Problem Statement

Research Methodology in Computer Science
CSCI 514

A problem statement is a concise and concrete summary of the research problem you seek to address.

Components of the research statement:

- Contextualize the problem. What do we already know?
- Describe the exact issue your research will address. What do we still need to know?
- Show the relevance of the problem. Why do we need to know more about this?
- Set the objectives of the research. What will you do to find out more?

Step 1: Contextualize the Research Problem

- The problem statement should frame your research problem, giving some background on what is already known.

- Focus on concrete details
    - Where and when does the problem arise?
    - Who does the problem affect?
    - What attempts have been made to solve the problem?
    - What is already known about the problem?
    - How has the problem been defined and debated in the scholarly literature?

Step 2: Describe the Exact Issue your Research will Address

- The problem statement should clearly define the specific gap in knowledge, limitation in practice, or unresolved challenge that your research will tackle.
- Consider these guiding questions:
  - What *exactly* is not yet known, understood, or agreed upon?
  - What are the limitations or shortcomings of current approaches or understanding?
  - Is there a contradiction, controversy, or ambiguity in the existing literature?
  - Is there an underserved population or underexplored aspect of the topic?
  - Has the problem evolved in new contexts (e.g., due to technology, policy, or social change)?

Step 3: Show Why the Problem Matters

- The problem statement should also address the relevance of the research. Why is it important that the problem is addressed

- Consider the following questions
  - What will happen if the problem is not solved?
  - Does the problem have wider relevance? Are similar issues found in other contexts?
  - How will resolving the problem advance understanding of the topic?
  - What benefits will it have for future research?
  - Does the problem have direct or indirect consequences for society?

Step 4: Set the Research Aims and Objectives

- The problem statement should frame how you intend to address the problem.
- The research aim is the overall purpose of your research. It is generally written in the infinitive form:
  - The aim of this study is to **determine**…
  - This project aims to **explore**…
  - This research aims to **investigate**…
- The research objectives are the concrete steps you will take to achieve the aim:
  - This work will use surveys to collect…
  - Using statistical analysis, the research will measure…

What is Missing in This Problem Statement?

Artificial intelligence (AI) is widely used in many applications today, from social media to self-driving cars. However, there are some challenges related to AI, including bias in decision-making. Many AI models are unfair, and this is a serious issue. Some researchers have tried to fix this, but the problem still exists.

This research will study AI bias and try to make models more fair. It will look at existing methods and suggest some improvements. The goal is to make AI better and more ethical.

AI bias is an important issue because unfair AI can lead to problems in real life. Fixing AI bias will help make AI more useful and fair for everyone.

In-Class Activity

• Create a 2-3 paragraphs problem statement for this paper:

[Evaluating Large Language Models on Academic Literature Understanding and Review: An Empirical Study among Early–stage Scholars](#)

Project Deliverable 1

Some Good Resources

- http://libguides.usc.edu/writingguide/introduction/researchproblem

- https://www.editage.com/insights/the-basics-of-writing-a-statement-of-the-problem-for-your-research-proposal

- http://www.ceptara.com/blog/how-to-write-problem-statement