CHAPTER 1
PROPOSAL IDEAS

1.1 General Description of the Problem Background

Breast cancer is a complex disease involving the uncontrolled proliferation of abnormal cells in breast tissue, leading to tumour formation. These tumours, if left untreated, can potentially spread throughout the body and be deadly. Breast cancer often originates within the milk ducts and milk glands in the breast. In the early stage (in situ), this condition is not immediately life- threatening and allows for early detection. However, if left uncontrolled, cancer cells can invade surrounding breast tissue, forming tumours that can be felt as lumps or thickening. Invasive breast cancer can spread to nearby lymph nodes or even other organs (metastasis). Metastasis is the main threat to a patient's life and can be deadly. According to World Health Organizations (WHO) data, in 2022, there were 2.3 million women (about twice the population of New Hampshire) diagnosed with breast cancer and 670,000 deaths globally. Breast cancer occurs in women in every country worldwide at any age after puberty, with the incidence increasing with age. This presents a complex issue, particularly considering the lack of readily available early detection solutions for breast cancer [1].

Recent literature suggests that the mortality rate among breast cancer patients in Indonesia remains high, reaching 70% in 2022, even 40% of cases are diagnosed at stages one and two [2]. The prevailing method for analyzing genomic profile classification in Indonesia still involves laboratory techniques, such as mammography classification. However, this approach cannot directly classify genes within minutes or hours but is typically minimal from five days, contributing to increased breast cancer mortality rates in the country.

This research aims to develop a website application to classify genomic profile linked to breast cancer. The application will analyze and diagnose different breast cancer types based on genomic profile. It will provide detailed classification analysis results for each case.

1.2 Problem Analysis

In the development of the system, various problem analyses were performed to support its urgency. The author focused on two main aspects: economics and health. The economic analysis addresses potential cost savings and efficiency enhancements, while the health analysis evaluates the system's impact on patient outcomes and overall public health.

1.2.1 Health Aspects

Breast cancer is the deadliest disease. The diagnosis often triggers mental health instability such as anxiety, stress, and depression in patients [3] [4]. The anxiety can worsen if the patient waits over three days for the diagnosis results. Anxiety in breast cancer patients can cause more symptoms, a longer recovery, and a decrease in quality of life. It is usually accompanied by feelings of uncertainty and inadequacy, leading to decreased self-esteem. Research shows that up to 69.3% of women diagnosed with breast cancer suffer from moderate to severe anxiety [4]. Therefore, a solution is needed to reduce anxiety in women diagnosed with breast cancer through various treatment.

1.2.2 Economic Aspects

From an economic aspect, breast cancer detection can help patients find out the type of breast cancer they are experiencing, but breast cancer detection requires quite a lot of money. It can be known that detecting breast cancer costs approximately $415 using the screening method, this fee covers mammography-related costs, radiologist fees, and follow-up procedures if necessary [5]. Therefore, a solution to reduce costs in detecting breast cancer is needed.

1.3 Capstone Objectives

Based on the problem background, the objectives to be achieved in this research are:

1. Able to develop the genomic profile analysis method utilizing machine learning to aid breast cancer classification in Indonesia.
2. Able to facilitate healthcare providers in analyzing breast cancer faster and more accurately.

1.4 Existing Solution Analysis

Based on the Ministry of Health's 2022 article, breast cancer ranks first in terms of the number of cancer cases in Indonesia and is one of the leading causes of cancer-related deaths. To address this issue, the Indonesian healthcare system still uses relatively time-consuming solutions to detect types of breast cancer. The existing solution is mammography, which is considered the gold standard for breast cancer detection. Mammography is an imaging technique using low-dose X-rays to view breast tissue. During a mammogram, the patient's breast is placed on a flat support plate and compressed with a parallel plate called a paddle.

The X-ray machine then produces small bursts of X-rays that pass through the breast to a detector on the opposite side. This detector can be a photographic film plate, which captures

the X-ray image on film, or a solid-state detector that sends electronic signals to a computer to produce digital images. The resulting images are called mammograms [6] [7].

From the above solution's analysis, there are still many shortcomings that make it not fully effective in addressing the existing problem. If look at the solution above, the issue remains unresolved in terms of the speed of obtaining results. Therefore, a system will be developed based on solutions from previous research, namely the classification of breast cancer types using genomic profile and machine learning methods based on the analysis of genomic profile data collected from patients. Moreover, its prediction accuracy is better and does not take long because it analyses a wide variety of data types to accurately predict the type of breast cancer.