Chapter 4: Problem Scoping

Introduction

Before solving any problem using Artificial Intelligence (AI), it is essential to define the problem clearly. **Problem Scoping** is the first and most critical step in an AI project. It involves identifying, analyzing, and understanding the problem thoroughly before jumping into building models or collecting data.

Just like a doctor first diagnoses a patient before prescribing medicine, an AI developer must understand the nature, impact, and requirements of a problem before developing an AI-based solution.

This chapter will walk you through all the major steps involved in scoping a problem, including identifying the problem, understanding its scope, defining goals, stakeholders, constraints, and success criteria.

4.1 Understanding the Problem

AI projects aim to solve **real-world problems** using data and intelligent algorithms. But not every problem is suitable for AI.

To determine whether a problem is **AI-approachable**, we must ask:

- Can it be solved using data?
- Can patterns be learned from that data?
- Will AI improve the efficiency or accuracy of the solution?

Key Aspects to Understand:

- **Problem Statement**: A brief description of what needs to be solved.
- **Background**: Why is this problem important?
- **Current Solutions**: How is the problem being solved now?

4.2 Goals of Problem Scoping

The goals of problem scoping are:

1. **Define the real problem** (not just symptoms).
2. **Identify the users or stakeholders** affected.
3. **Set clear project goals** and objectives.
4. **List constraints** such as time, data availability, cost, etc.

5. **Determine success criteria** for measuring the solution.

4.3 Four Ws of Problem Scoping

To help students understand the problem better, CBSE introduces the **Four Ws Methodology**:

1. Who:

- Who are the stakeholders?
- Who is affected by the problem?
- Who will benefit from the solution?

2. What:

- What exactly is the problem?
- What impact does it have?
- What are its possible causes?

3. Where:

- Where does the problem occur?
- Is it limited to a specific area or is it global?

4. Why:

- Why is it important to solve this problem?
- Why hasn't it been solved yet?
- Why will AI be helpful here?

Using the Four Ws helps define the **problem boundaries** clearly and avoid working on vague or overly broad problems.

4.4 Problem Canvas

The **Problem Canvas** is a visual tool to structure and document the information gathered during problem scoping. It is divided into specific sections:

Section	Description
Problem Statement	What is the core problem?
Rationale	Why is this problem worth solving?
Stakeholders	Who are directly or indirectly affected?
Benefits	What benefits will the solution bring?
Potential Risks	What risks or challenges could arise?
Constraints	Limitations such as time, budget, data access, etc.

Section	Description
Success Criteria	What metrics will determine if the problem is solved?

The Problem Canvas ensures a **structured approach** to solving real-world problems and increases the chances of a successful AI solution.

4.5 Importance of Problem Scoping in AI Projects

- **Prevents time and resource wastage**.
- Helps in building **data-driven and user-centric** AI solutions.
- Ensures the problem is **feasible for AI**.
- Aligns team members and stakeholders on the project goal.
- Forms the foundation for further steps like data collection and modeling.

4.6 Case Study Example (Smart School Attendance System)

Problem Statement:

Manually marking attendance in schools is time-consuming and can be prone to errors or proxy attendance.

Using the Four Ws:

- **Who**: Teachers, students, school administration.
- **What**: Need to automate attendance.
- **Where**: In schools.
- **Why**: To save time, ensure accuracy, and prevent misuse.

Problem Canvas Summary:

- **Stakeholders**: Teachers, Students, School Management
- **Benefits**: Time-saving, accuracy, reduced proxy
- **Constraints**: Budget, availability of facial recognition data
- **Success Criteria**: 95%+ accurate face recognition, daily usage

This case study shows how to apply the Four Ws and Problem Canvas to a real-world AI project.

Summary

In this chapter, you learned about the **first and most crucial step of AI project development**—Problem Scoping. It ensures that you're solving the right problem using the right approach. You learned to apply the **Four Ws** (Who, What, Where, Why) and use the **Problem Canvas** as a tool

to define and organize the problem. With a well-scoped problem, AI solutions become more targeted, effective, and impactful.

✓ Key Takeaways:

- **Problem Scoping** is essential before building AI solutions.
- Ask **Who, What, Where, Why** to understand the problem better.
- Use a **Problem Canvas** to structure your problem.
- Clearly identify stakeholders, constraints, and success criteria.
- A well-scoped problem leads to a successful AI project.
