

**HANOI UNIVERSITY OF SCIENCE AND TECHNOLOGY**

# **GRADUATION THESIS**

**Analyze and design software to checking weld quality  
using image processing technology and segmentation  
deep learning**

**NGUYEN THO DIEP**

diep.nt168121@sis.hust.edu.vn

**Major: Information Technology**

**Specialization: Information Technology**

**Supervisor:** TS. Trinh Anh Phuc \_\_\_\_\_

Signature

**Department:** Computer science

**School:** School of Information and Communication Technology

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# **ABSTRACT**

Locating and identifying printed circuit board (PCB) mounted components based on machine vision is an important and challenging issue for automated PCB inspection and PCB recycling. Through that, we can determine product quality quickly, helping to reduce manpower as well as costs in industrial production. In this project, we propose a depth image-based PCB segmentation method to segment and identify components in a PCB by classification method.

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## LIST OF ABBREVIATIONS

<b>Abriviation</b>	<b>Full Expression</b>
AI	Artificial Intelligence
AOI	Automated Optical Inspection
AUC	Area Under The Curve
CNN	Convolutional Neural Network
NN	Neural Network
MVVM	Model - View - ViewModel
SVM	Support Vector Machine

## CHAPTER 1. INTRODUCTION

### 1.1 Overview

PCB (Printed Circuit Board)( figure 1.1) is a multi-layer and non-conductive printed circuit board in which all the electronic components are connected together on a circuit board and with a base underneath. When there is no PCB, the components are connected by wires, which increases the complexity and the reliability is not high, so it is not possible to create a circuit as large as the motherboard. In a PCB, all the components are connected wirelessly and are wired internally, thus reducing the complexity of the overall circuit design. PCBs are used for power supply and connections between components. PCB can customize any specifications according to user requirements. You can encounter PCB in many electronic devices such as: TV, mobile phone, digital camera, computer parts such as: Graphics card, Motherboard... It is also used in many fields. such as: Medical equipment, industrial machinery, automotive industry, lighting...



**Figure 1.1:** Circuit board (PCB) sample

In the electronics industry, error checking on printed circuit boards (PCBs) is an important factor in ensuring product accuracy and safety. Currently, there are many techniques and devices used for error checking on PCBs, including in-circuit testing (ICT), X-ray inspection( figure 1.3), and automated optical inspection (AOI)( figure 1.2). These techniques allow for quick and efficient error detection during