1️⃣ WHAT IS A VARIABLE?

🔹 Professional Definition

A **variable is a characteristic, attribute, or quantity that can take different values across different observations in a dataset.**

🔹 Simple Explanation

Variable matlab:

Koi bhi aisi cheez jo change ho sakti hai

Matlab jiska value same nahi rehta.

🔹 Examples

Student	Age	Height	Marks
A	20	5.5	80
B	22	5.8	75

Yaha:

Age → Variable
Height → Variable
Marks → Variable

Kyuki sabke values different hain.

🔹 Data Science Definition (Advanced)

In Data Science,

Variables are the features or attributes used to analyze patterns and build predictive models.

Also called:

- Features (Machine Learning)
- Attributes
- Columns (Dataset)

🔹 Real Life Data Science Example

Placement Dataset:

Student	CGPA	Internship	Package

Variables are:

CGPA
Internship
Package

These variables are used to predict placement.

2️⃣ TYPES OF VARIABLES

Variables are mainly divided into:

1. Quantitative Variable
2. Qualitative Variable

3️⃣ QUANTITATIVE VARIABLES (Numerical Variables)

🔹 Professional Definition

Quantitative variables are variables that represent numerical values and can be measured mathematically.

🔹 Simple Explanation

Jo numbers me hota hai.

🔹 Examples

Age
Salary
Marks
Height
Weight

🔹 Data Science Example

Salary Prediction Model:

Input variables:

Experience
Age

Output variable:

Salary

Quantitative Variables are further divided into:

1. Discrete Variable
2. Continuous Variable

4️⃣ DISCRETE VARIABLE

🔹 Professional Definition

A discrete variable is a quantitative variable that can take only specific, separate, countable values.

🔹 **Simple Explanation**

Count kar sakte hain.

Decimal me nahi hota.

🔹 **Examples**

Number of students = 50

Number of cars = 10

Number of employees

🔹 **Invalid Example**

Students = 25.5

Not possible.

🔹 **Data Science Example**

Number of products sold

Number of website visitors

5️⃣ CONTINUOUS VARIABLE

🔹 **Professional Definition**

A continuous variable is a quantitative variable that can take any value within a range, including decimal values.

🔹 **Simple Explanation**

Measure karte hain.

Decimal me hota hai.

🔹 **Examples**

Height = 5.7 feet

Weight = 60.5 kg

Temperature = 36.8°C

🔹 **Data Science Example**

House price prediction

Temperature prediction

Stock price

6️⃣ QUALITATIVE VARIABLE (Categorical Variable)

🔹 **Professional Definition**

Qualitative variables represent non-numerical categories or labels describing characteristics.

🔹 **Simple Explanation**

Categories me hota hai.

Number nahi hota.

🔹 **Examples**

Gender:

Male
Female

City:

Ahmedabad
Mumbai

Color:

Red
Blue

🔹 **Data Science Example**

Spam Detection:

Spam
Not Spam

Disease Prediction:

Positive
Negative

Qualitative Variables are further divided into:

1. Nominal Variable
2. Ordinal Variable

7️⃣ NOMINAL VARIABLE

🔹 Professional Definition

Nominal variable is a categorical variable with no inherent order.

🔹 Simple Explanation

Order nahi hota.

🔹 Examples

Gender

Religion

City

Blood Group

Order ka koi meaning nahi.

Male > Female ❌

Invalid

8️⃣ ORDINAL VARIABLE

🔹 Professional Definition

Ordinal variable is a categorical variable with meaningful order but without fixed numerical difference.

🔹 Simple Explanation

Order hota hai.

But exact difference pata nahi hota.

🔹 Examples

Education level:

Primary
Secondary
Graduate
Postgraduate

Customer Rating:

Poor
Average
Good
Excellent

🔹 **Data Science Example**

Customer Satisfaction Analysis

9️⃣ Summary Table (Very Important)

Variable Type	Example
Quantitative	Salary
Discrete	Number of students
Continuous	Height
Qualitative	Gender
Nominal	City
Ordinal	Rating

🔟 Role of Variables in Data Science (Masters Level)

Variables are used as:

Input Variables → Independent Variables

Output Variable → Dependent Variable

Example:

Predict Salary

Input:

Experience
Education

Output:

Salary

1️⃣1️⃣ Machine Learning Terminology Connection

Statistics Term → ML Term

Variable → Feature

Output Variable → Target Variable

Dataset → Training Data

1️⃣2️⃣ Real Dataset Example

Student Placement Dataset:

Variable	Type
Age	Quantitative
CGPA	Continuous
Gender	Nominal
Rating	Ordinal
Package	Continuous