Chapter 7: Modelling – Class 10 Artificial Intelligence

✅ Introduction

In Artificial Intelligence (AI), modelling is the process of creating a **mathematical or logical representation** of real-world scenarios to help machines learn patterns, make predictions, or take decisions. Just like humans create mental models to understand and solve problems, AI systems build models using data.

Modelling is one of the most crucial steps in AI development. Without it, an AI system cannot "learn" or "predict" effectively. This chapter introduces the basics of AI modelling, how data is used to train models, and the different types of models that exist.

📑 7.1 What is Modelling?

Modelling refers to the process of:

- **Collecting data**
- **Analyzing patterns**
- **Building a logic or mathematical structure**
- **Training the machine to recognize or predict outcomes**

In simple terms, it is like training a student using various examples (data), so they can solve similar problems on their own later (prediction or classification).

📌 Example:

Suppose you want to build a model to identify whether a fruit is an apple or an orange. You provide the machine with **features** (data) like:

- Color
- Weight
- Shape

Using this data, the machine learns how apples differ from oranges and can later predict new fruits correctly.

📑 7.2 Importance of Modelling in AI

- **Basis of AI Learning**: Models allow machines to learn from experience.
- **Prediction Making**: Helps machines make future predictions based on past data.

- **Automation**: Enables AI to perform tasks without human intervention.
- **Decision Making**: Assists in intelligent decisions using historical data.

📑 7.3 Types of Modelling

There are **two major types** of modelling used in AI:

◈ A. Descriptive Modelling

- Describes the **past data** and finds patterns or structures within it.
- Focuses on **data exploration**, not prediction.
- Often used in **clustering**, **market segmentation**, and **pattern discovery**.

◈ B. Predictive Modelling

- Focuses on **predicting future outcomes** based on past data.
- Requires a dataset with **input features** and **target labels**.
- Examples: Predicting house prices, diagnosing diseases, spam detection.

📑 7.4 Components of AI Modelling

☐ 1. Data

The foundation of every model. It includes:

- **Input features** (independent variables)
- **Labels/output** (dependent variable in supervised learning)

☐ 2. Algorithm

The mathematical method or formula used to train the model. Examples:

- Linear Regression
- Decision Trees
- K-Nearest Neighbours (KNN)
- Support Vector Machines (SVM)

☐ 3. Model

The outcome of applying an algorithm on data. It is now capable of:

- Recognizing patterns
- Making predictions or classifications

☐ 4. Training and Testing

- **Training**: Feeding the model with known data to learn.

- **Testing**: Checking model's performance on unseen data.

📑 7.5 Supervised vs Unsupervised Learning (in Context of Modelling)

Feature	Supervised Learning	Unsupervised Learning
Input Data	Labeled	Unlabeled
Goal	Prediction/classification	Grouping/clustering
Example Algorithms	Decision Trees, SVM, KNN	K-Means, Hierarchical Clustering
Use Case	Spam detection, sentiment analysis	Customer segmentation

📑 7.6 Common AI Models Used in Modelling

Model Type	Description
Linear Regression	Predicts numeric values using a straight line
Logistic Regression	Used for binary classification problems
Decision Tree	A flowchart-like structure used for decisions
K-Nearest Neighbors (KNN)	Classifies data based on closest examples
Neural Networks	Mimics human brain structure for deep learning

📑 7.7 Steps in AI Modelling Process

Step 1: **Problem Identification**

Understand what you want to solve or predict.

Step 2: **Data Collection**

Gather relevant and clean data.

Step 3: **Data Preprocessing**

Clean, normalize, and prepare data for training.

Step 4: **Model Selection**

Choose an appropriate model/algorithm.

Step 5: **Training**

Feed the data into the model and let it learn.

Step 6: **Testing and Evaluation**

Check how accurately the model performs on new/unseen data.

Step 7: **Deployment**

Use the trained model in real-world applications.

📋 7.8 Challenges in Modelling

- **Poor quality data**
- **Overfitting or underfitting**
- **Insufficient training data**
- **Wrong algorithm choice**
- **Bias in dataset**

📋 7.9 Real-Life Applications of Modelling

- **E-commerce**: Product recommendation
- **Banking**: Fraud detection
- **Healthcare**: Disease diagnosis
- **Transportation**: Route optimization
- **Education**: Personalized learning

⮐ Summary

Modelling is a key step in AI that involves using data and algorithms to create intelligent systems. It enables machines to learn from the past and make decisions or predictions. Understanding different types of models and how to train and evaluate them is critical for building successful AI solutions.

✦ Key Takeaways:

- Modelling involves training machines to understand and act on data.
- There are two major types: Descriptive and Predictive.
- Proper modelling needs clean data, right algorithms, and evaluation.
- Real-world AI systems like recommendation engines, voice assistants, and diagnostic tools are all based on modelling.