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How Manufacturing Companies Can Improve Their Competitiveness:
Research on Service Transformation and Product Innovation Based on Computer Vision

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ABSTRACT

As the global market continues to evolve and competition escalates, the business environment becomes increasingly competitive. How manufacturing companies improve their competitiveness has always been a topic of great concern. Service transformation and product innovation are key factors and are considered to be important ways for enterprises to stand out in the market. Traditional service transformation and product innovation processes often face complex problems, including the diversity of customer needs and fierce market competition. This makes it difficult for companies to accurately capture market opportunities, provide personalized solutions, and respond quickly to changes. At the same time, many companies also face problems with product quality control and production efficiency, which further weakens their competitiveness. It is against this background that the importance of computer vision technology has become increasingly prominent.

KEYWORDS

CGAN, computer vision, EfficientNet, product innovation, service transformation, YOLOv5

INTRODUCTION

As an important topic in the business field, research on service transformation and product innovation has always attracted much attention. Amidst intensifying competition in the global market, companies constantly seek new ways to enhance their competitiveness and meet changing customer needs (Klinker et al., 2020). In this context, service transformation and product innovation have become the two

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core strategies driving the development of enterprises. However, despite their evident value, these strategies encounter a series of complex challenges in practical implementation.

On the one hand, service transformation involves the transformation of traditional product-oriented business models into more flexible and personalized service models. This change requires a deep understanding of customer needs, the provision of customized solutions, and their conversion into viable business models (Alt et al., 2018). For example, in the automotive industry, manufacturers are shifting toward service-oriented models like car-sharing services, requiring an overhaul of their business strategies and customer interaction approaches. However, this process involves intricate information processing and decision-making, demanding effective tools for support.

On the other hand, product innovation requires companies to continuously introduce new products to meet the diverse needs of the market. This requires companies to identify market trends in a timely manner and quickly design and launch innovative products (Tian et al., 2024). In the tech industry, for instance, companies like Apple and Samsung regularly innovate their product lines to maintain a competitive lead in the market. Yet, a significant challenge during product development lies in effectively assessing the feasibility and potential market reception of these new products.

At this stage, computer vision technology has emerged as a focal point in research on service transformation and product innovation, providing businesses with powerful tools to address the aforementioned challenges. Through computer vision, companies can better understand their customer needs (Ng et al., 2021), monitor production processes in real time, and accelerate the development and testing of new products. Despite the theoretical potential of computer vision, effectively using its advantages in practical applications to support service transformation and product innovation remains a topic worthy of in-depth study (Han & Yuan, 2023).

Thus, this article proposes the EfficientNet-YOLOv5-conditional generative adversarial networks (CGAN) model, aiming to explore how to fully harness computer vision technology to address practical problems in service transformation and product innovation. This research aims to delve into the potential of computer vision technology in commercial applications, providing enterprises with more innovative solutions and helping them gain a competitive advantage in the ever-changing market (Gao et al., 2023).

This article outlines a series of experimental results that confirm the effectiveness of the EfficientNet-YOLOv5-CGAN model. To present a comprehensive overview of these results, the authors summarize the key findings of the experiments and describe the main metrics used to measure the effectiveness of the model.

First, the authors use Accuracy, Recall, F1 Score, and Area Under the Curve (AUC) as the main indicators to evaluate the model's performance in both image classification and object detection. These metrics collectively reflect the model's ability to correctly identify images and objects. In particular, AUC is an important indicator, particularly to measure the performance of a classification model when handling imbalanced data sets. In this study's tests, the EfficientNet-YOLOv5-CGAN model demonstrated high Accuracy, high Recall, and high F1 Score, along with an excellent AUC value. These results highlight its significant advantages in processing complex images and real-time object detection.

In comparison with existing solutions, the EfficientNet-YOLOv5-CGAN model outperforms traditional computer vision models across multiple metrics. Especially noteworthy is its efficiency and accuracy in processing large-scale data sets and complex scenes. In addition, this model shows significant advantages in providing customized solutions that can better adapt to the diverse needs of different industries and application scenarios.

Through these experimental results, the authors demonstrate the application potential of the EfficientNet-YOLOv5-CGAN model in the fields of service transformation and product innovation, underscoring its significant advancement over existing technologies. The following section will introduce the characteristics and applications of the EfficientNet-YOLOv5-CGAN model, as well as its potential contributions in the fields of service transformation and product innovation.