n(n+1)}{(n-1)(n-2)(n-3)} \frac{\sum (x_i - \bar{x})^4}{(\sum (x_i - \bar{x})^2)^2} - 3 \frac{(n-1)^2}{(n-2)(n-3)}$$

More Dangerous  
than Skewness

Where

- $n$  is the sample size
- $x_i$  are observations of the variable  $x$
- $\bar{x}$  is the **mean** of the variable  $x$



- **KURT()** function in **Excel** calculates kurtosis using the above formula.
- “from **scipy.stats** import **kurtosis**”, a built-in function in **Python’s scipy.stats module**.



Interpretation.....

# KURTOSIS

## TYPE & INTERPRETATION

### (Kurtosis $> 3$ ): Leptokurtic

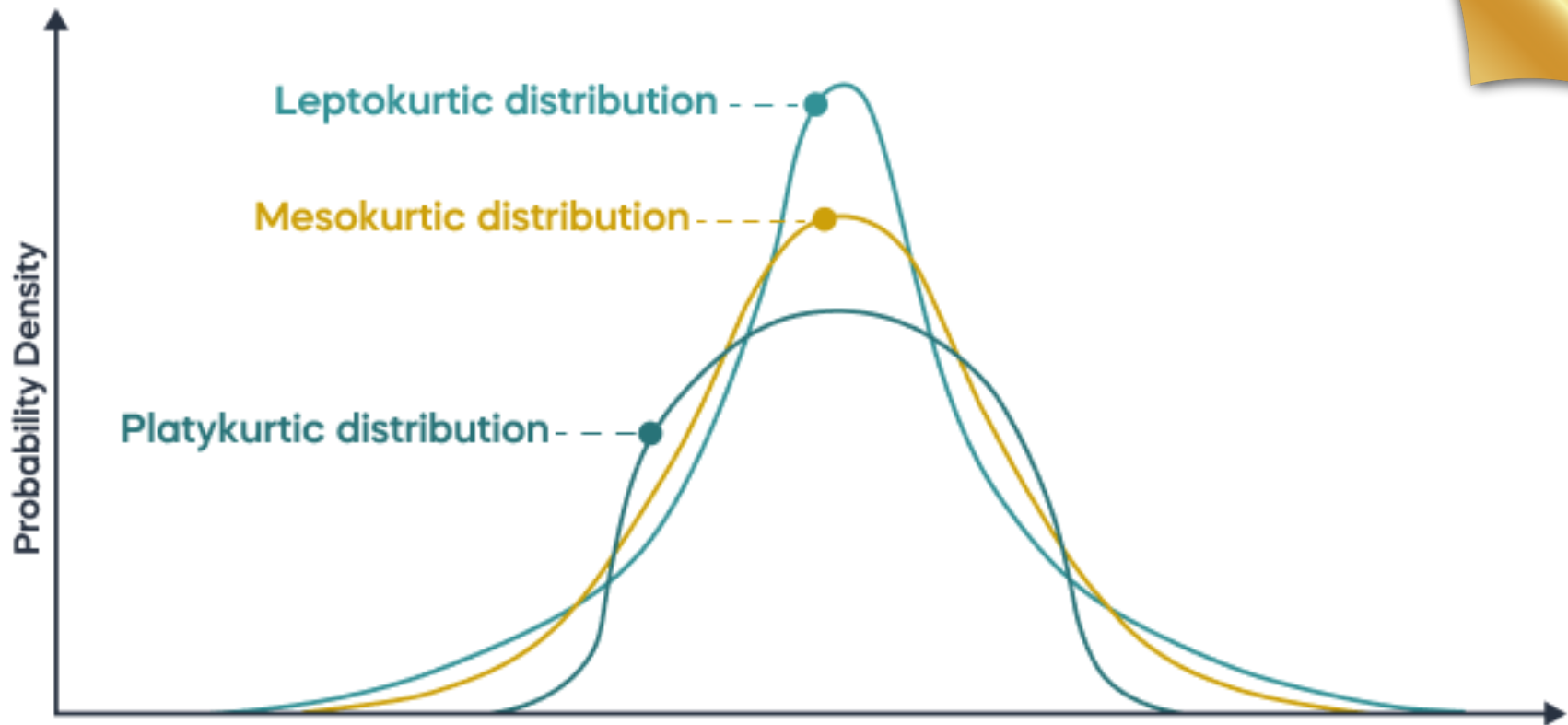
- These distributions have **heavier tails and a sharper peak** compared to the normal distribution.
- The **presence of more extreme values (outliers)** is a characteristic of leptokurtic distributions.

### (Kurtosis $\approx 3$ ): Mesokurtic

- The tails of a mesokurtic distribution are **neither particularly heavy nor light, and the peak is of moderate height.**
- For many practical purposes, a mesokurtic distribution is used as a **baseline for comparing other distributions.**

### (Kurtosis $< 3$ ): Platykurtic

- These distributions have **lighter tails and a flatter peak** compared to the normal distribution.
- Data points are more evenly spread, and there are **fewer extreme values.**
- **Uniform distributions** are often platykurtic.



- **Interpretation Challenges:** Understanding and interpreting kurtosis requires a good knowledge of Stats, as it may not be intuitive as other measures.

**Slightly Confusing can you  
give some common example  
to understand this.**





## Kurtosis as the "Party Crowd"

- Imagine you're at a party, and the guests represent data points in a distribution. The way the guests are spread out in the room can help you visualize kurtosis.








## Mesokurtic (Normal Party):

- At a typical party, most of the **guests are gathered around the center of the room**, chatting in small groups. A few guests might be near the edges, but not too far from the center.
- This represents a normal distribution with a moderate peak and moderately populated tails.
- The party has a good balance—**nothing too wild or too dull**.

## Leptokurtic (Crowded and Exciting Party):

- Now, imagine a party where a large number of guests are tightly packed in the center, dancing or having an intense conversation.
- Meanwhile, **a few guests are hanging out in the far corners of the room**, maybe having deep, private talks or simply observing from a distance.
- This represents a leptokurtic distribution with a sharp peak (crowded center) and heavy tails (guests far from the center). **The party is lively, with some extreme behavior happening in the corners.**

## Platykurtic (Chill, Spread-Out Party):

- Finally, picture a party where the **guests are evenly spread out all over the room**. There's no real crowd in the center; everyone is casually mingling, with no big clusters.
  - This represents a platykurtic distribution with a flatter peak and light tails. **The party is relaxed and laid-back, with no intense clusters or extreme behaviors.**
- 



# KURTOSIS

## APPLICATIONS

### Finance:

- Kurtosis is used to assess the risk of investment portfolios by analyzing the likelihood of extreme returns. Higher kurtosis in asset returns can indicate a higher risk of significant gains or losses.

### Environmental Studies

- Kurtosis can be applied to analyze extreme weather events.
- For instance, high kurtosis in temperature data might indicate a higher likelihood of extreme heatwaves or cold spells.

### Sports Analytics

- In sports, kurtosis can be used to evaluate the consistency of player performances.
- For example, a high kurtosis in a player's scoring data might indicate that while they usually score around their average, they occasionally have very high or very low scoring games, which could be important for team strategy and coaching.



# THANK YOU

**Share your thoughts and  
feedback !!**

