

Chapter 7: AI Project Cycle

Introduction

Artificial Intelligence (AI) is not just about building intelligent systems but about solving real-world problems using data-driven models. To approach problems systematically, we follow a structured methodology known as the **AI Project Cycle**. This cycle is similar to software development cycles but focuses specifically on applying AI tools and techniques.

The **AI Project Cycle** enables students and professionals to build AI models step-by-step – from problem identification to deployment – ensuring clarity, collaboration, and effective implementation. Understanding this cycle is crucial for building successful AI projects in real-world applications.

7.1 What is the AI Project Cycle?

The **AI Project Cycle** is a 5-stage process used for developing AI-based solutions. These stages help in organizing work, refining the problem, collecting and cleaning data, training AI models, and finally testing and improving the results.

7.2 Phases of AI Project Cycle

The five main phases of the AI Project Cycle are:

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

Let's understand each phase in detail.

7.2.1 Problem Scoping

This is the **first and foundational step** of the AI Project Cycle. It involves identifying and defining the problem you want to solve.

Key Activities:

- Understand the **problem domain** (health, education, environment, etc.).
- Define the **AI problem clearly**.

- Identify the **goals** and what success looks like.
- Define the **stakeholders** – who is affected by this problem.
- Prepare a **problem statement** and list possible solutions.

Example:

If you're solving the problem of "water wastage in cities", scoping would include:

- What is the cause of wastage?
 - How can AI help?
 - What kind of data might be needed?
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7.2.2 Data Acquisition

Once the problem is clear, you need **relevant and quality data** to solve it.

Key Activities:

- Identify sources of data (surveys, sensors, internet, databases).
- Collect **raw data** from these sources.
- Ensure **data relevance** – data should match the problem.

Types of Data:

- **Structured data:** e.g., CSV files, tables.
- **Unstructured data:** e.g., images, audio, video.

Example:

For detecting water leakage, you might collect sensor data from water pipelines or usage data from household meters.

7.2.3 Data Exploration

This step involves **cleaning, analyzing, and visualizing** the data to understand its patterns and usability.

Key Activities:

- Remove irrelevant or noisy data (data cleaning).
- Handle **missing values**.
- Perform **statistical analysis** (mean, median, mode).
- Use **data visualization tools** to detect trends.

Tools Used:

- Excel
- Python libraries (like Pandas, Matplotlib)
- Google Sheets

Example:

You might discover that water leakage increases during night hours – this insight will help build better models.

7.2.4 Modelling

In this stage, you create and train an **AI model** using the explored data.

Key Activities:

- Choose the **right algorithm** (depending on data and problem).
- Train the model using the dataset.
- Test the model with test data.
- Fine-tune the model for better accuracy.

Types of Models:

- **Supervised Learning:** With labeled data (e.g., spam email classification).
- **Unsupervised Learning:** Without labels (e.g., customer segmentation).
- **Reinforcement Learning:** Learn by feedback (e.g., game-playing bots).

Example:

You might train a model to detect unusual water usage patterns that suggest leakage.

7.2.5 Evaluation

This is the **final stage**, where you assess how well your model is performing.

Key Activities:

- Evaluate using **accuracy, precision, recall, and F1-score**.
- Identify **errors or biases** in the model.
- Improve performance by **retraining** or refining the model.
- Validate if the model meets the original problem scope and success criteria.

Example:

If the model can correctly detect 95 out of 100 leakage incidents, it has a 95% accuracy.

7.3 Importance of AI Project Cycle

- Helps in **structured development** of AI solutions.
- Encourages **critical thinking** and **teamwork**.
- Ensures **reliable and ethical use** of AI.
- Makes it easier to **debug and improve** models.

7.4 Case Study Example (Optional)

Project: Reducing Food Wastage in School Canteens

1. **Problem Scoping:** Identify that canteens overproduce meals.
 2. **Data Acquisition:** Collect data on student attendance, meal preferences.
 3. **Data Exploration:** Analyze patterns in leftover food and attendance.
 4. **Modelling:** Build a predictive model to estimate the number of meals needed.
 5. **Evaluation:** Validate accuracy of meal prediction vs. actual wastage.
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Summary

The **AI Project Cycle** is a systematic and iterative process that helps in developing AI applications effectively. It consists of five essential stages:

1. **Problem Scoping** – Understanding what needs to be solved.
2. **Data Acquisition** – Gathering the necessary data.
3. **Data Exploration** – Cleaning and understanding the data.
4. **Modelling** – Building and training the AI model.
5. **Evaluation** – Checking how well the model performs.

Mastering this cycle ensures that AI solutions are not only **technically sound** but also **practically useful** and **ethically acceptable**.
