NCP 3205 - Quiz #1: Preliminaries

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Step 1: Identify a BROAD PROBLEM AREA

- **Practical Research Problem**
    - Breast cancer is the most diagnosed type of cancer globally and in the Philippines.
    - Breast cancer detection is mostly inaccessible and expensive.
    - Lack of advanced technologies involving AI and deep learning for early detection of breast cancer in the Philippines.
    - There are only a few publicly known Asian breast mammography datasets.

Step 2: Learn More About the Problem

Question #1: Answer the questions in “Context and Background” and “Specificity and Relevance”

Context and Background

1. **Who does the problem affect?**
    - Breast cancer affects millions globally and is more prevalent in women (Wilkinson & Gathani, 2022). With millions of recorded cases annually, it is stated to be the most common type of cancer to be diagnosed.

- In the Philippines, breast cancer is the leading type among cancer morbidity cases and is among the leading cause of cancer-related deaths in women (de Rosas-Valera et al., 2025).

2. **Has it been an issue for a long time, or is it a newly discovered problem?**
    - Breast cancer has been a long-standing health problem that continues to impact women worldwide. It became the most commonly diagnosed type of cancer globally, surpassing lung cancer around late 2020. With breast cancer being the most common cancer diagnosis in 157 out of 185 nations. By 2040, it is anticipated to rise to almost 40%, or 3 million cases yearly (Arnold et al., 2022).
3. **What research has already been done?**
    - Breast cancer research has been conducted all around the world, although the majority of discoveries and population samples have come from Western countries. Much of the research has focused on a variety of better, more effective techniques for identifying cancer at an early or nascent stage, before it has a significant impact on a person's life.
4. **Have any solutions been proposed?**
    - For breast cancer detection, the integration of AI and deep learning techniques in the screening process have been one of the solutions.
5. **What are the current debates about the problem, and what do you think is missing from them?**

    The current debates about breast cancer revolves around 3 things:
    - **Accuracy vs. Accessibility -** There is continuous discussion about whether AI-based diagnostic tools can match or outperform radiologists' accuracy, particularly in real-world clinical situations. While much research indicates excellent accuracy rates, skeptics contend that these results are frequently obtained from controlled contexts utilizing curated Western datasets, resulting in a significant contrast between the scenario and public hospital situations in developing nations.

- **Ethics, Biases, and Reliability of AI** - Another debate centers on algorithmic bias. AI models trained predominantly on Caucasian breast mammography datasets, which may not generalize well to Asian populations due to its anatomical and density differences. This raises concerns about fairness, misdiagnosis, and over-reliance on automated systems.
- **Cost and Implementation Barriers** - There is also discussion on whether AI truly lowers healthcare costs. While AI promises efficiency, the infrastructure, expertise and data requirements can be prohibitive for the low to middle income countries such as the Philippines.

There is a lack of a localized, population-specific approach.

- Asian breast mammography datasets, particularly those representing Filipino patients, are scarce.
- The lack of validation studies conducted in the Philippines.
- Public hospitals in the Philippines face significant limitations in resources, including equipment, personnel, and infrastructure.
- Frameworks that are useful for implementing AI tools in a sustainable manner rather than just experimentally.

Specificity and Relevance

1. **What particular place, time and/or people will you focus on?**
   - The study will be conducted in the National Capital Region (NCR), Philippines, focusing on women.
2. **What aspects will you not be able to tackle?**
   - The study will not concern other breast imaging modalities.
   - The datasets to be gathered will only include public hospitals within the National Capital Region (NCR), and other publicly available datasets within Asian countries.

- The study will only focus on implementing Convolutional Neural Networks (CNNs) in identifying breast cancer through Asian breast mammography datasets.

3. **What will be the consequences if the problem is not resolved?**
    - If the problem is not resolved, more breast cancer patients will suffer from delayed and false diagnosis.
4. **Whose will benefit from resolving the problem (e.g. the management of an organization or future researchers)?**
    - Hospitals and a significant portion of the Philippine population will benefit from resolving this problem.

Question #2: Create a NEW Specific RESEARCH PROBLEM

- Despite the high prevalence of breast cancer in the Philippines, particularly in the National Capital Region (NCR), early detection remains limited due to high screening costs, accessibility issues, and the lack of advanced diagnostic technologies. Existing AI- and deep learning–based breast cancer detection systems are largely developed using Western mammography datasets, which may not accurately represent Asian breast tissue characteristics. Furthermore, there is a scarcity of localized studies and datasets that evaluate the feasibility, performance, and sustainability of integrating deep learning techniques, such as Convolutional Neural Networks (CNNs), into X-ray mammography screening in the Philippine healthcare setting. This gap highlights the need for a population-specific, technology-driven approach to support early breast cancer detection using Asian datasets and resource-aware system frameworks.