สยามชำนาญกิจ
SIAM CHAMNAN KIT

Effective Big Data Management for Business analytics and decision

Topics (1)

Introduction to Big Data
Basic understanding of business analytic
Data format (structured vs unstructured)
Fundamental of Data management
Workshop

Topics (2)

Data analysis techniques
Statistical analysis
Working with data analysis tool
Business intelligence
Workshop with Visualization data tool

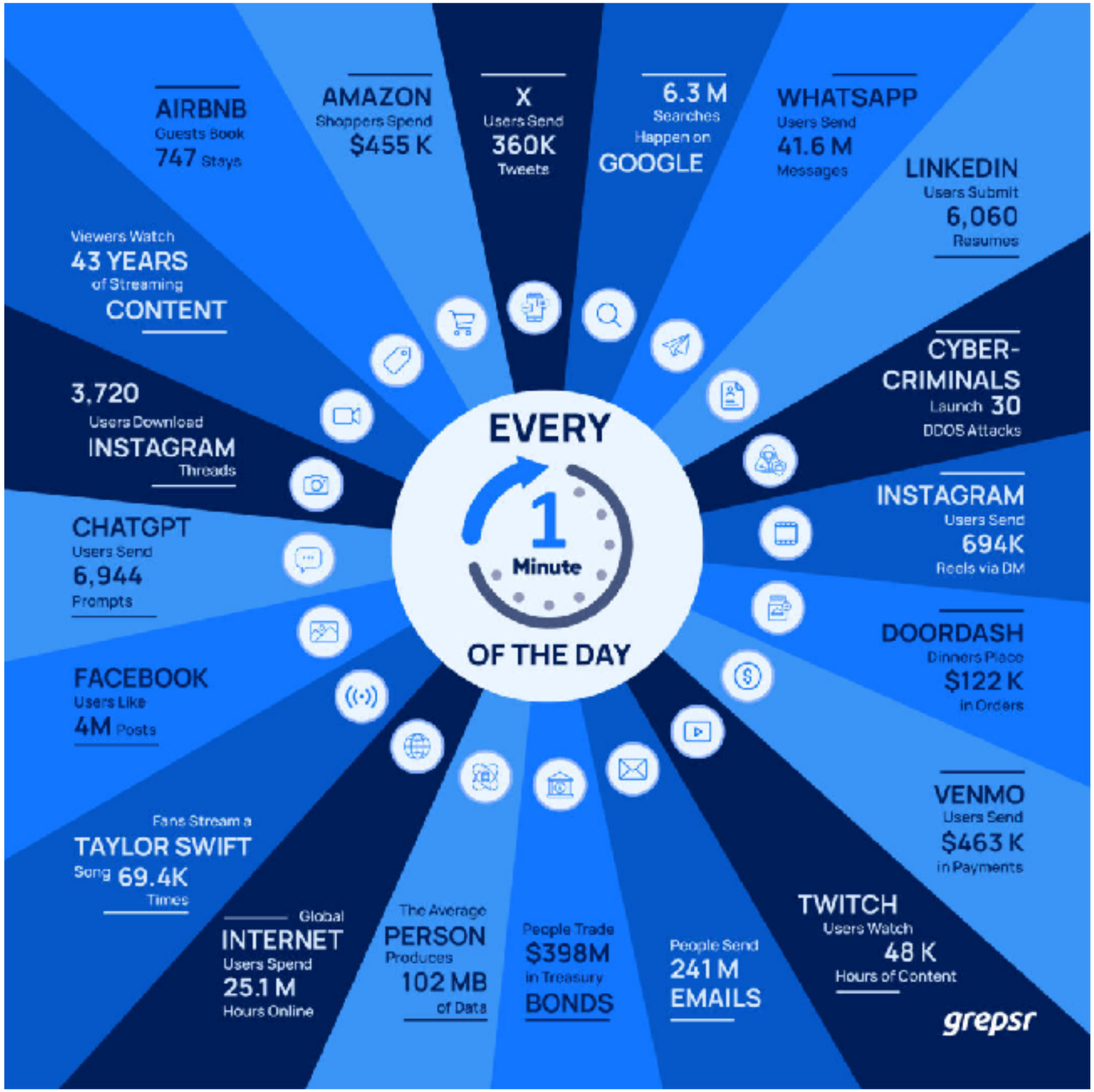
Introduction

Big Data

Business Analytics (BA)

Business Intelligence (BI)

Introduction to Big Data



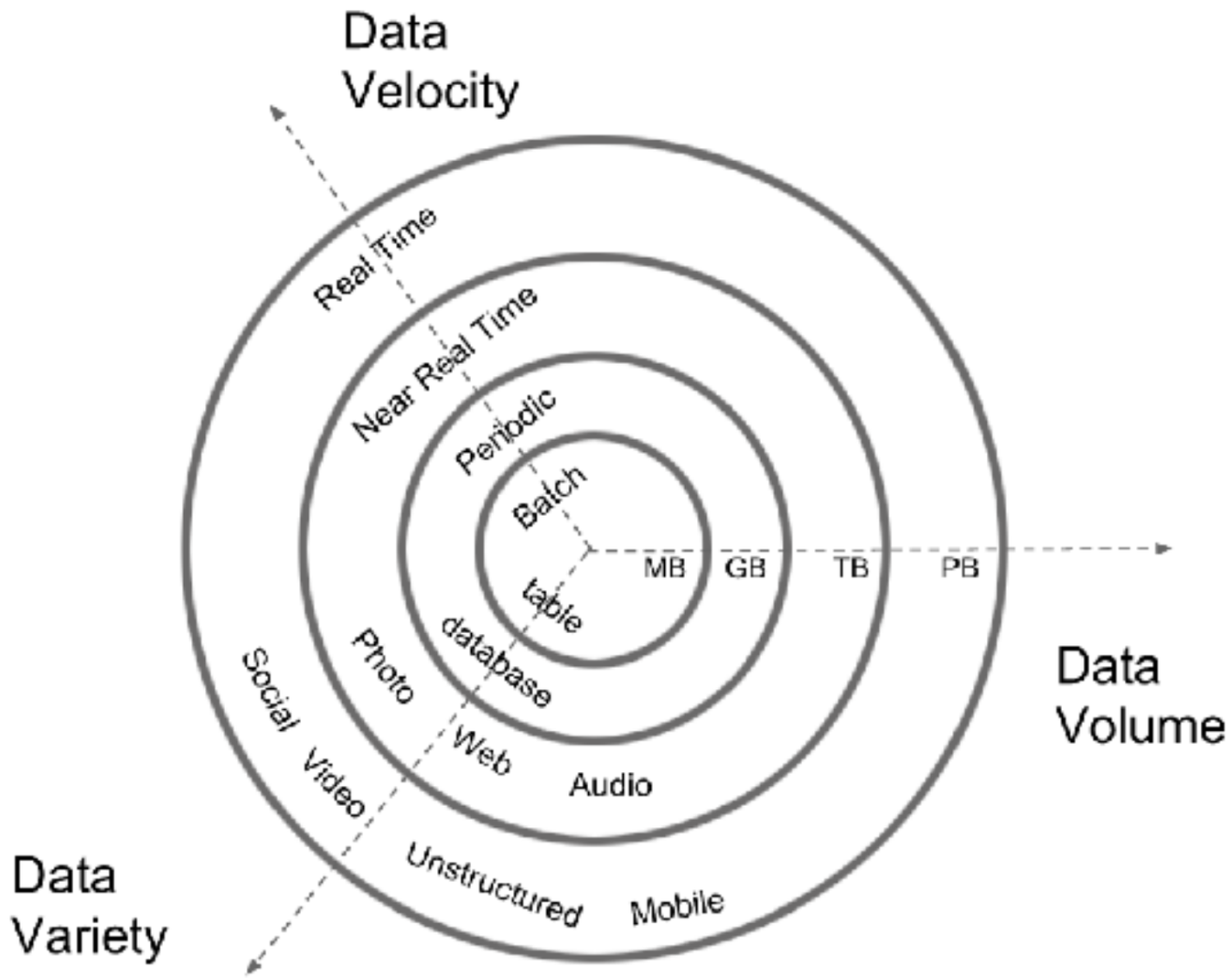
Big Data

Refer to the vast amount of structured and unstructured data generated at high velocity, variety, and volume

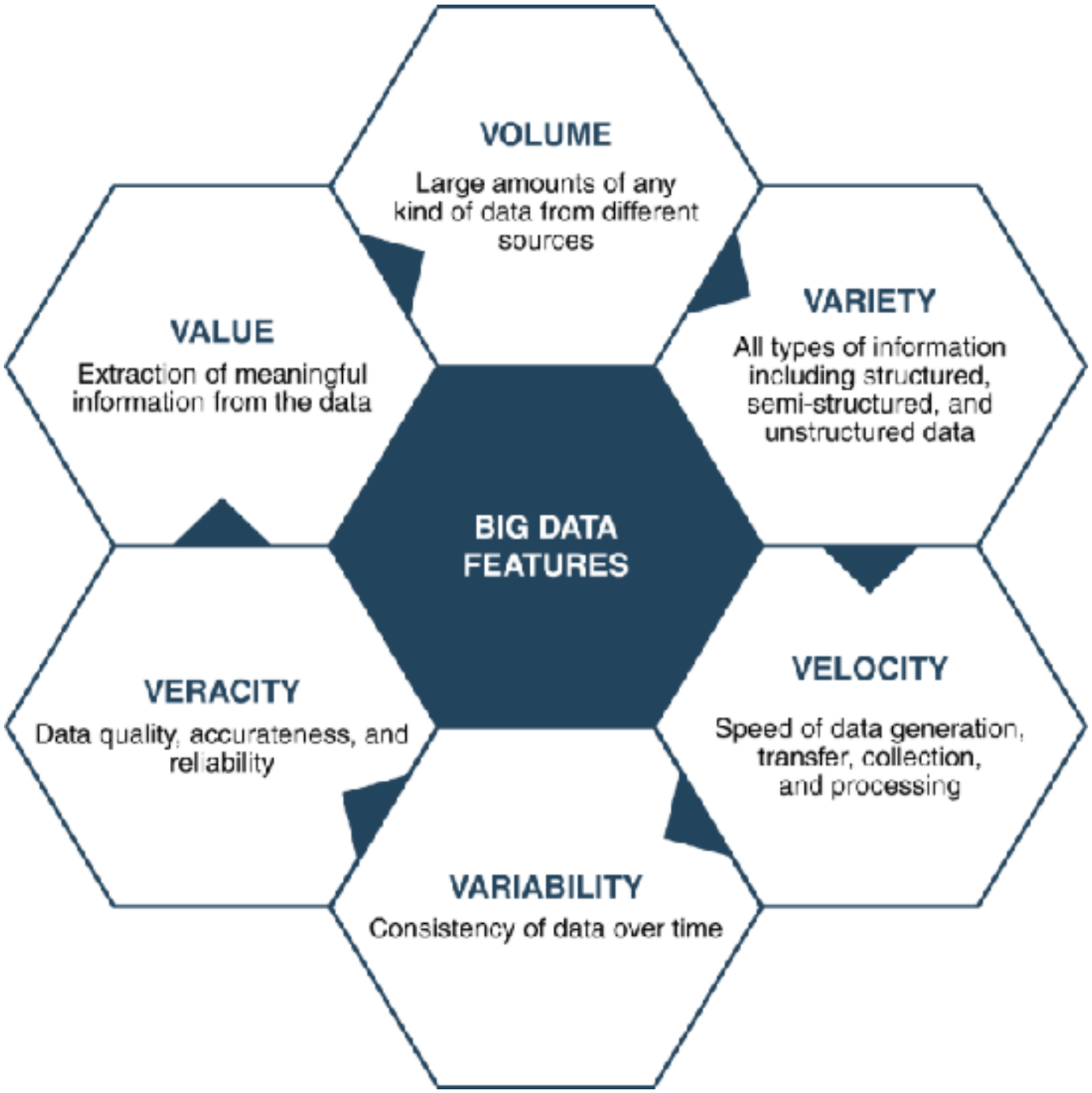
Data is too complex to processed by traditional databases and tools

Characteristics for Big Data

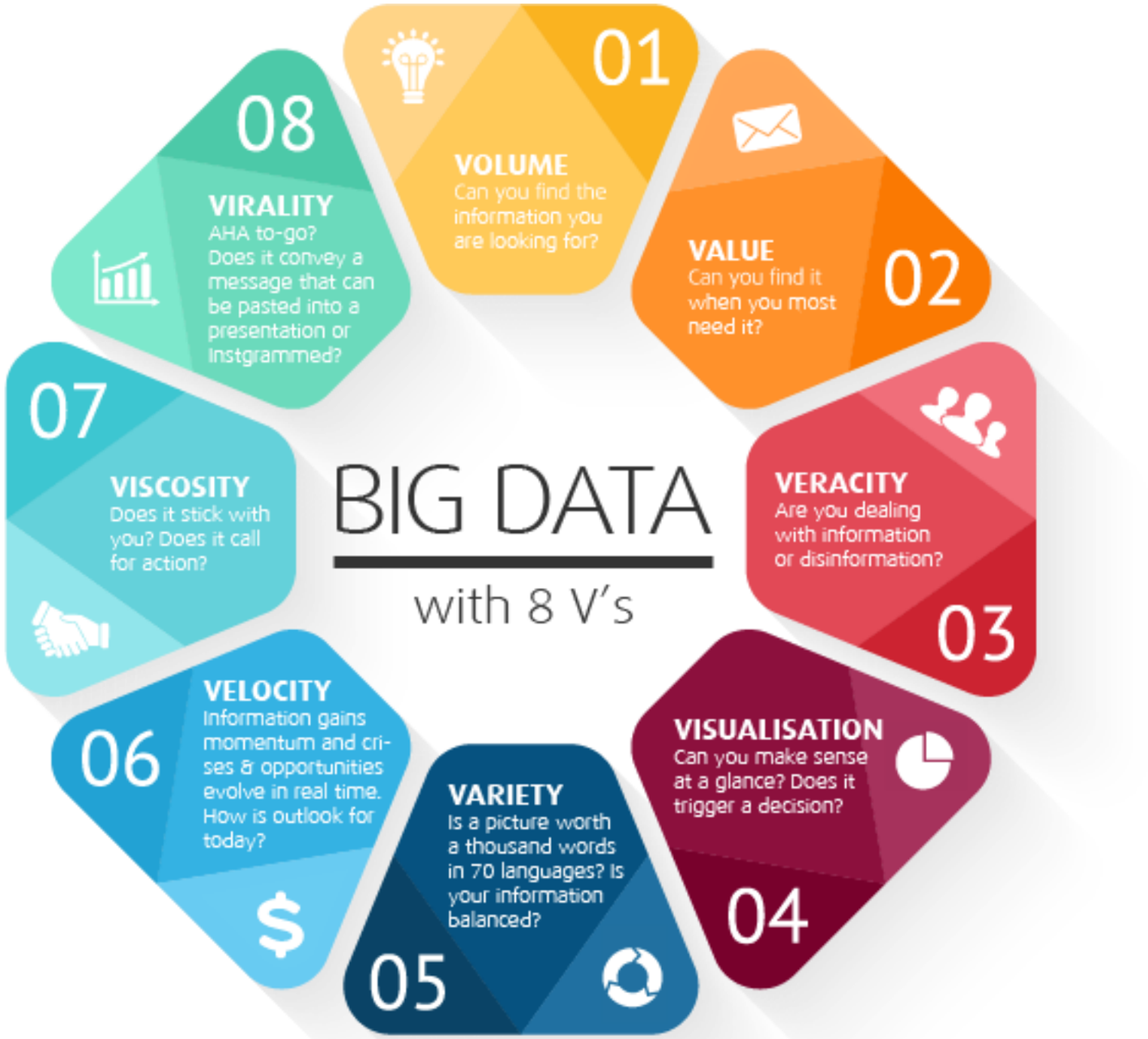
3 V's !!!



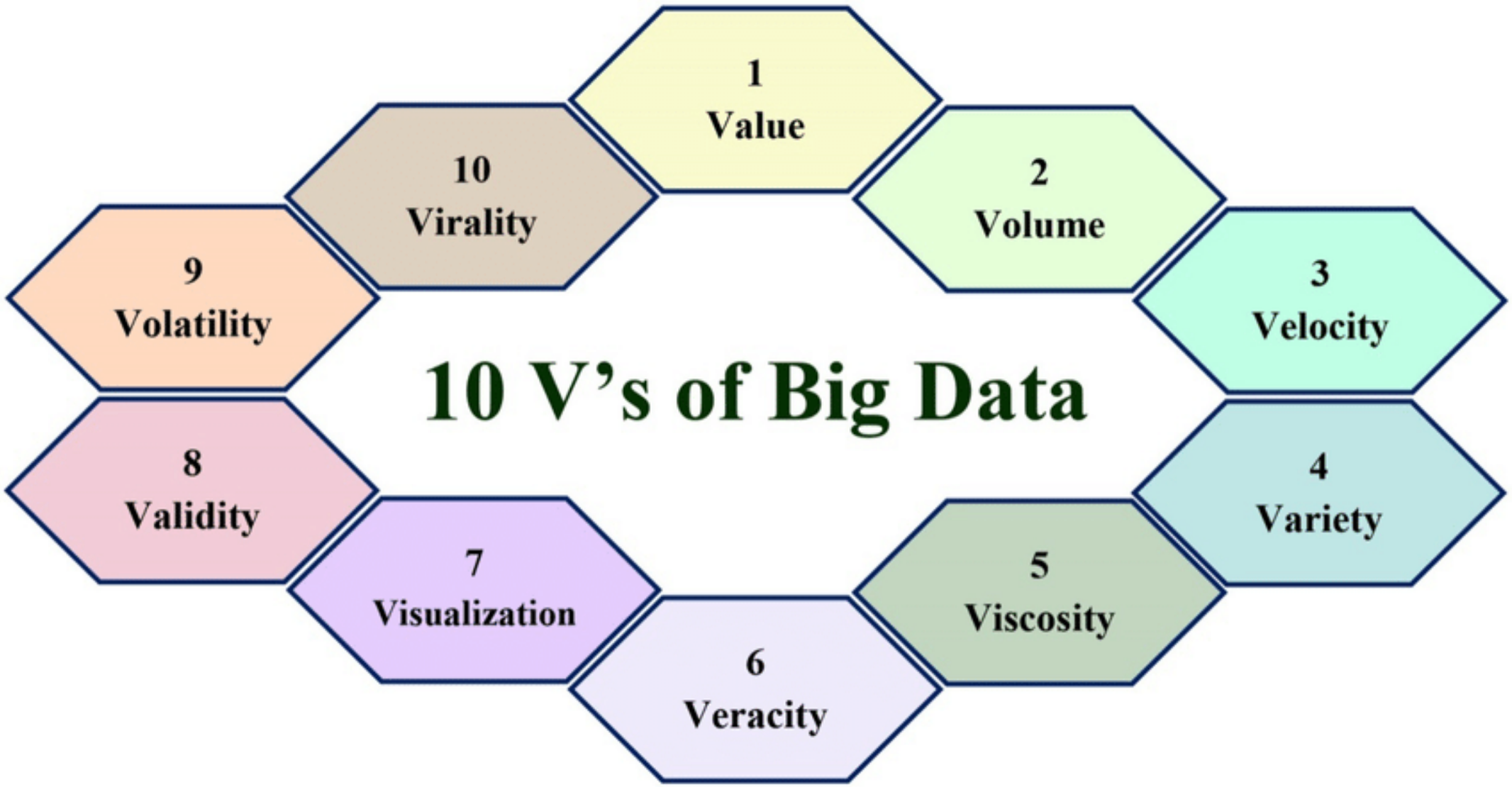
Characteristics for Big Data



Characteristics for Big Data



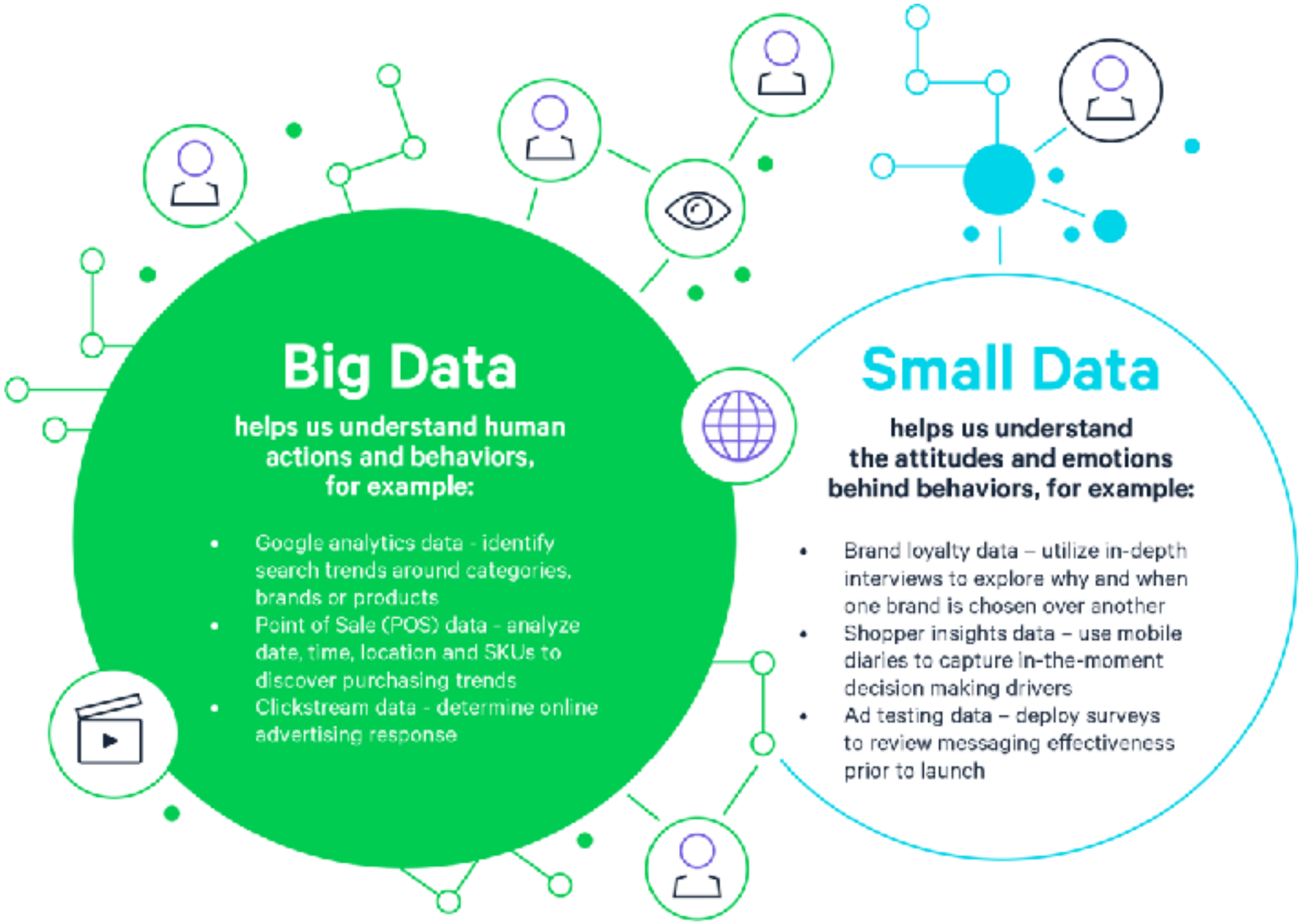
Characteristics for Big Data



Purpose of Big Data

To extract **meaningful** information
from massive datasets
that conventional tools can't manage,
using **advanced analytics** and data processing
methods.

Big Data vs Small Data



Introduction to Business Analytics (BA)

Business Analytics (BA)

Practice of using data, statistical analysis, and quantitative methods to drive **decision-making** and **improve business outcomes**

It often involves predictive modeling, data mining, and machine learning to **forecast trends** and derive **insights**.

Purpose of BA

The goal of BA is
to help businesses make informed,
data-driven decisions by predicting
future outcomes or trends

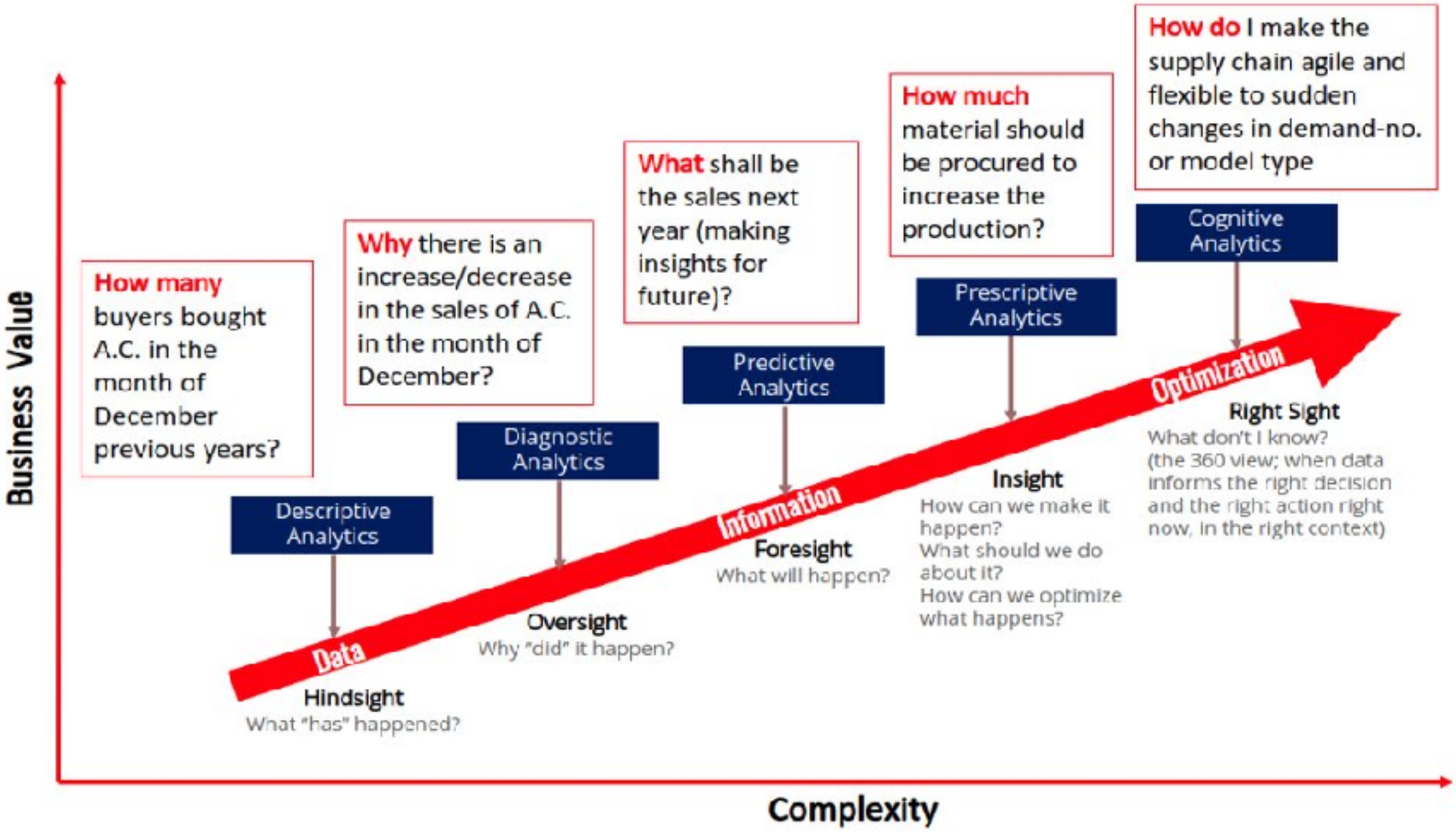
Key Techniques

Predictive Analytics

Prescriptive Analytics

Diagnostic Analytics

Key Techniques



Descriptive Analytics

Descriptive analytics answers the question,

“What happened?”

by summarizing historical data to identify patterns and trends.

Descriptive Analytics

It helps businesses understand
past performance and gain insights
from historical data to determine
what has occurred over a given period.

Basic data aggregation

Reporting tool

Data visualisation tool

Statistic and trend

Diagnostic Analytics

Diagnostic analytics answers the question,

“Why did it happen?”

by analyzing data to understand the root causes of past events.

Diagnostic Analytics

It digs deeper into descriptive analytics
to find the reasons behind specific outcomes or patterns.

Drill-down analytics

Correlation analysis

Root cause analysis

Statistic with regression analysis

Predictive Analytics

Predictive analytics answers the question,

“What will likely happen in the future?”

by using historical data, statistical models, and machine learning techniques to forecast future trends.

Predictive Analytics

It helps businesses anticipate **future outcomes**
based on patterns and trends
found in historical data.

Statistic modeling	Machine learning algorithm	Time series forecast

Prescriptive Analytics

Prescriptive analytics answers the question,

“What should be done?”

by recommending specific actions or strategies to achieve desired outcomes or optimize processes.

Prescriptive Analytics

It goes beyond predicting future outcomes by suggesting the best course of action based on predictions.

Optimization model	Simulation	Decision/scenario analysis

Summary

Type	Main Question	Purpose	Techniques	Example
Descriptive Analytics	What happened?	Understanding past performance.	Data aggregation, reporting, visualization	Sales reports showing performance by region.
Diagnostic Analytics	Why did it happen?	Identifying causes of past outcomes.	Drill-down analysis, correlation, root cause	Analyzing why sales declined in a certain area.
Predictive Analytics	What will happen?	Forecasting future trends and outcomes.	Machine learning, statistical models	Predicting customer churn for an online store.
Prescriptive Analytics	What should we do?	Recommending actions to optimize future outcomes.	Optimization, simulation, decision models	Suggesting optimal pricing strategies for sales.

Summary

Descriptive Analytics

focuses on summarizing what has already happened

Diagnostic Analytics

helps businesses understand why those things happened

Predictive Analytics

forecasts future trends based on historical data

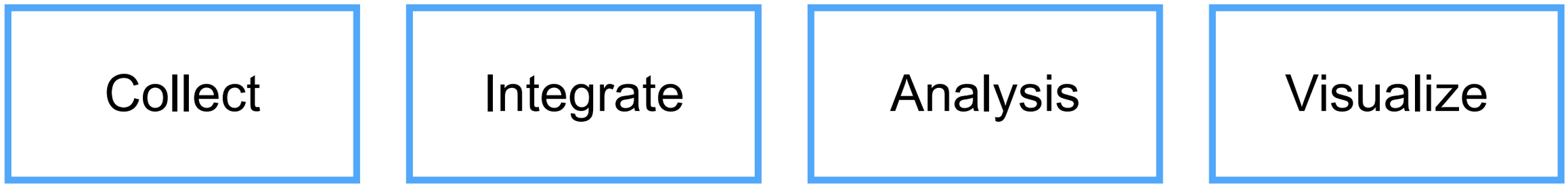
Prescriptive Analytics

provides recommendations to optimize decision-making and future outcomes

Introduction to Business Intelligence (BI)

Business Intelligence (BI)

Refers to technologies, applications, and practices used for the collection, integration, analysis, and presentation of business data.



Purpose of BI

BI is about **reporting and dashboards**
that help businesses monitor their current state
and past performance
by organizing data into actionable insights.

Data sources

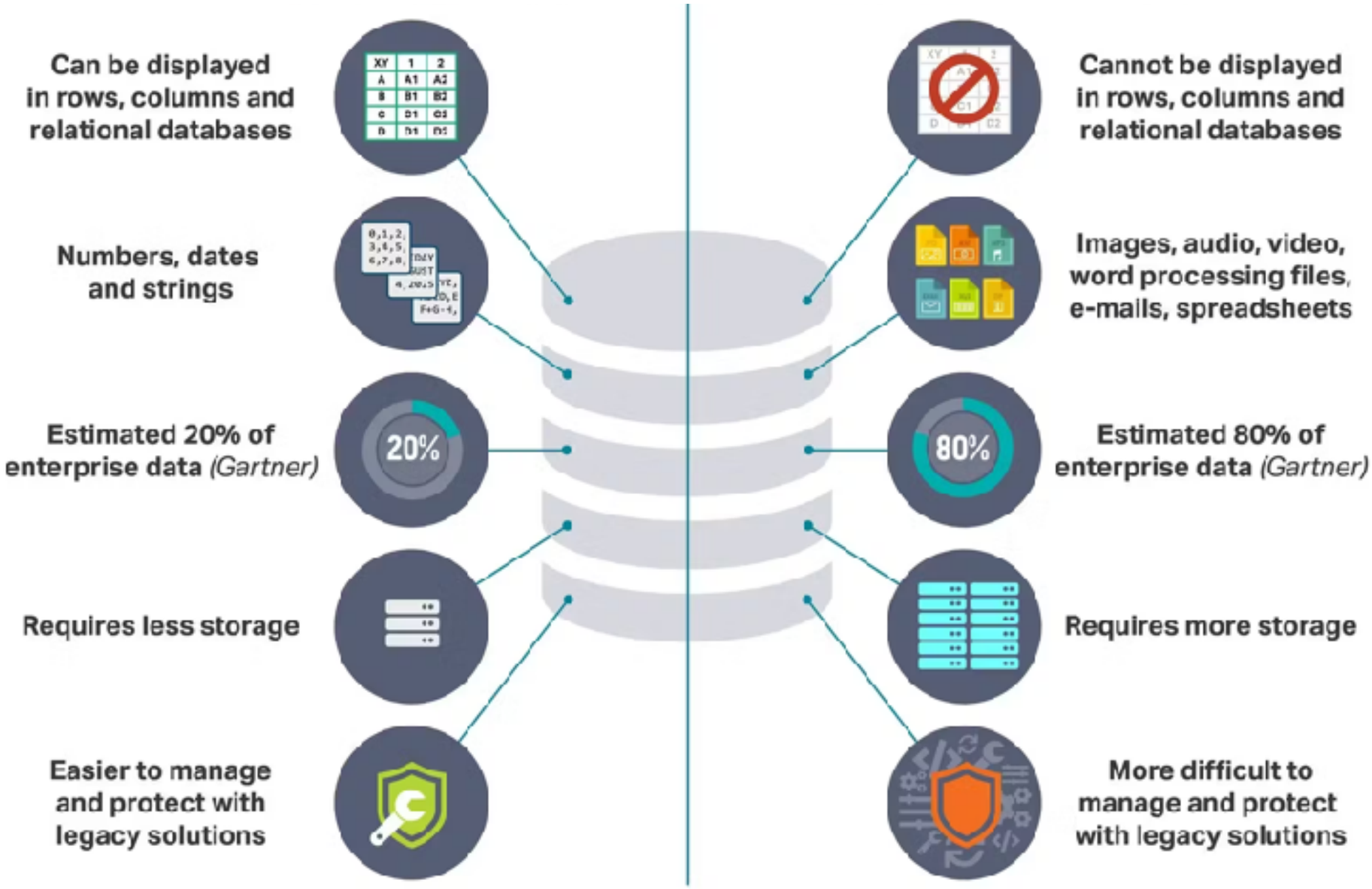
Types of data sources

Structured
Unstructured
Semi-structured

Types of data sources

Feature	Structured Data	Unstructured Data	Semi-structured Data
Definition	Data organized in a predefined format with a clear structure	Data lacking a predefined format and organization	Data with some internal structure but lacking a rigid schema
Examples	Relational databases, spreadsheets, CSVs, APIs	Text documents, emails, images, videos, social media posts	JSON files, XML files, log files
Characteristics	Standardized format, easily searchable and analyzable, consistent and reliable	Diverse formats, challenging to process and analyze, rich and diverse information	Flexible format, adaptable to evolving data needs, requires specialized tools
Advantages	Easy to process and analyze, supports efficient data retrieval, suitable for statistical analysis	Rich and diverse information, captures real-world context, valuable for sentiment analysis and trend identification	Adaptable to evolving data needs, flexible and scalable, suitable for real-time applications
Disadvantages	Limited flexibility, unable to capture complex relationships, not suitable for all types of data	Difficult to process and analyze, requires specialized tools, data quality concerns	Limited data integration potential, lack of standardized formats, evolving data structures
Use Cases	Business intelligence, financial transactions, scientific research, data warehousing	Customer feedback analysis, social media monitoring, content analysis, multimedia processing	Real-time analytics, sensor data analysis, web scraping, scientific experiments
Tools and Techniques	SQL databases, spreadsheets, data warehouses, data analytics tools	Natural language processing (NLP), machine learning, sentiment analysis, image recognition	JSON parsers, XML parsers, stream processing tools, data pipelines

Structured vs Unstructured data



Basic of Data Management

Data management

Data management refers to the **process** of organizing, storing, maintaining, and retrieving data efficiently and securely.

It plays a crucial role in **ensuring** that data is accurate, available, and usable for decision-making, analysis, and operations

Keys of data management

Data collection	Data storage	Data Security
Data quality	Data governance	Data Integration
Data backup/ restore	Data accessibility	Data analysis

Data storage ?

Database

Data Warehouse

Data Mart

Data Lake

Data Warehouse

A data warehouse is a centralized repository that stores **structured** and processed data from **multiple sources**.

It is optimized for querying and analysis, primarily used for reporting, business intelligence, and decision-making.

Data Mart

A data mart is a smaller,
more **focused subset of a data warehouse**,
designed to serve the needs of a **specific** business unit or department (e.g., sales, marketing).

It contains only relevant data for
that particular group, **enabling quicker access** and more tailored analysis.

Data Lake

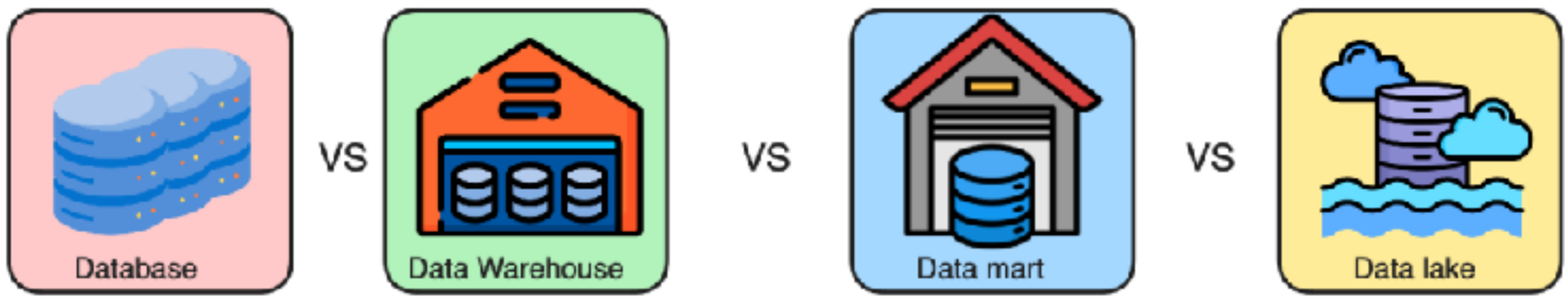
A data lake is a **vast storage** repository
that holds a large amount of raw data in
its **native format**
(structured, semi-structured, and unstructured)
until it is needed for analysis.

It is designed for **storing data**
before it is processed and transformed for analysis,
offering flexibility and scalability.

Key differences

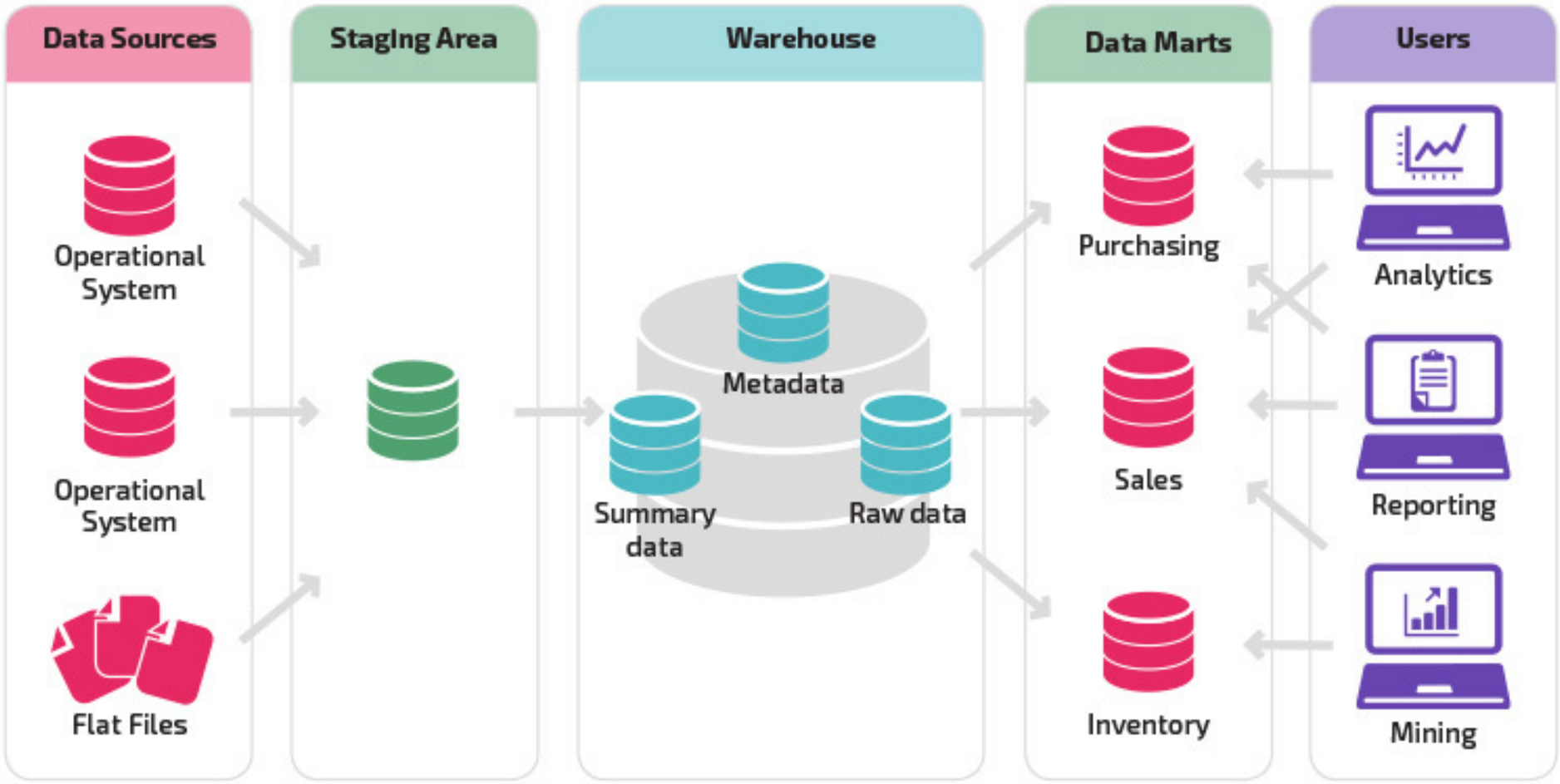
Feature	Data Warehouse	Data Mart	Data Lake
Data Type	Structured	Structured	Structured, semi-structured, and unstructured
Scope	Enterprise-wide (broad)	Department-specific (narrow)	Enterprise-wide (but raw)
Storage Type	Structured (rows/columns)	Structured	Raw format
Data Processing	Pre-processed (ETL)	Pre-processed (ETL)	Raw, processed when queried
Primary Use	Reporting, historical analysis	Department-specific insights	Big data analysis, machine learning
Speed of Query	Fast for complex queries	Faster for localized queries	Slower for complex queries
Cost	Generally more expensive	Less expensive than data warehouse	Cheaper for storage, but processing may incur costs
Schema	Schema-on-write	Schema-on-write	Schema-on-read

Different between data types



	Database	Data Warehouse	Data mart	Data lake
Scope	Application-specific	Organization-wide, structured data.	Department-specific, structured data.	Organization-wide, any type of data
Data Type	Structured	Structured	Structured	Structured, semi-structured, unstructured.
Structure	Predefined schema	Schema on write	Schema on write (inherited from data warehouse)	Schema on read
Use Case	Operational applications(OLTP)	Business intelligence, historical analysis(OLAP).	Specific business function analysis	Big data analytics, data exploration.

Data Warehouse vs Data Mart

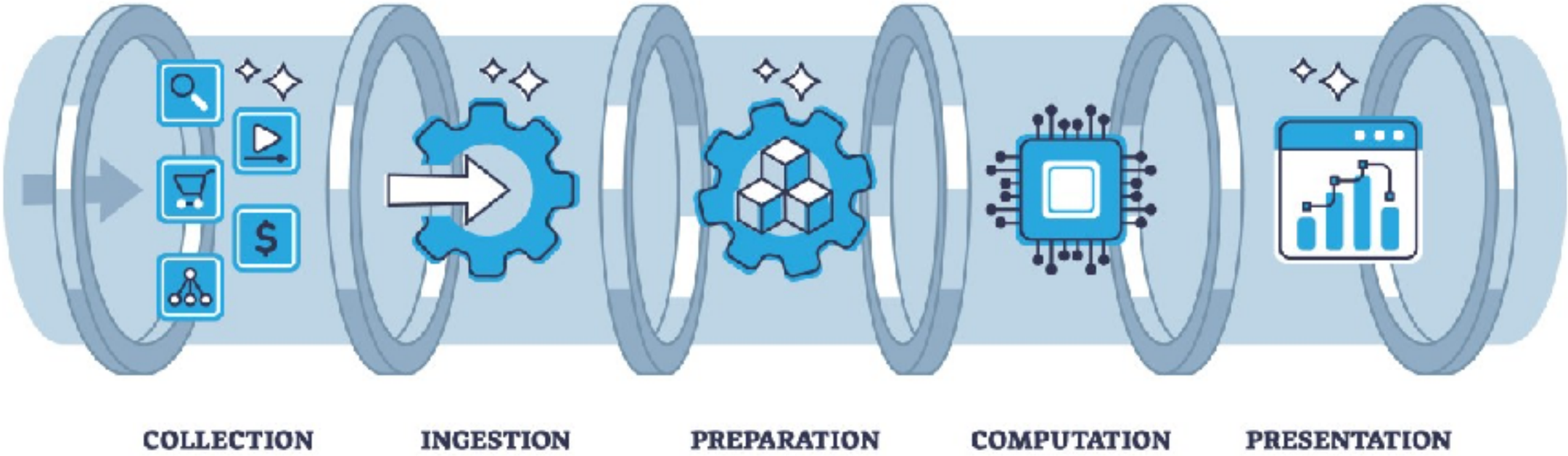


Data pipeline

Data pipeline

A **data pipeline** refers to a series of **processes** and tools used to automate the flow of data from source systems to destination systems, such as databases, data lakes, or data warehouses.

Data pipeline



Data Ingestion

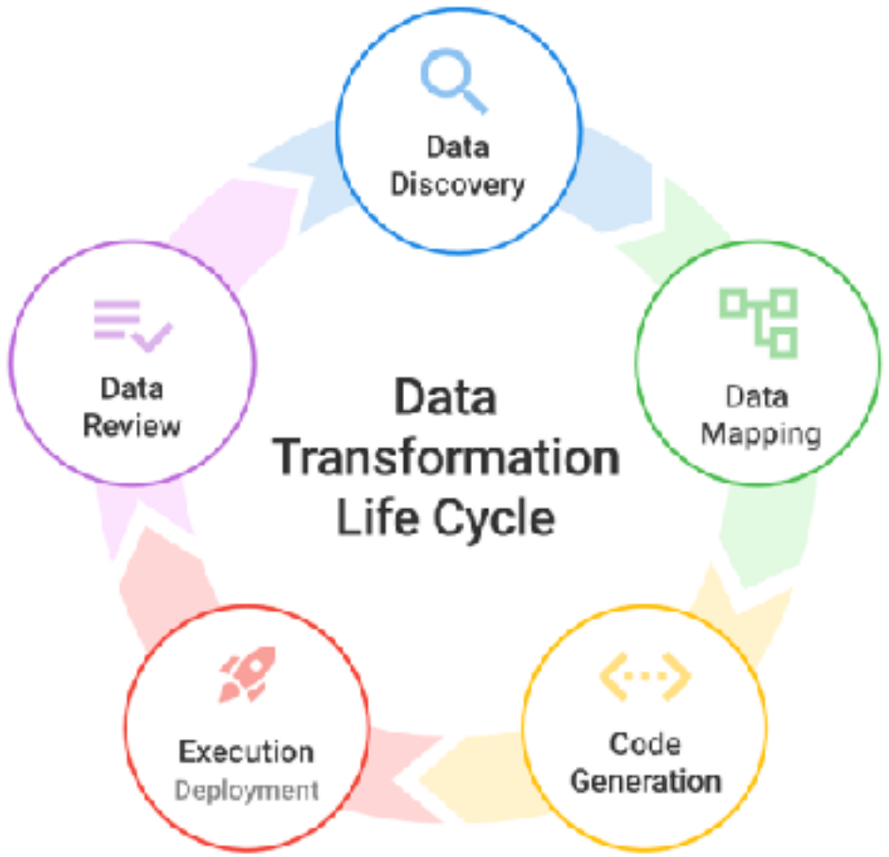
The process of collecting data from various sources and bringing it into the pipeline.

Batch processing

Real-time processing

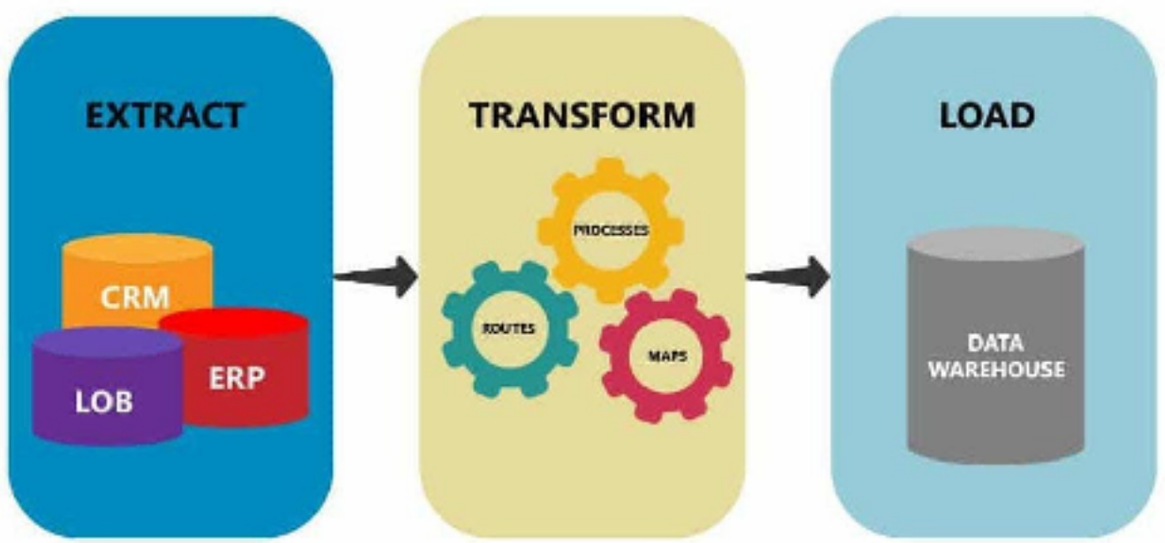
Data Transformation

This step involves cleaning, validating,
and transforming the data into a standardized format
or structure suitable for analysis or storage.



Data Loading

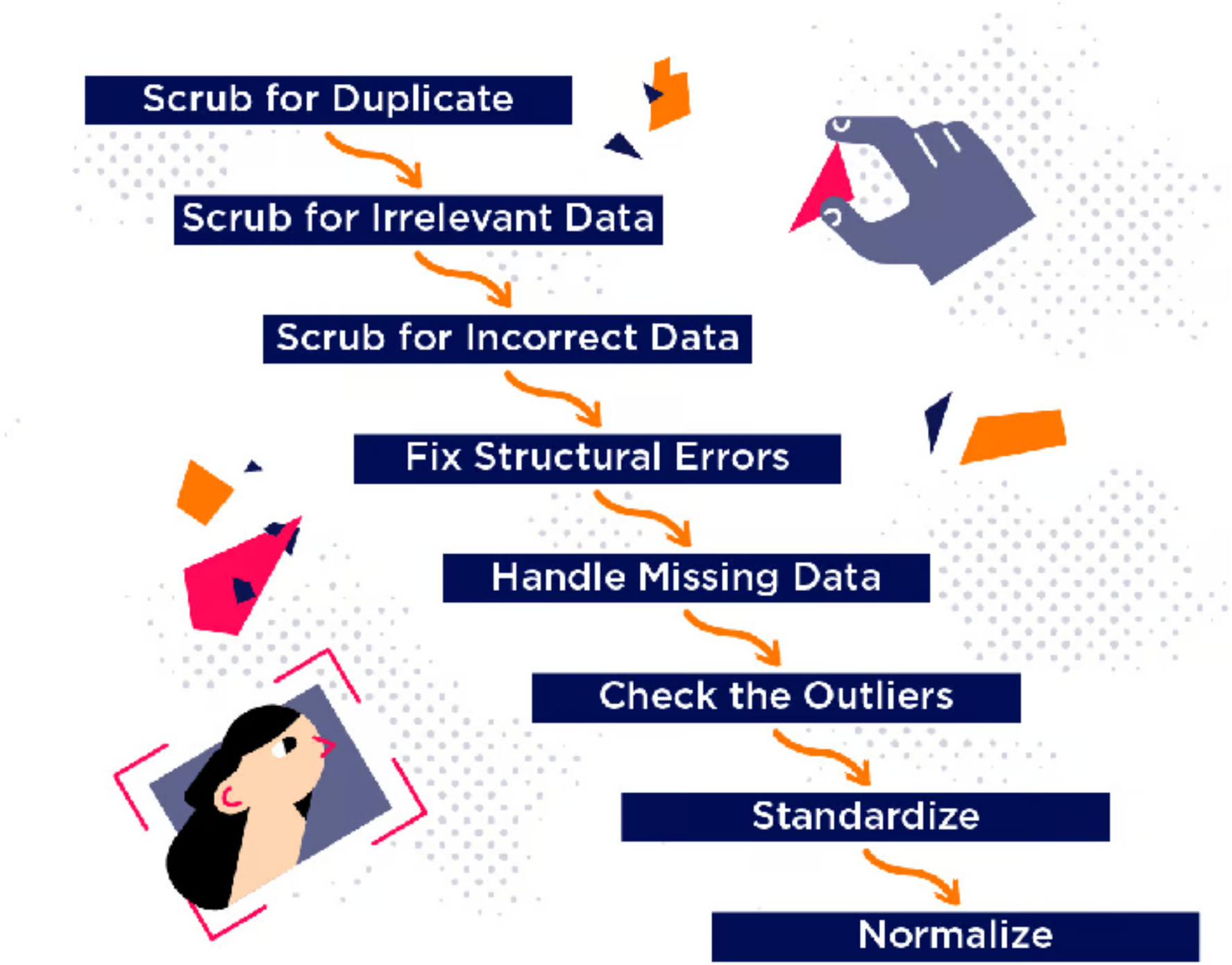
The transformed data is loaded into a target destination, which could be a data warehouse, database, or cloud storage platform.



Orchestration

This component **manages the overall** workflow
and scheduling of the pipeline,
ensuring the proper execution
and coordination of data processing tasks.

How to cleaning data ?



How to cleaning data ?

Key Techniques with MS Excel

Remove duplication	Handle missing data	Standardize Data Formatting
Remove Unwanted Characters	Convert Text to Columns	Data Validation
Find and Replace Inconsistent	Fix Outliers	Data Cleansing

Workshop

Data Analysis Techniques

Exploratory Data Analysis

Critical step in the **data science process**
that involves summarizing
the main characteristics of a dataset,
often using visual methods, before applying more
formal **statistical** techniques.

Summarize

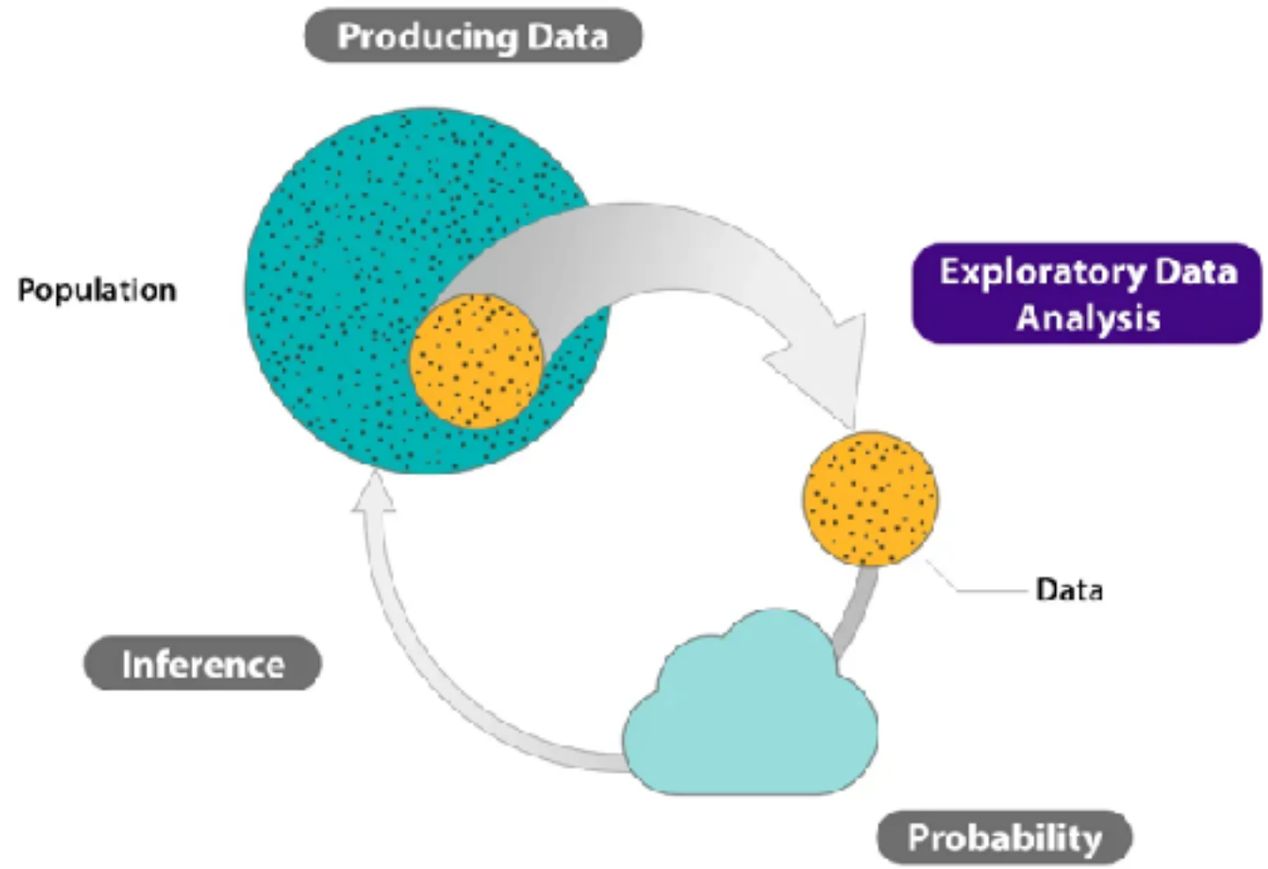
Visualize

Identify

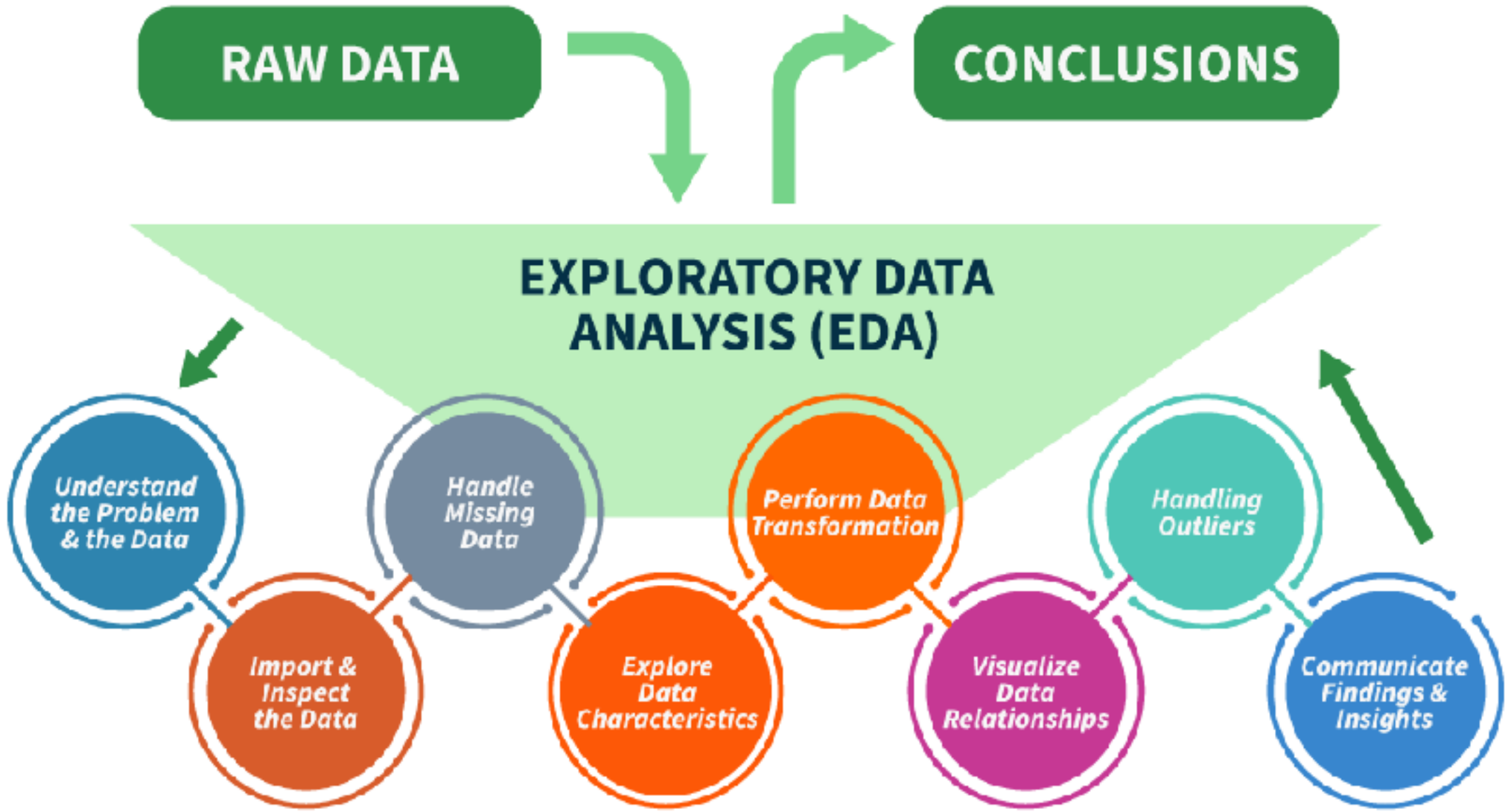
Missing data/values

Exploratory Data Analysis

EDA helps in understanding the data, identifying patterns, detecting anomalies, and testing hypotheses.



Steps for Performing Exploratory Data Analysis

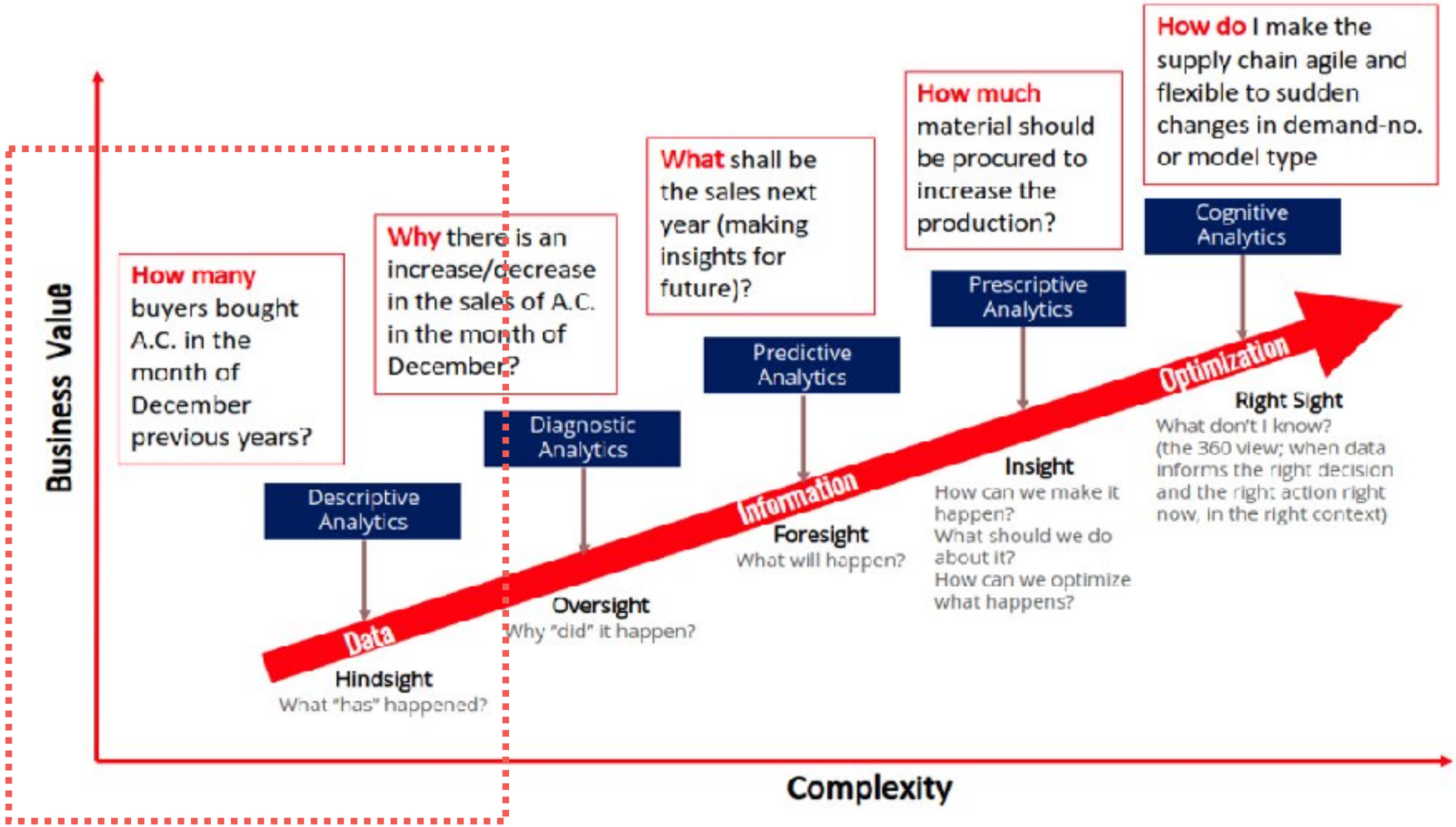


Steps

Problem and data understanding
Data cleaning
Pattern discovery
Data visualization
Model selection
Quality control

Statistical Analysis for data analysis

Key Techniques

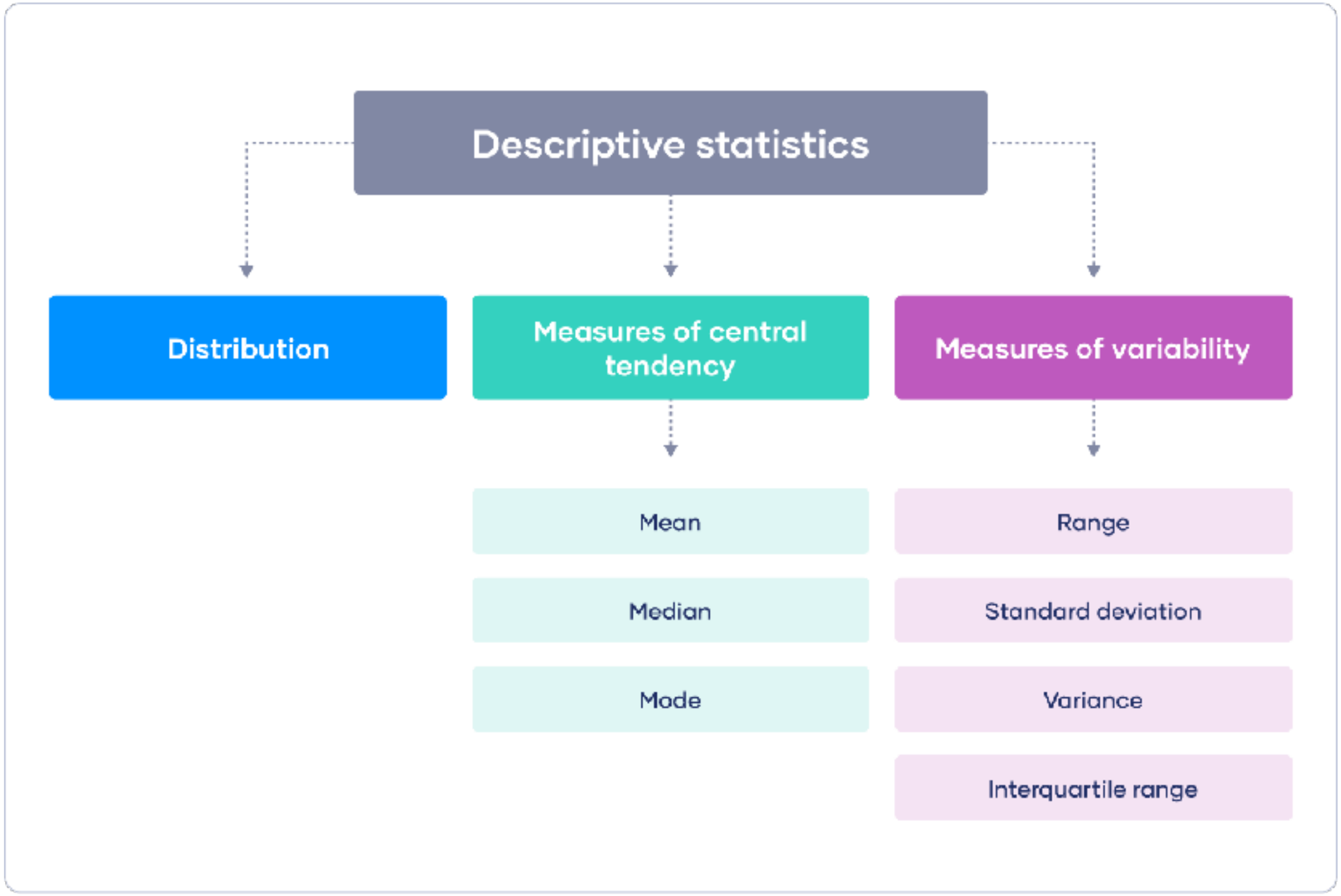


Descriptive statistic

Statistical methods used to **summarize** and describe the **main features** of a dataset.

Help in **understanding the data** by providing a clear overview through numerical measures and visual representations.

Types of descriptive statistic



Measures of Central Tendency

Mean

The average of all data points

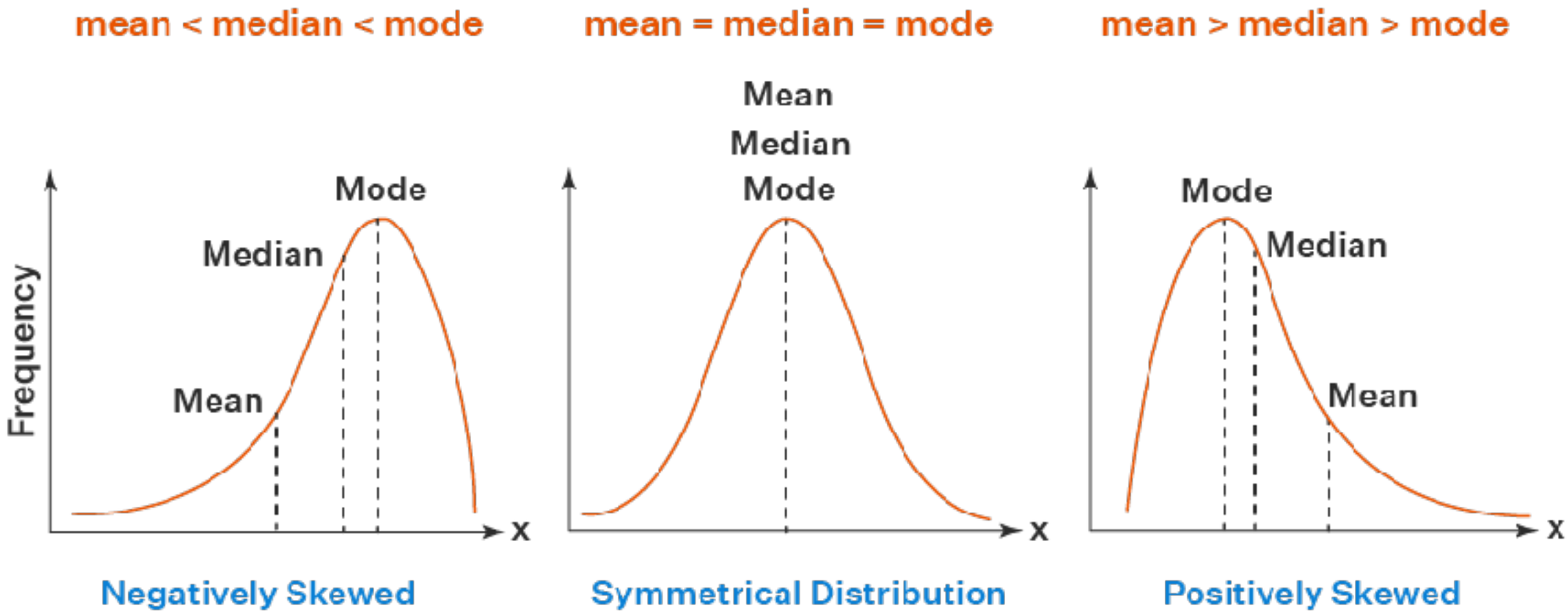
Median

The middle value when data points are arranged in order

Mode

The value that appears most frequently in the dataset

Distribution



Measures of Variability

Range

The difference between the maximum and minimum values

Variance

The average of the squared differences from the mean

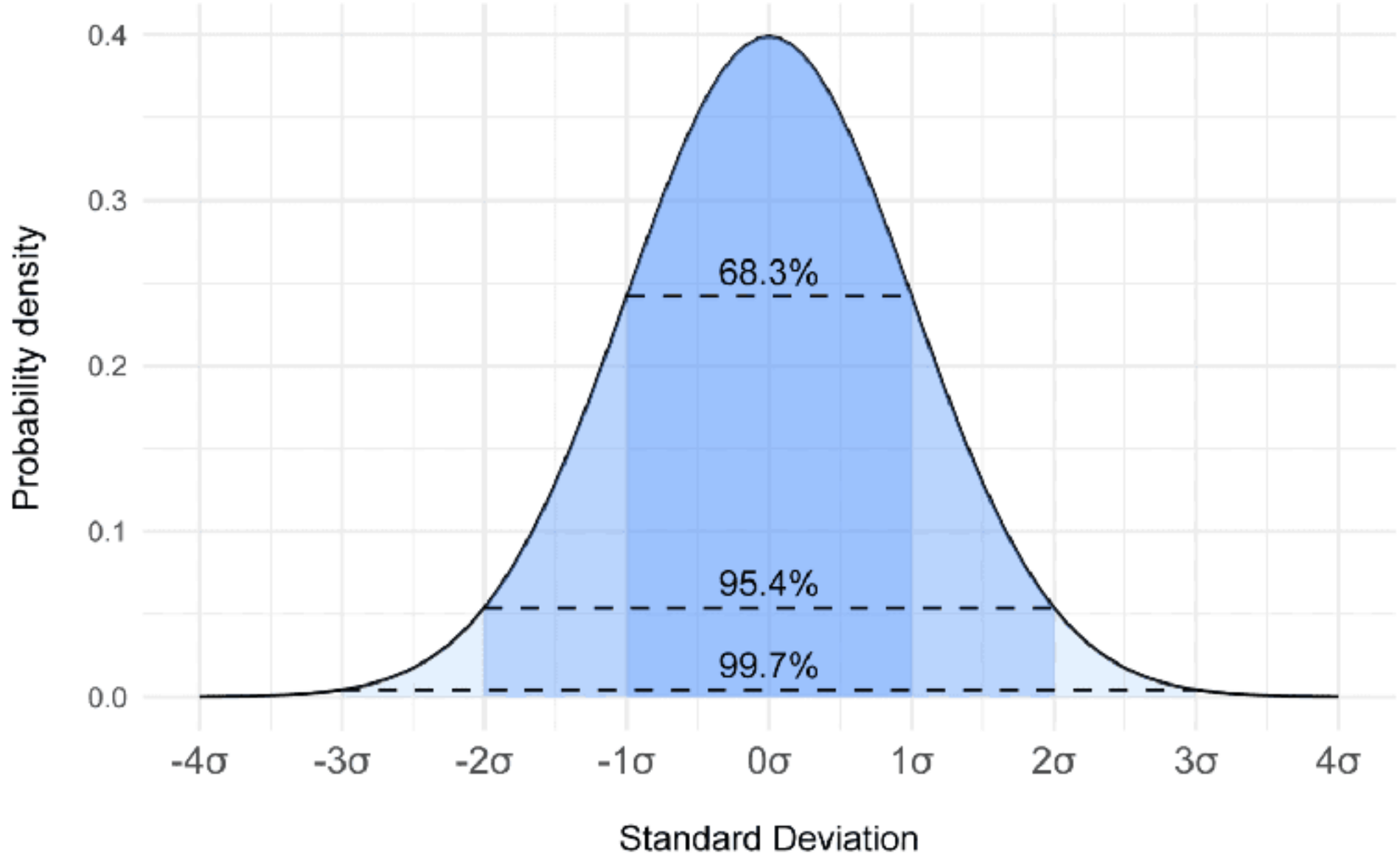
Standard Deviation

The square root of the variance, showing how much the values deviate from the mean

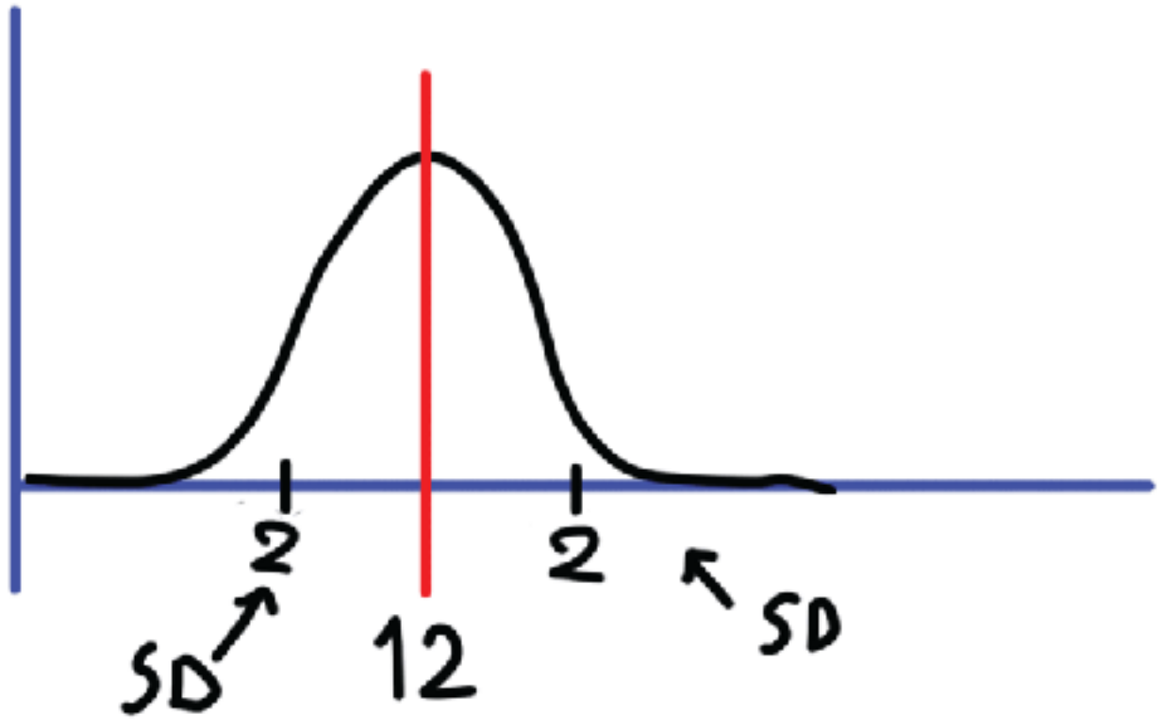
Interquartile Range (IQR)

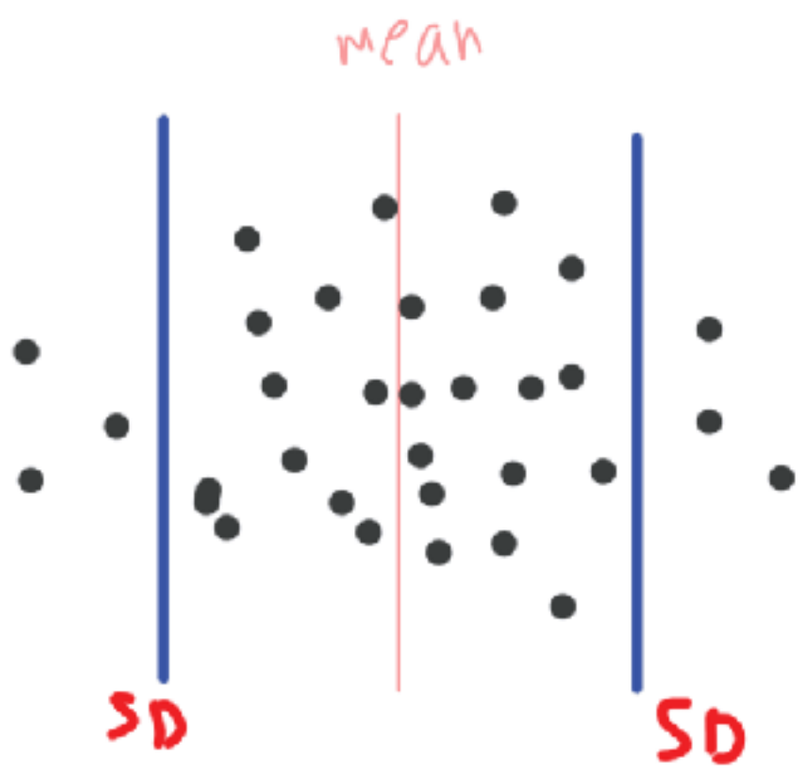
The difference between the first (25th percentile) and third (75th percentile) quartiles

Standard Deviation (1)

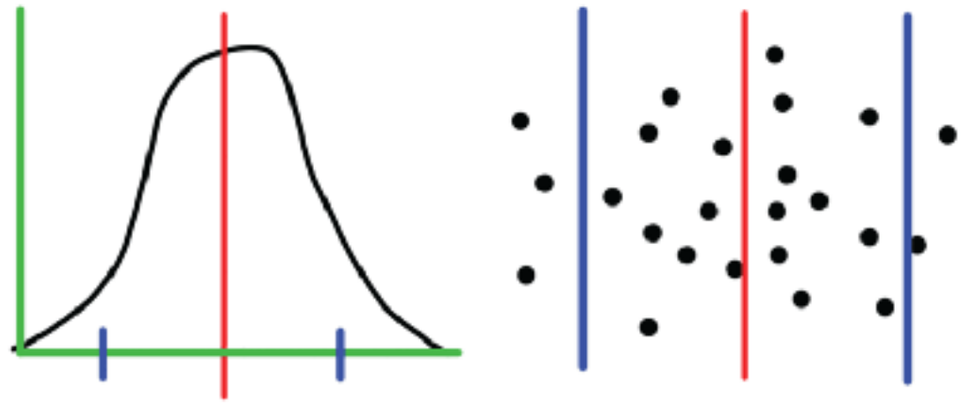


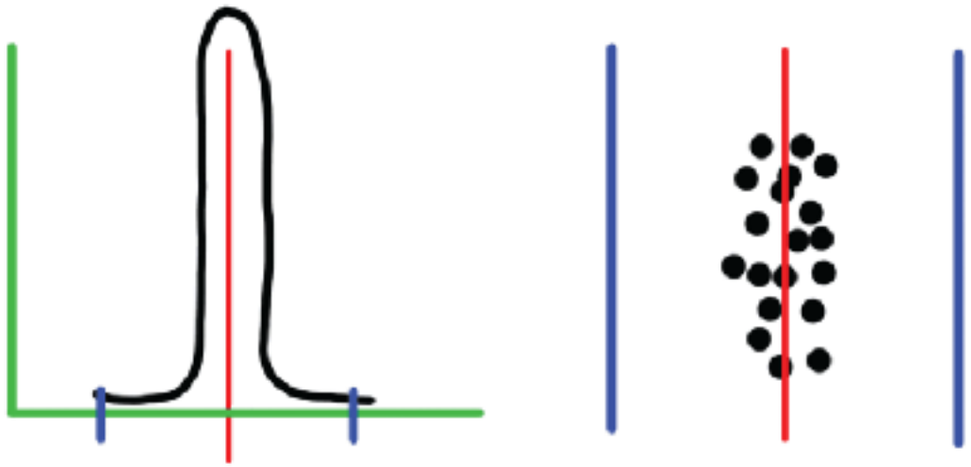
Standard Deviation (2)



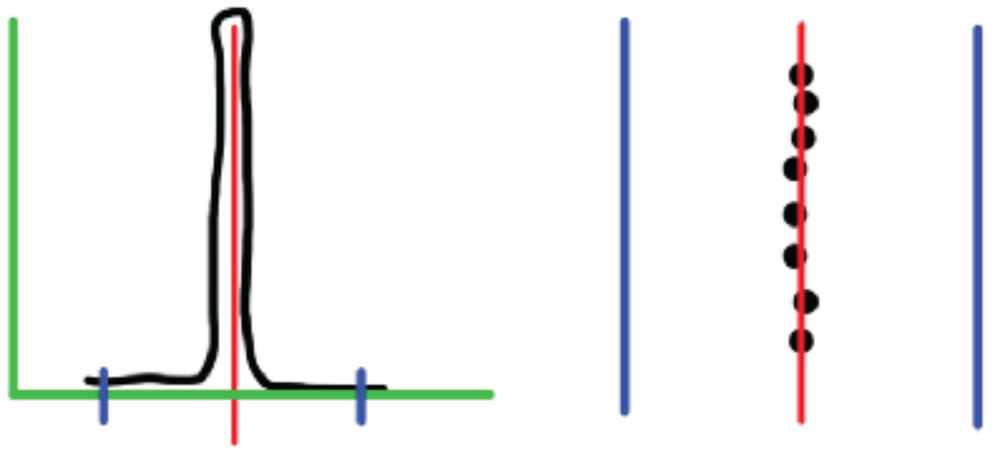


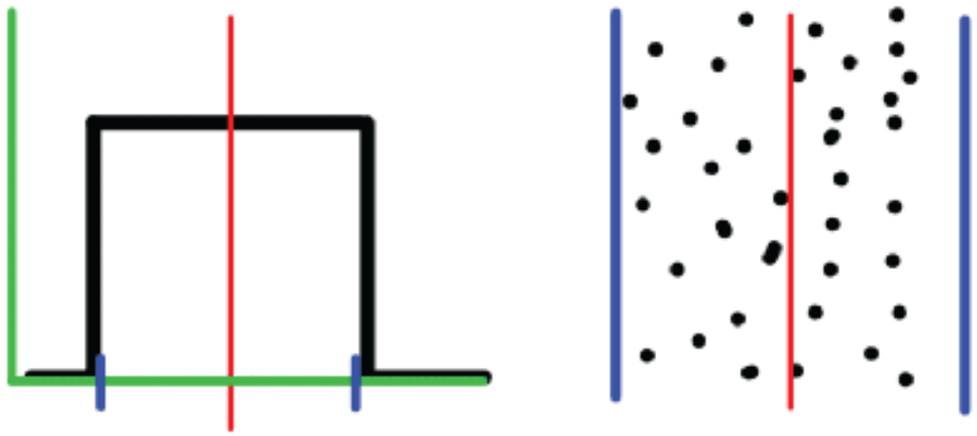
Standard Deviation (3)



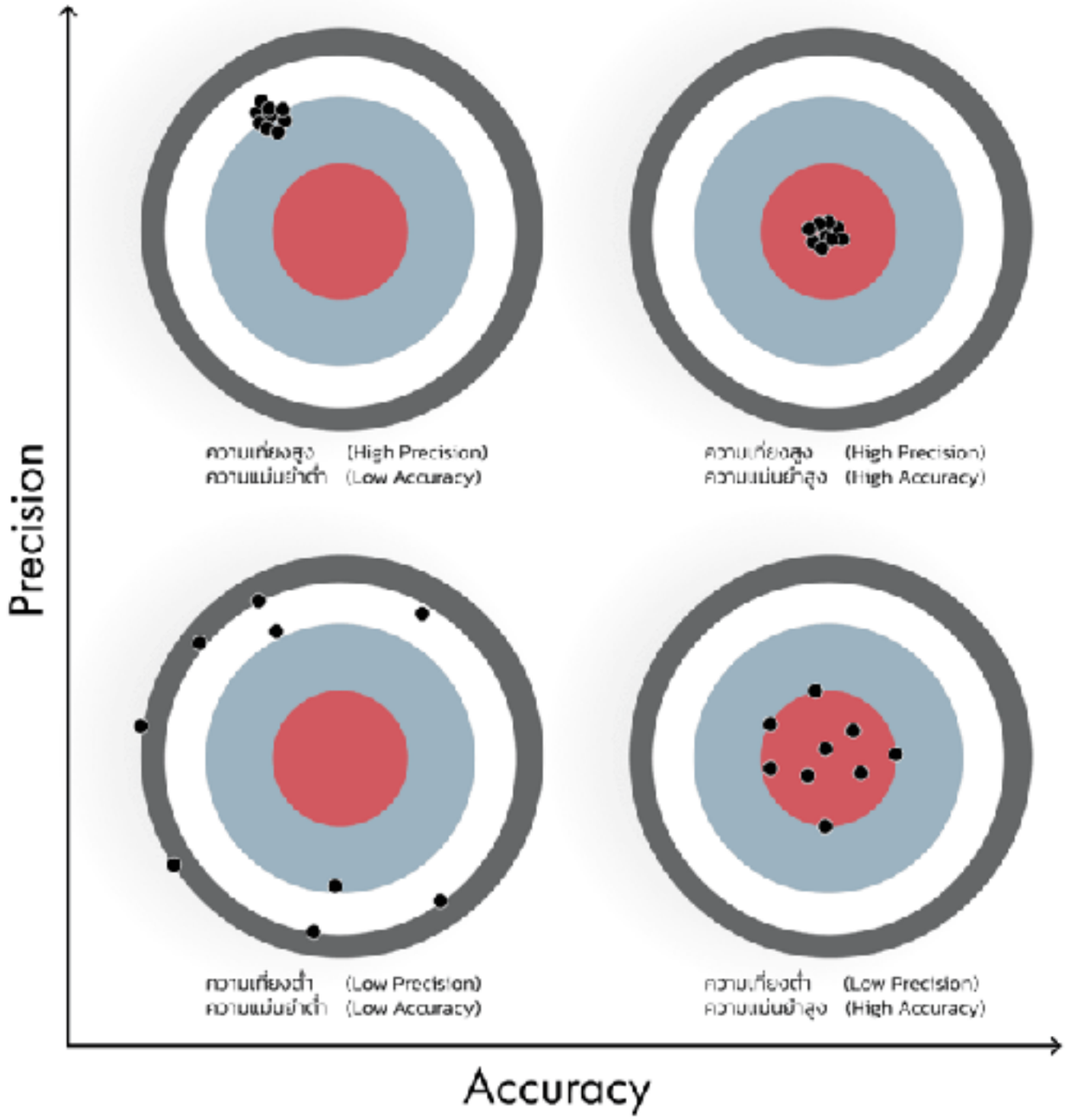


Standard Deviation (4)





Standard Deviation and Precision

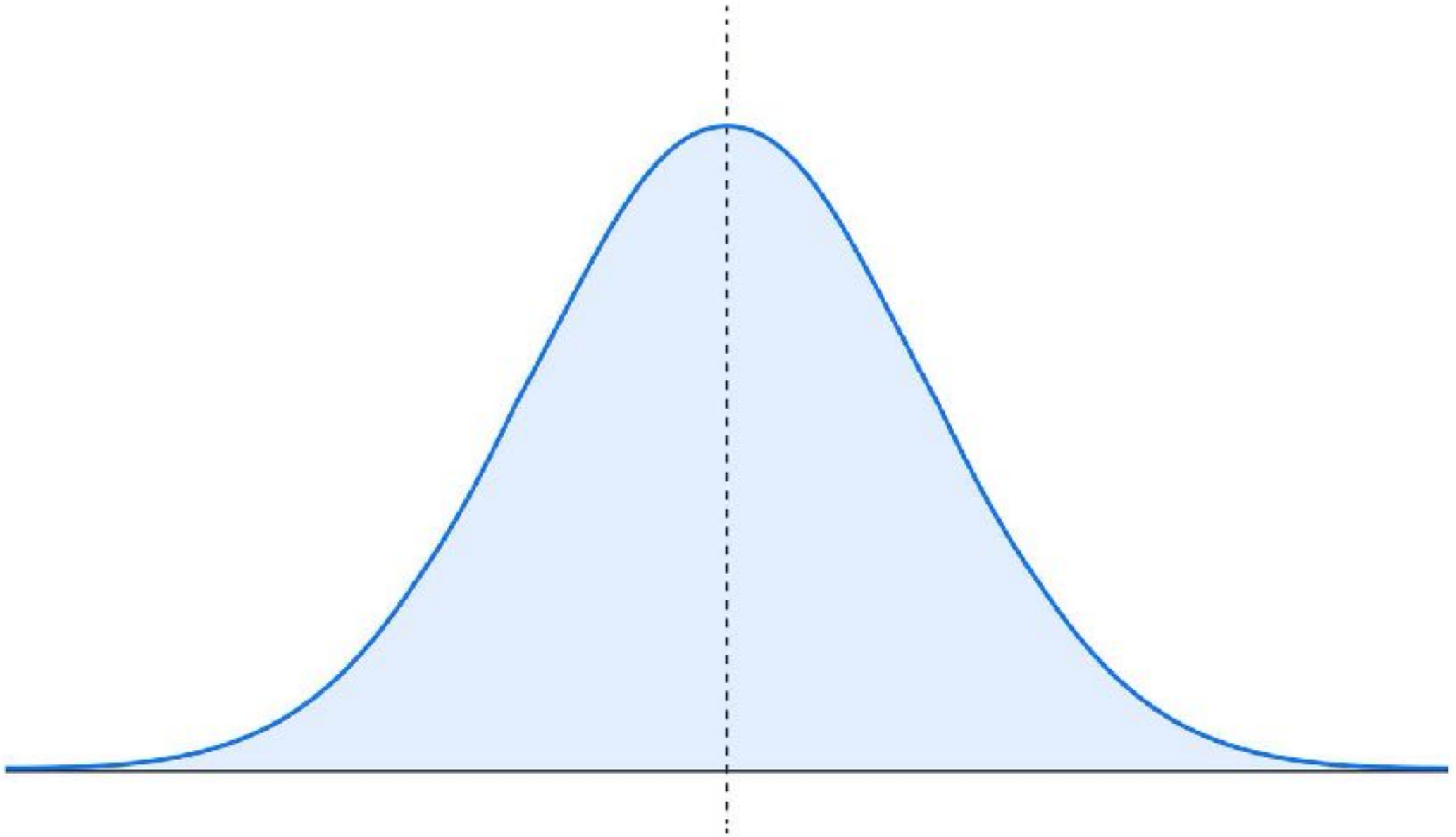


Percentile

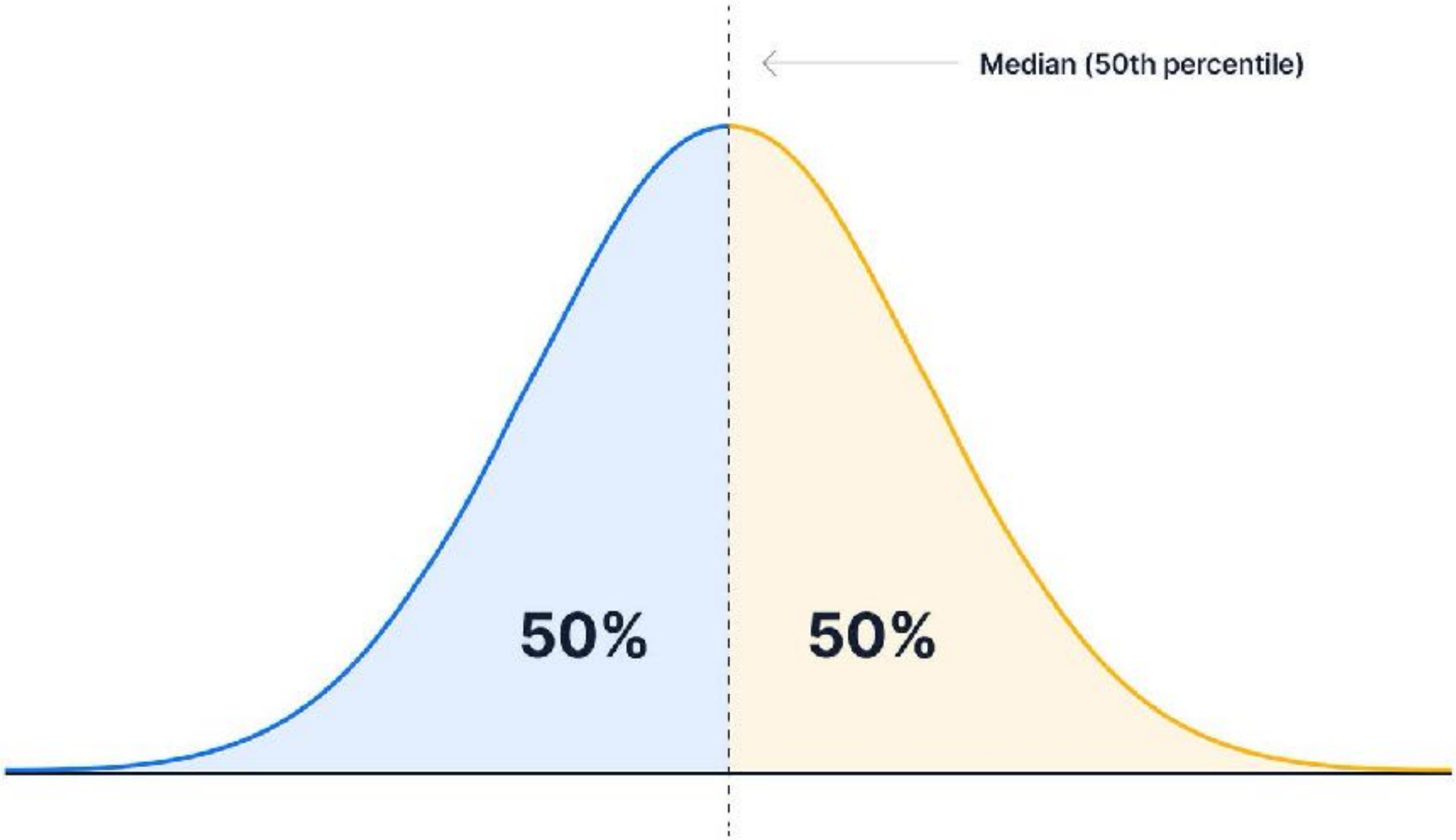
Measure used in statistics to indicate the relative standing of a value within a dataset.

It represents the **percentage of values** in the data that are below a certain point.

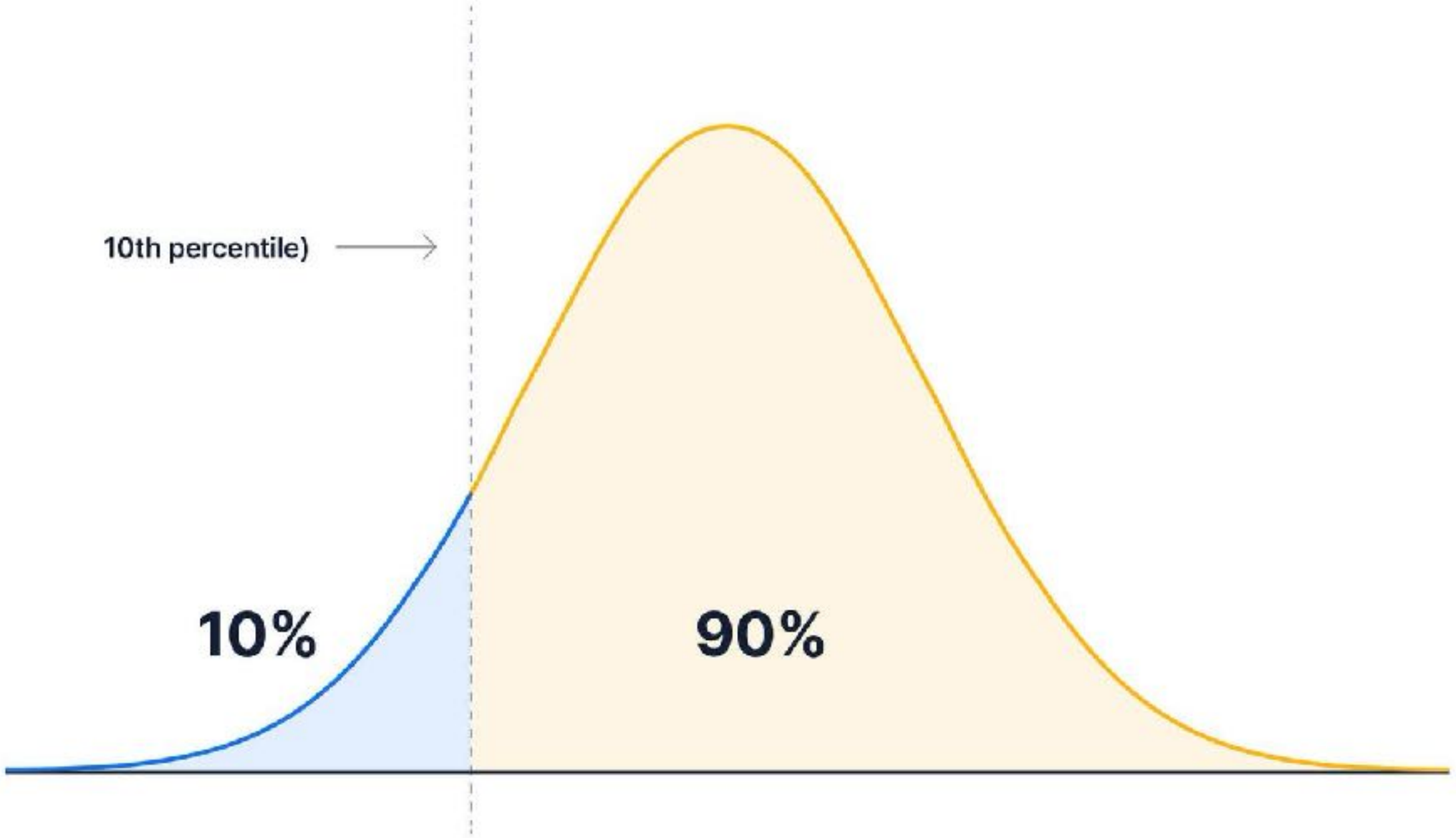
Normal distribution



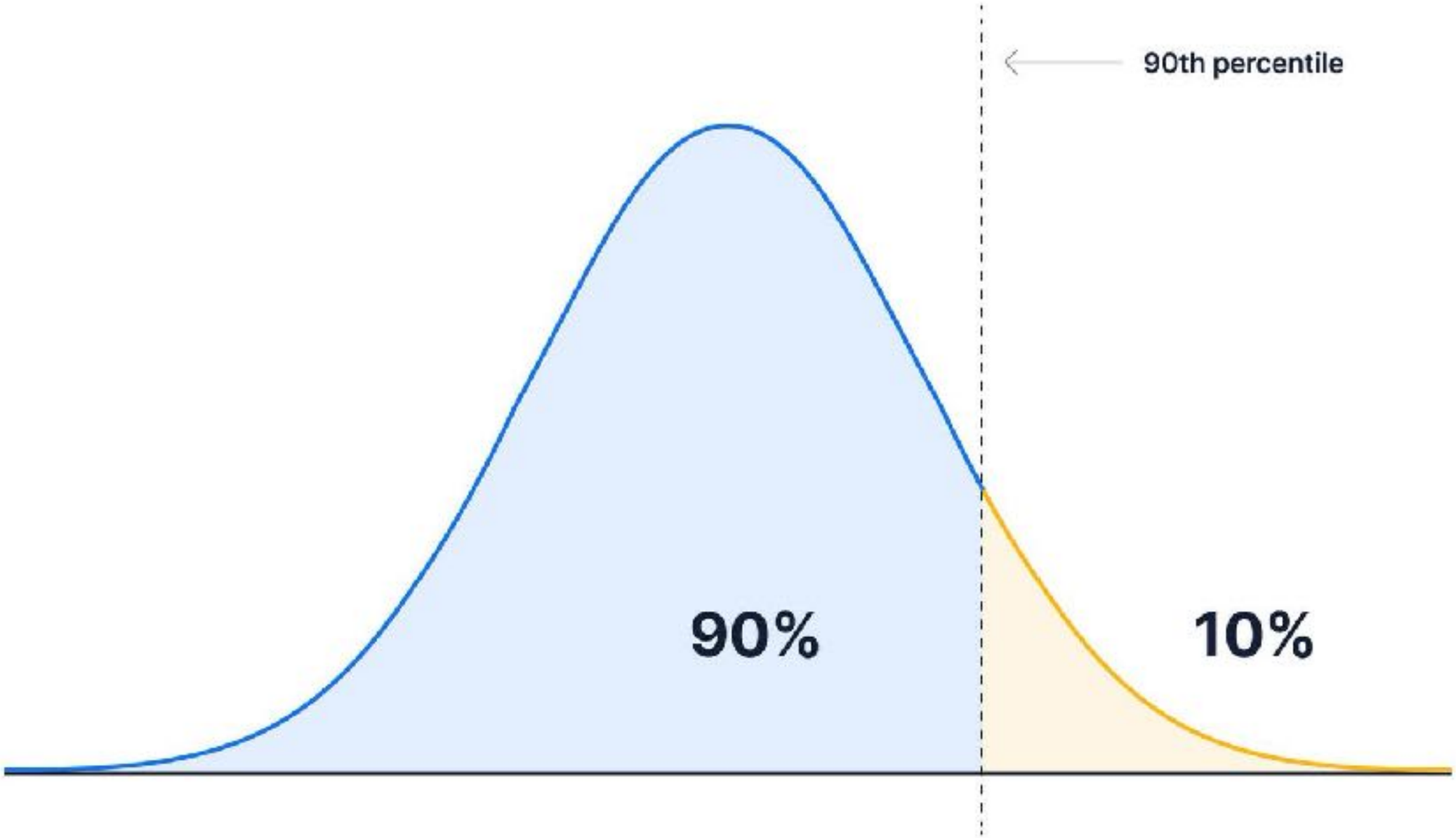
50th percentile



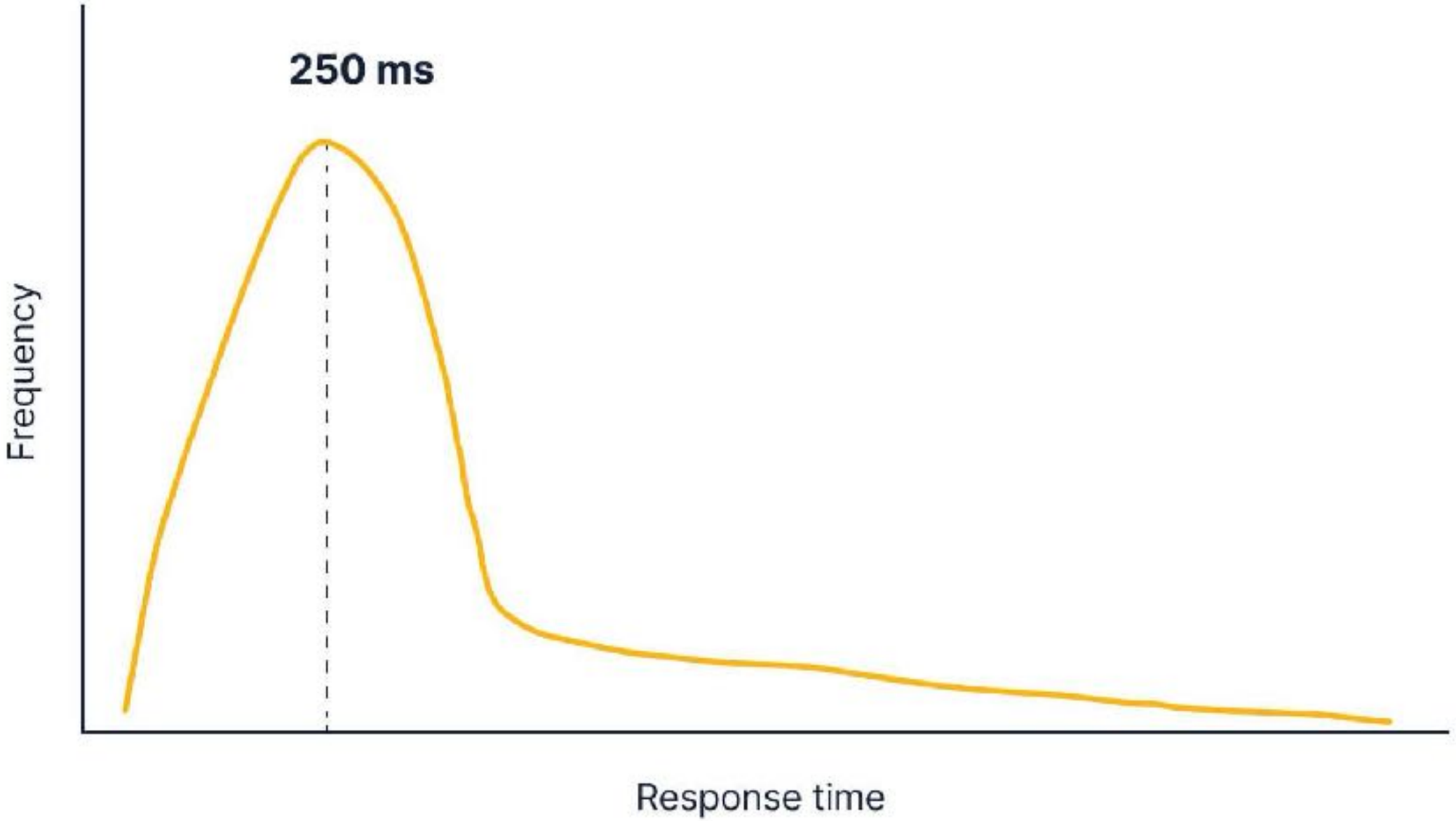
10th percentile



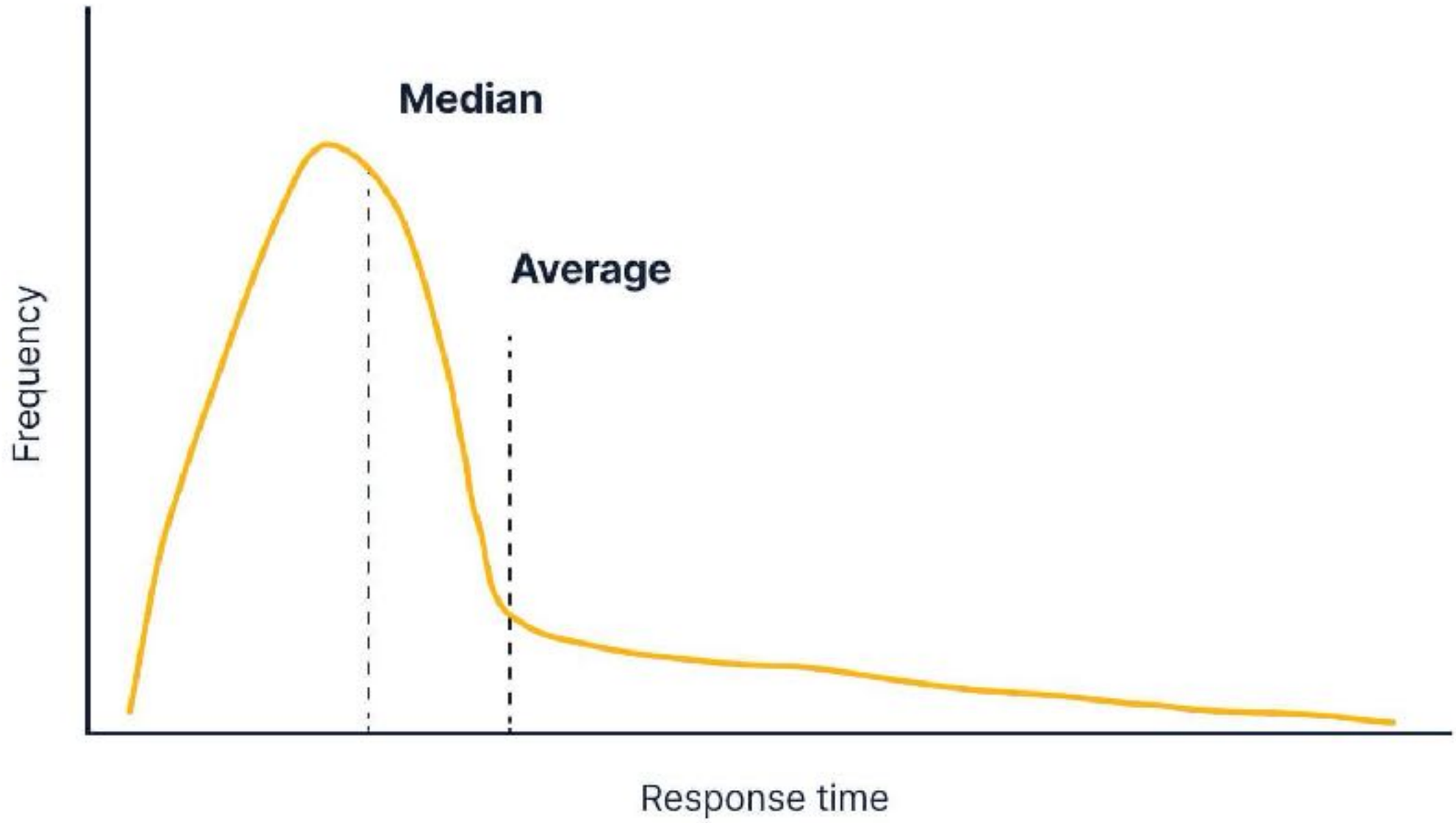
90th percentile



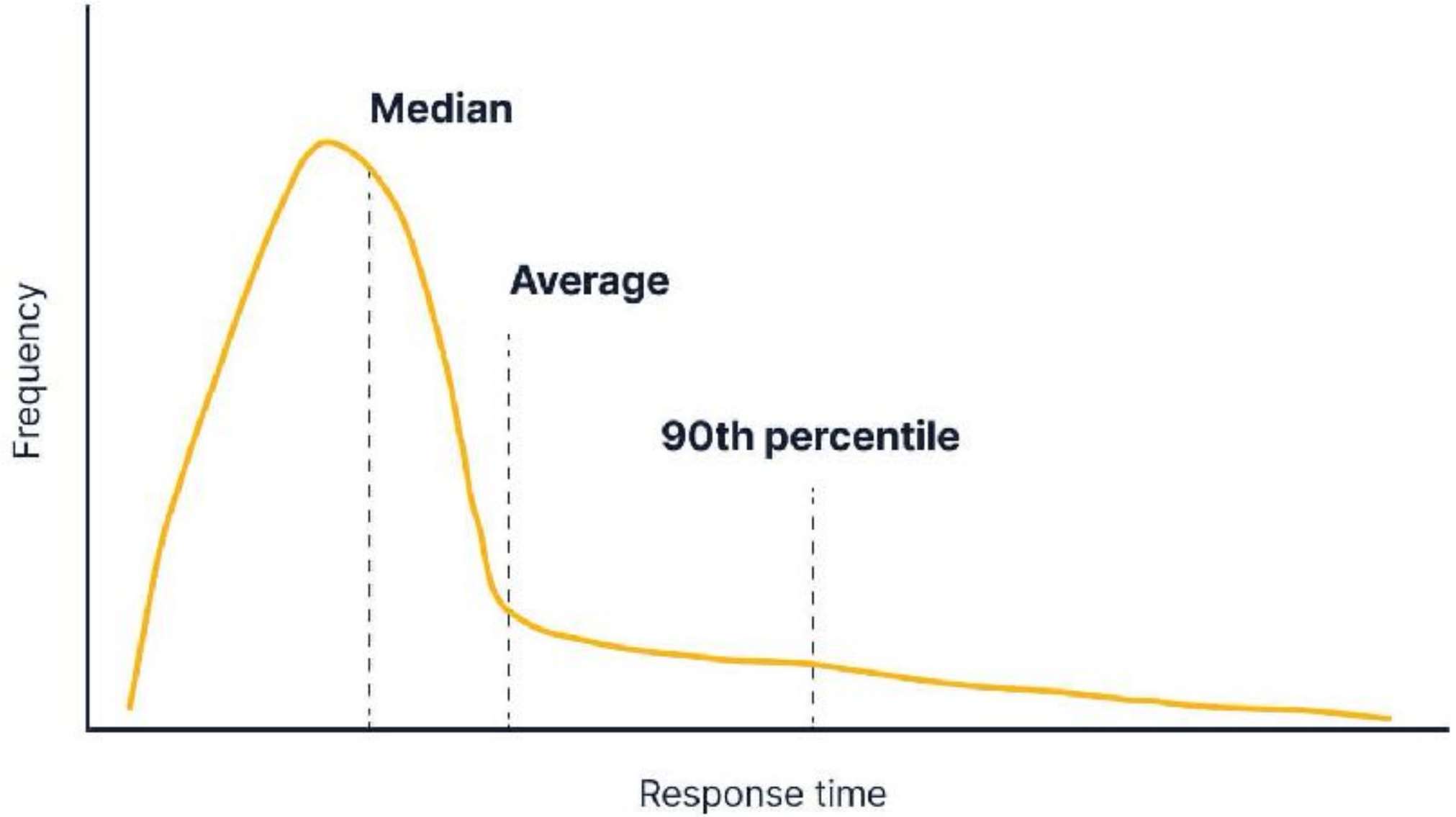
Long tails (1)



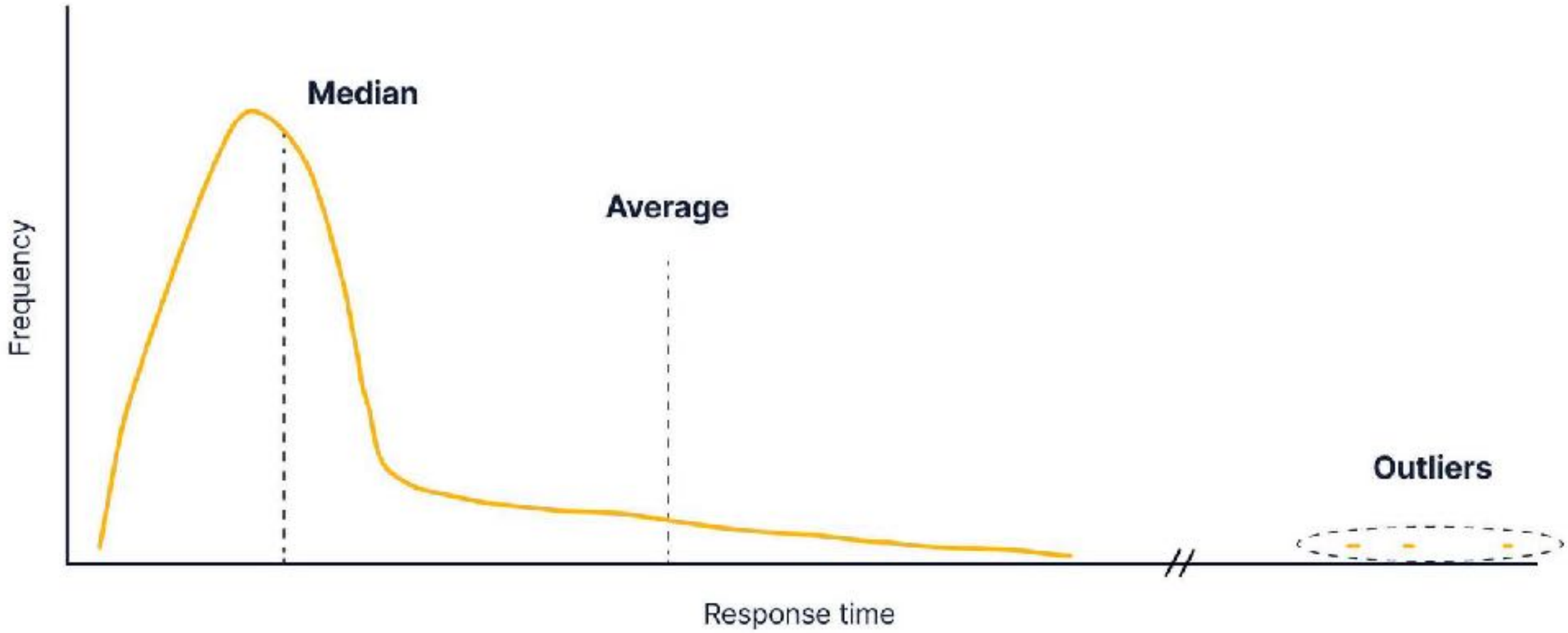
Long tails (2)



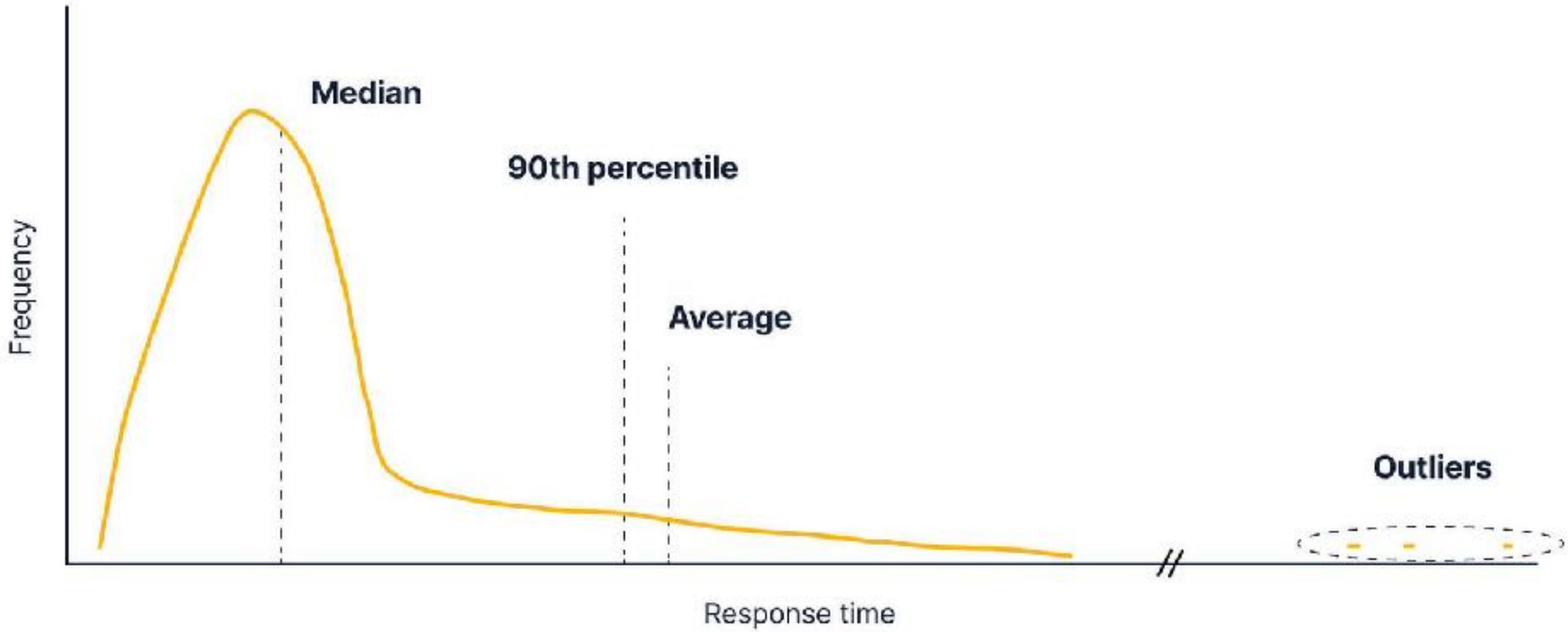
Long tails (2)



Long tails with outliners



Long tails with outliners



Workshop

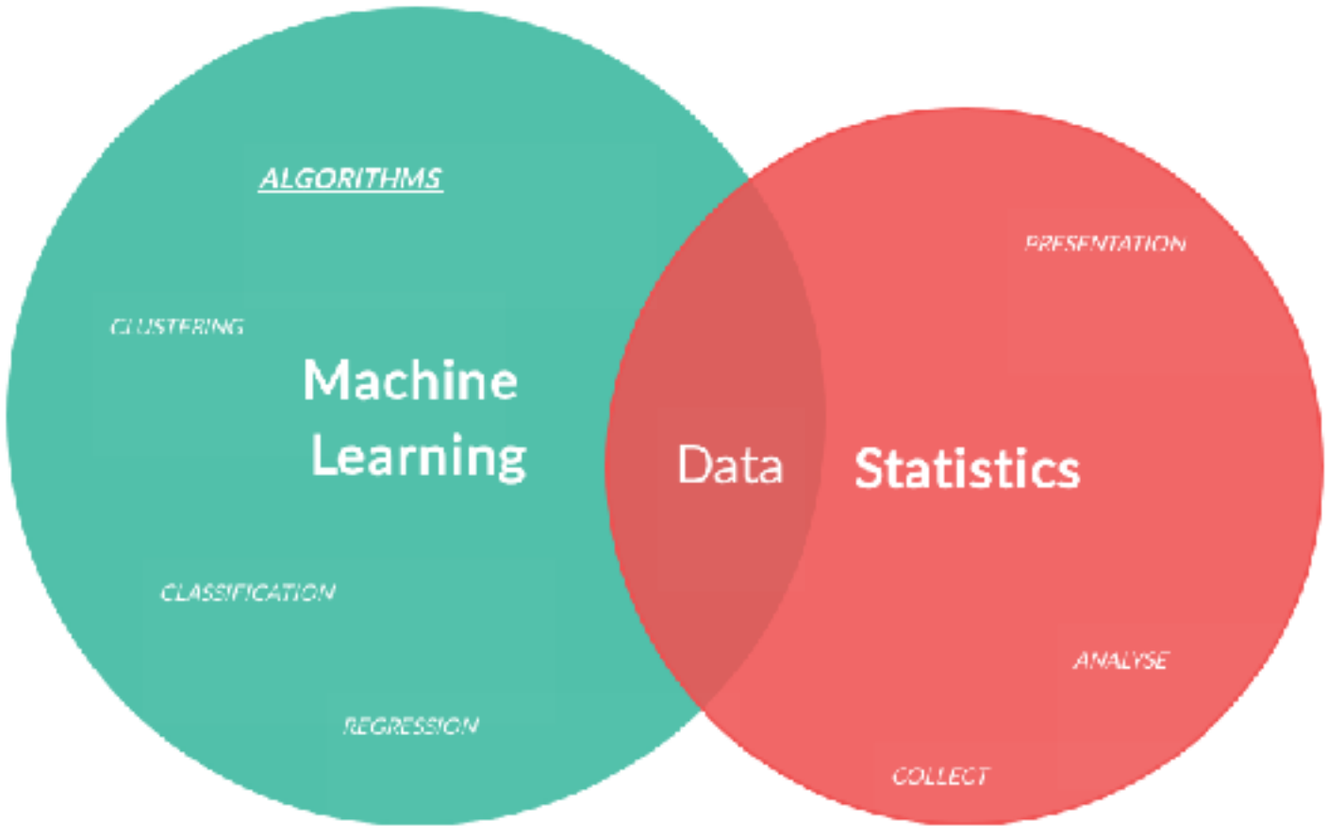
Business Intelligence (BI) and Visualization

Data visualization

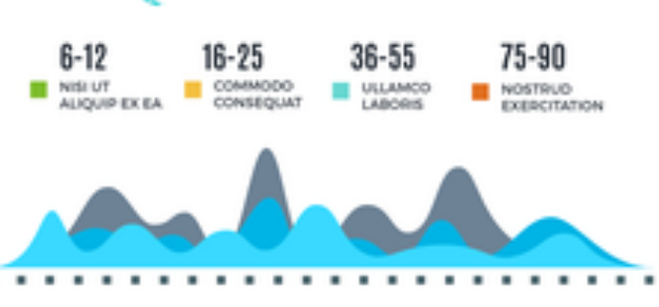
Data visualization is a method that uses **visuals**,
both static and interactive,
to help people **understand**
the large amount of data being collected.

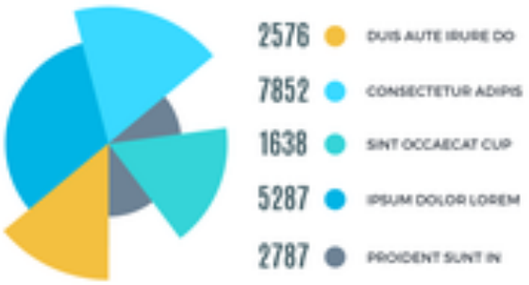
Data visualization

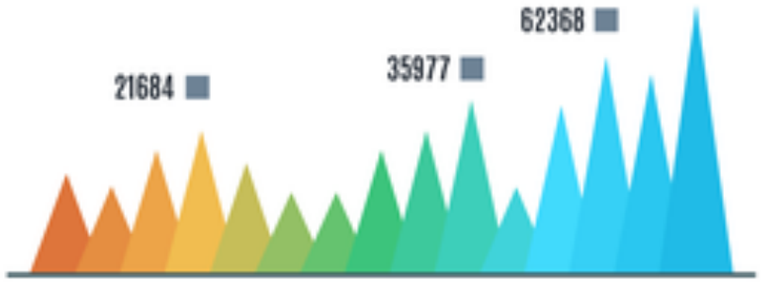
Data visualization is an **important skill** in applied statistics and machine learning.

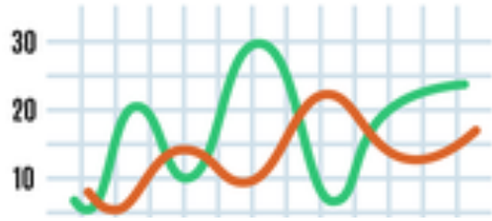


Data visualization

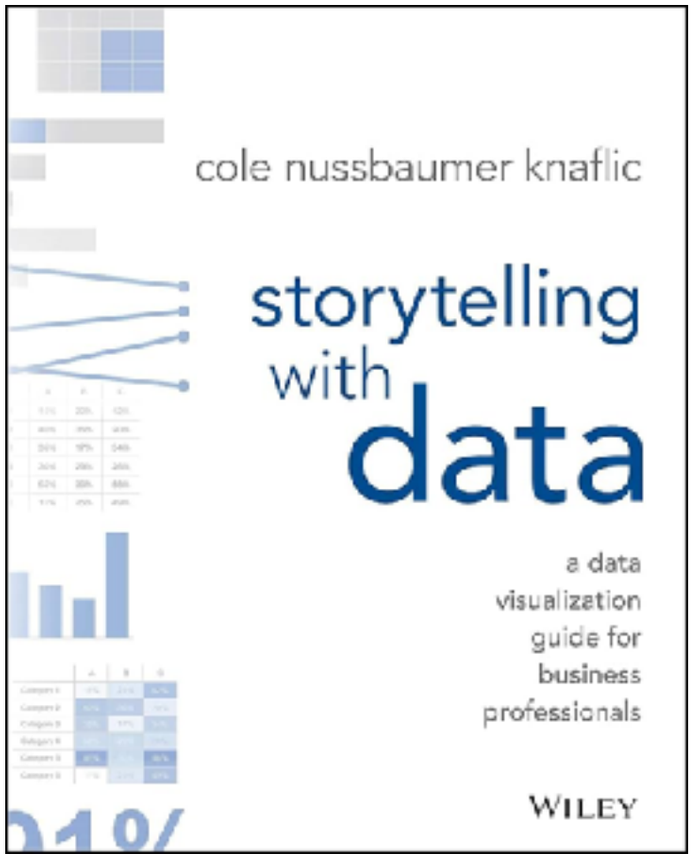


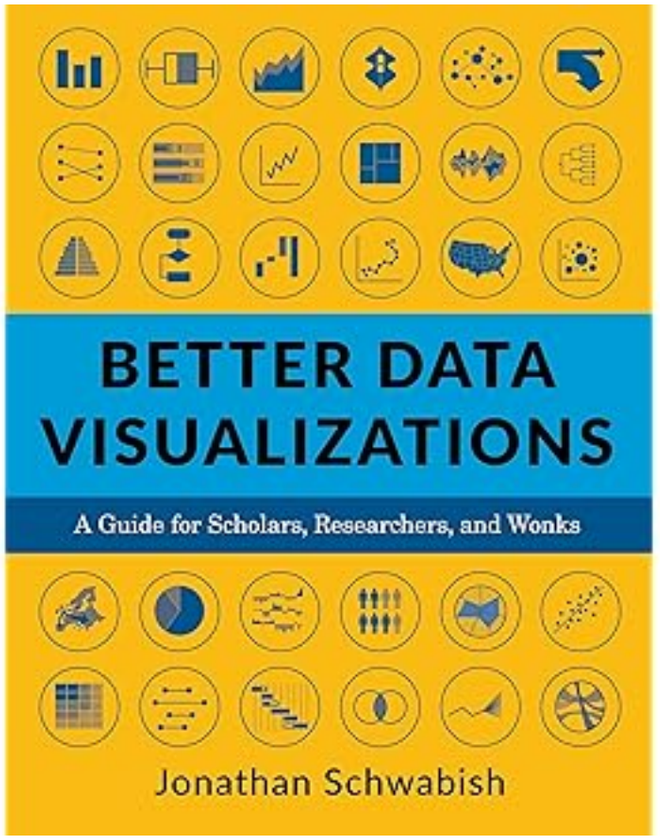


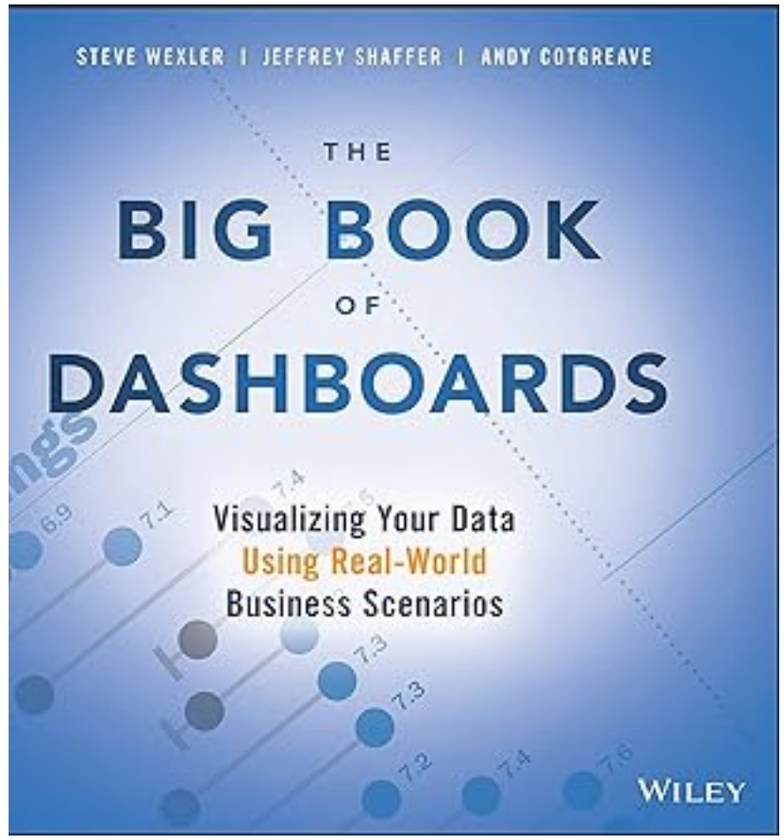




Books







Data visualization process

1
Collecting data

2
Clean you data

3
Choose a chart type

4
Prepare data

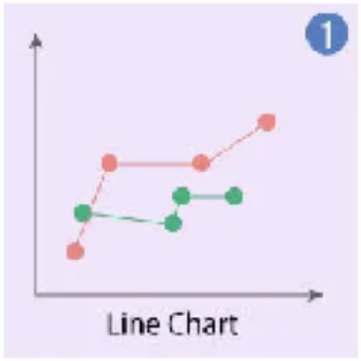
5
Visualize data

6
Presentation

How to choose a chart type ?

Before choosing a visual chart or graph,
it is important to understand your **audience**

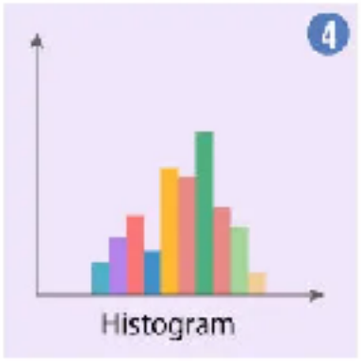
TYPES OF DATA VISUALIZATION CHARTS



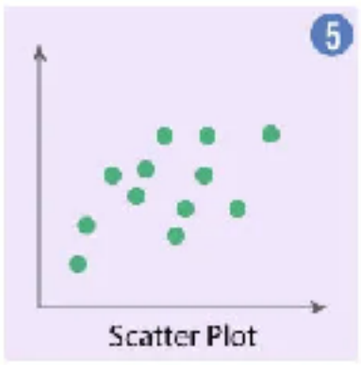
Display trends over time

A line chart with areas below the lines filled with colors

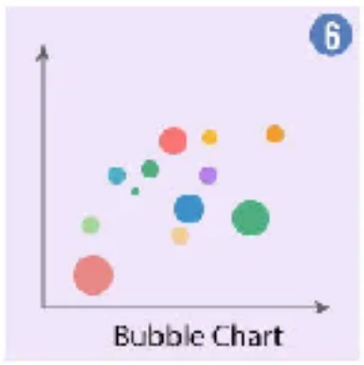
Display trends with multiple variables



Display the shape and spread of continuous dataset samples



Show correlation in a dataset



Show and compare the relationship between the labelled circles

Show the contribution of data point inside a whole dataset

Visualize the distance between intervals

Show data with location as a variable

Show magnitude of a phenomenon

Key Concepts in Data Visualization

Data Representation

Clarity

Context

Accuracy

Color Theory

Storytelling

Interactivity

Workshop

Q/A