Defect Detection in PCB Design using Segmentation and Self-Supervised Learning

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***Abstract — Printed circuits boards (PCBs) are an essential part of modern electronic devices, connecting components and providing functionality in a neat and compact manner. With advancements in technology, there have been significant advancements in PCB manufacturing and scaling. However, as the size of the PCB reduces, the chance for defects to arise also increases. Contemporary methods for defect detection rely mostly on deep learning algorithms for their purposes. In this paper, we present a novel two-stage approach to defect detection in PCBs using a combination of self-supervised learning and image processing. The images from the dataset are first fed into a segmentation algorithm comprising the Unet architecture with ResNet50 as the backbone, which extracts the precise component locations on the PCB. Following this, anomaly detection is carried out using the PatchCore algorithm which focuses on only the specific component regions rather than the whole PCB, reducing the chances for false positives. The training and testing are carried out on the VisA PCB datasets, and the results obtained show significant improvement over pre-existing methods.***

***Keywords—PCB, segmentation, self-supervised learning, PatchCore, defect detection***