1. INTRODUCTION

1.1 Background of the Study

Orthopedic medicine is a crucial branch of healthcare concerned with diagnosing, preventing, and treating disorders of the musculoskeletal system. This includes bones, joints, ligaments, tendons, and muscles. Among the most frequently encountered conditions in this field are bone fractures, which may result from falls, accidents, sports injuries, or underlying conditions such as osteoporosis (Almigdad et al., 2022). Fractures account for a large proportion of emergency cases worldwide, necessitating accurate and timely diagnostic procedures to guide effective treatment and ensure optimal patient recovery (Court-Brown & Caesar, 2006).

Medical imaging techniques, such as X-rays, computed tomography (CT), and magnetic resonance imaging (MRI), play an essential role in detecting and characterizing fractures. However, the interpretation of these images can be subjective, relying heavily on the experience and judgment of radiologists and orthopedic specialists. Studies indicate that up to 30% of fractures may initially go undetected, particularly in complex anatomical regions or when assessed by less experienced professionals (Lee et al., 2019). Such limitations can lead to delayed diagnoses, inappropriate treatments, or prolonged recovery periods.

The situation is often compounded in resource-limited settings, such as rural hospitals or developing regions, where there is a shortage of qualified radiologists and advanced imaging equipment. These constraints highlight the need for additional diagnostic support tools that can improve the speed, reliability, and accessibility of fracture detection.

In recent years, the adoption of artificial intelligence (AI) and machine learning (ML) in medical imaging has shown considerable promise. In particular, image recognition, a subfield of computer vision focused on identifying patterns, objects, or features in visual data, is being increasingly applied in healthcare. These technologies offer opportunities to automate aspects of the diagnostic process, potentially enhancing accuracy, reducing human error, and speeding up fracture detection.