Duale Hochschule Baden-Württemberg · Mannheim
Coblitzallee 1-9, 68163 Mannheim · Postfach 100461, 68004 Mannheim

Prof.Dr.-Ing. Bozena, Lamek-Creutz,
Professorin Elektrotechnik
Professorin Medizintechnik

Telefon +49 621 4105 - 1117
bozena.lamek-creutz@dhbw-mannheim.de

Shobhit Agarwal M.Sc.
Akademischer Mitarbeiter, Elektrotechnik

Telefon +49 621 4105 - 1225
shobhit.agarwal@dhbw-mannheim.de

DHBW Mannheim
Coblitzallee 1-9
68163 Mannheim

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Abstract

Quality control is an essential process in the industry to ensure that the products meet the required standards and specifications. Traditional quality control methods involve manual inspection, which is time-consuming, subjective, and prone to errors. Machine learning and computer vision techniques have revolutionized quality control in the industry by automating the inspection process, reducing the time required for inspection, and improving the accuracy and reliability of the inspection process. In this work, we discuss two examples of using machine learning and computer vision in quality control: binary classification of defect vs non-defect and object detection.

Binary Classification of Defect vs Non-Defect

Binary classification is a fundamental problem in machine learning, and it has numerous applications in quality control. In the industry, binary classification is used to classify products into defect and non-defect categories. Machine learning algorithms are trained on a dataset of images of defective and non-defective products. The algorithm learns the features that distinguish between defective and non-defective products and uses these features to classify new products.

One example of binary classification in quality control is the inspection of printed circuit boards (PCBs). PCBs are used in many electronic devices, and their quality is critical for the performance and reliability of the devices. Traditional inspection methods involve manual inspection of the PCBs, which is time-consuming and prone to errors. Machine learning and computer vision techniques have been used to automate the inspection of PCBs. A machine learning algorithm is trained on a dataset of images of defective and non-defective PCBs. The algorithm uses these images to learn the features that distinguish between defective and non-defective PCBs. The algorithm can then classify new PCBs as defective or non-defective with high accuracy and reliability.

Object Detection

Object detection is a computer vision technique that involves detecting and localizing objects within an image. Object detection has numerous applications in quality control, including defect detection and counting the number of objects in a given image. Machine learning algorithms are trained on a dataset of images that contain the object of interest, along with its location in the image. The algorithm learns to detect the object and localize it within the image.

In this example, a machine learning algorithm can be trained on the GDxray[1] dataset to detect and localize defects within the x-ray images of industrial components. The GDxray dataset is a publicly available dataset for object detection in industrial x-ray images. The dataset contains over 19,000 x-ray images of various objects, including electronics, automotive parts, and mechanical components. Object detection using the GDxray dataset has been used to automate the inspection of industrial components, improve production efficiency, and reduce the cost of quality control.

REFERENCES:

[1]: Riffo, Vladimir & Lobel, Hans & Mery, Domingo. (2015). GDXray: The Database of X-ray Images for Nondestructive Testing. Journal of Nondestructive Evaluation