

# Day 4 – Variables, Data Types & Operators(Python Basics for AI Engineer)

## **==> Why Day 4 is EXTREMELY Important**

Before AI, ML, or GenAI models:

 **We must know how to store data and operate on it**

Everything in AI depends on:

- Variables → store data
- Data Types → define data nature
- Operators → perform logic & math

 No variables → no data

 No data types → errors

 No operators → no computation

This is the **foundation of all programming.**

## 4.1. Variable

### ==> 2. What is a Variable?

#### Definition ==>

A **variable** is a name given to a memory location that stores data.

-- > Simple words:

**Variable = container (box) that holds value**

#### ==> Real-Life Example

- Name = "Ramakant"
- Age = 22
- Salary = 50000

Just like:

- A bottle holds water
- A variable holds data

#### ==> Syntax (How to Create Variable)

variable\_name = value

#### ==> Example

```
name = "Ramakant"
```

```
age = 22
```

```
height = 5.9
```

#### ==> Rules for Defining Variables

##### --> Allowed

- Letters (a–z, A–Z)
- Numbers (after letters)
- Underscore (\_)

##### --> Not Allowed

- Starting with number
- Special symbols (@, #, \$)
- Python keywords

#### ==> Invalid Examples

```
1name = "Amit"    # X
```

```
my-name = "Amit" # X  
for = 10      # X keyword
```

### => Valid Examples

```
student_name = "Amit"  
student1 = 101  
_age = 22
```

### => Why Variables Are Needed

- Store user input
- Store model data
- Store predictions
- Store configuration values

--> Every AI program uses **thousands of variables**

## 4.2. Data Types

### ==> What are Data Types?

#### --> Definition

Data types define the type of value stored in a variable.

Python needs to know:

- Is it number?
- Is it text?
- Is it collection?

### --> Built-in Data Types in Python

#### 1 Integer (int)

Whole numbers

```
x = 10
```

```
y = -5
```

**Use case:**

- Age
- Count
- Quantity

#### 2 Float (float)

Decimal numbers

```
price = 99.99
```

```
accuracy = 0.89
```

**Use case:**

- ML accuracy
- Loss values
- Measurements

#### 3 String (str)

Text data

```
name = "Python"
```

```
message = "AI Engineer"
```

**Use case:**

- NLP
- Chatbots
- User input

## **4 Boolean (bool)**

True or False

```
is_active = True  
is_logged_in = False
```

**Use case:**

- Conditions
- Model decisions

### **--> Check Data Type**

```
x = 10  
print(type(x))
```

Out : int

## **--> Collection Data Types**

### **5 List (list)**

Ordered & changeable

```
marks = [80, 85, 90]
```

**Use case:**

- Dataset rows
- ML features

### **6 Tuple (tuple)**

Ordered & immutable

```
coordinates = (10, 20)
```

**Use case:**

- Fixed values
- Model configurations

### **7 Set (set)**

Unordered & unique

```
unique_ids = {1, 2, 3}
```

**Use case:**

- Remove duplicates
- Feature uniqueness

### **8 Dictionary (dict)**

## Key-value pairs

```
student = {  
    "name": "Amit",  
    "age": 21,  
    "marks": 85  
}
```

### Use case:

- JSON data
- API responses
- AI model inputs

## 7. Type Conversion (Very Common in AI)

```
age = "22"  
age = int(age)  
Out: 22  
-- > Required when:  
    • Reading user input  
    • Loading CSV data
```

## 4.3 Operators

### --> What are Operators?

#### Definition

Operators perform operations on variables and values.

Without operators:

- ✗ No calculation
- ✗ No comparison
- ✗ No logic

### --> Arithmetic Operators

```
a = 10  
b = 3  
print(a + b) # Addition  
13  
print(a - b) # Subtraction  
7  
print(a * b) # Multiplication  
30  
print(a / b) # Division  
3.33  
print(a // b) # Floor division  
3  
print(a % b) # Modulus  
1  
print(a ** b) # Power  
1000
```

#### --> AI Use:

- Loss calculation
- Feature scaling
- Optimization

### --> Assignment Operators

```
x = 5  
x += 2 # x = x + 2
```

Used in:

- Loops

- Counters
- Training steps

## --> Comparison Operators

a = 10

b = 5

a > b

a == b

a != b

### AI Use:

- Threshold checks
- Accuracy evaluation

## --> Logical Operators

(age > 18) and (is\_logged\_in == True)

### AI Use:

- Decision making
- Rule-based systems

## --> Membership Operators

"a" in "data"

### Used in:

- NLP
- Text search