CHAPTER 1.INTRODUCTION

1.1 Research Background of Image Recognition Technology Research and Application

Image recognition is a very important field in deep learning. Image recognition refers to the use of computers to analyze and process images, and then understand them. To identify the targets and objects in different modes, the purpose of which is to enable the trained computer to extract information from the images to be detected and recognize them. Nowadays, image recognition has been applied to all aspects of our life. What we are most familiar with is the application of face recognition, such as shopping payment, face scanning payment, clock in at work, face brushing, etc. are all manifestations of the field of face recognition in image recognition. Image recognition technology can intelligently extract image features and complete image classification. It has been applied to medical, traffic, security and other life scenes [1]. Early attempts at mechanical recognition date back to the 1920s, and image recognition technology has a long history dating to the 19th century. Character recognition, template matching, and feature extraction methods like edge detection were developed as a result of the development of computers and pattern recognition in the 1950s and 1960s. As machine learning gained popularity in the 1990s and 2000s, sophisticated feature extraction methods like SIFT and SURF as well as Support Vector Machines (SVMs) for image classification were developed. Image recognition has undergone a revolution thanks to the Deep Learning Revolution in the 2010s and beyond, with applications in consumer technologies, robotics and automation, medical image analysis, and security. Further advancements in image recognition technology are expected to bring about more revolutionary Applications are anticipated to surface.

1.2 Brief history and evolution of image recognition

Contrary to popular belief, image recognition has much older roots! This is a brief   timeline:

1950s: The foundation is set. Future computer vision applications are based on Hubel and Wiesel's groundbreaking neuroscience research on the mechanisms of

vision in biological systems.

1960s: A pitch blows up. Researchers such as Lawrence Roberts make great strides towards teaching computers to interpret 3D information from 2D images, and computer vision becomes a recognised field of study . The first attempts at identifying basic objects and

patterns are made during this decade.From the 1970s onward: Consistent progress. Scientists are still improving methods and creating increasingly complex algorithms. Real-world applications are however limited by processing power limitations.

The development of artificial intelligence (AI) and machine learning (ML) methods marked a significant turning point for image recognition. A particular kind of machine learning called deep learning was crucial to the breakthroughs made in the2010s: The revolution in deep learning. In 2012, the creation of strong neural networks such as AlexNet led to a notable increase in image recognition task accuracy. This opens up a greater variety of applications. Image recognition is still developing quickly today. Researchers are always trying to increase its capabilities and boost efficiency and accuracy.

1.3 Applications of image recognition technology (preview of key areas)

The construction industry's rapid social and economic development has led to opportunities for growth but also increased competition among personnel. This competition is crucial for maintaining quality, progress, safety, and cost considerations. In the past, construction technology constraints and conditions led to emergencies, increased input costs, and safety hazards. Nowadays, information network technology has become more prevalent, such as computer image recognition technology, which improves personnel management efficiency. This technology is applied in various aspects of construction projects, such as entrance and exit face recognition, building construction robots, building mapping robots, and intelligent AI camera systems. These technologies improve project quality, safety management, and personnel safety, promoting the value of digital transformation in construction projects. To strengthen construction engineering, it is necessary to increase the application strength and depth of computer image recognition technology[2].

Image recognition technology is widely used in various industries, including facial recognition, object detection and classification, medical imaging, security and surveillance, and content moderation. Facial recognition is commonly used in

security systems to identify authorized personnel, while object detection and classification are used in self-driving cars and inventory management systems. Medical imaging uses image recognition to diagnose diseases, while security and surveillance systems monitor for suspicious activity. Content moderation is used by social media platforms to moderate content, identifying and removing images containing violence or hate speech. Overall, image recognition technology plays a crucial role in various industries, ensuring the safety and security of users.

1.4 Thesis statement and research objectives

The thesis centres on how advanced automation, increased productivity, and more in-depth analysis of visual data can be made possible by image recognition technology, and how this could transform a number of industries. Reducing bias and fairness, improving accuracy and robustness, and addressing privacy concerns are among the goals of the research. We are investigating methods to enhance image recognition in a variety of lighting, angle, and quality conditions. Techniques to guarantee equitable performance in various scenarios and demographics are in the process of being developed. Investigating methods for anonymizing or obscuring sensitive data while preserving functionality helps allay privacy concerns. Regulations and moral frameworks for the responsible advancement and application of image recognition technology are also examined in this research. The research attempts to contribute to a more dependable, moral, and significant application of this technology by addressing these limitations.