Chapter 2: AI Project Cycle

Introduction

Artificial Intelligence (AI) doesn't just happen. Behind every smart assistant, chatbot, or self-driving feature lies a structured and logical process of development called the **AI Project Cycle**. This cycle helps teams of developers, data scientists, and engineers build intelligent systems step by step, from identifying a problem to deploying and improving the solution.

In this chapter, we will explore the **5 essential stages** of the AI Project Cycle:

1. Problem Scoping
2. Data Acquisition
3. Data Exploration
4. Modelling
5. Evaluation

Each of these stages plays a crucial role in ensuring the AI system is effective, accurate, and beneficial for its intended use.

2.1 Problem Scoping

Definition:

Problem Scoping means understanding the problem you want to solve and defining its boundaries clearly.

Steps in Problem Scoping:

- **Understand the Problem:** What exactly are you trying to solve? Example: Traffic congestion, customer complaints, product recommendations.
- **Define the Goal:** What do you want the AI system to do? Classify, predict, recommend?
- **Identify Stakeholders:** Who will benefit from the solution? (e.g., customers, employees, society)
- **Create a Problem Statement:** A brief, clear sentence summarizing the issue and the intended AI solution.

Tools Used:

- SWOT Analysis (Strengths, Weaknesses, Opportunities, Threats)
- 4Ws Canvas (What, Why, Where, Who)

2.2 Data Acquisition

Definition:

This stage involves collecting the **right kind** and **amount** of data that is required for your AI project.

Types of Data:

- **Structured Data:** Organized data like tables, spreadsheets.
- **Unstructured Data:** Images, audio, videos, free text.

Sources of Data:

- Surveys, sensors, social media, government/public datasets, company databases, etc.

Considerations:

- Data must be **relevant**, **accurate**, and **ethical**.
- Ensure **privacy laws** and **consent** where required.

2.3 Data Exploration

Definition:

Data Exploration means analyzing the data you collected to find useful patterns, clean errors, and understand the data deeply.

Key Tasks:

- **Cleaning Data:** Removing missing, duplicate, or incorrect entries.
- **Visualization:** Charts, graphs, and tables to understand trends.
- **Statistical Analysis:** Mean, median, mode, standard deviation, etc.
- **Feature Selection:** Choosing the most useful variables (features) for modelling.

Why it's Important:

If your data is poor, your AI model will also perform poorly. This step ensures your dataset is ready for training.

2.4 Modelling

Definition:

Modelling is the stage where you **train an AI model** using your prepared data so that it can learn to make predictions or decisions.

Steps in Modelling:

- **Select an Algorithm:** Choose from Decision Trees, Neural Networks, etc.
- **Train the Model:** Feed the model with training data so it can learn.
- **Test the Model:** Use a small portion of data to see how well it performs.

Types of AI Models:

- **Classification Models:** Categorize data into classes (e.g., spam vs. not spam)
- **Regression Models:** Predict continuous values (e.g., house prices)
- **Clustering Models:** Group similar items together (e.g., customer segmentation)

2.5 Evaluation

Definition:

Once a model is built, it must be tested to see how well it performs. This is done during the Evaluation phase.

Metrics Used:

- **Accuracy:** How often the model gives correct predictions.
- **Precision and Recall:** How well it identifies true cases and avoids false ones.
- **Confusion Matrix:** A table showing true positives, false positives, etc.

Why it's Important:

A model might work well in the lab but fail in real life. Evaluation helps ensure reliability before deployment.

Real-Life Example: AI in Healthcare

Let's say you want to develop an AI model to detect whether a patient has pneumonia from an X-ray.

- **Problem Scoping:** Identify pneumonia detection as the goal.
- **Data Acquisition:** Collect X-ray images and diagnoses from hospitals.
- **Data Exploration:** Clean and analyze images for quality and patterns.
- **Modelling:** Use a Convolutional Neural Network (CNN) to classify X-rays.
- **Evaluation:** Check if predictions match doctors' diagnoses accurately.

Summary

The **AI Project Cycle** provides a roadmap to building intelligent systems in a structured and successful way. Each phase—**Problem Scoping, Data Acquisition, Data Exploration, Modelling**, and **Evaluation**—is vital for building a reliable, ethical, and useful AI model. Skipping or rushing through any stage can result in poor performance, biased results, or even harmful consequences. By following this cycle, students and professionals alike can ensure their AI projects are well-planned and impactful.