Journal of Information Systems Engineering and Management
2025, 10(25s)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

EnsembleDRM Model for Multiclass Image Classification in Deep Learning

Rana J. AL-Sukeinee[1], Noor M. Al-Moosawi[2], Jenan A. Alhijaj[2], Raidah S. Khudeyer[2], Zaid Ameen Abduljabbar[3,4], Vincent Omollo Nyangaresi [5, 6]

[1]Department of Physic, College of Science, University of Basrah, Basrah, 61004, Iraq.

[2]Department of Computer Science, College of Computer Science and Information Technology, University of Basrah, Basrah, 61004, Iraq.

[3]Department of Computer Science, College of Education for Pure Sciences, University of Basrah, Basrah, 61004, Iraq.

[4] Department of Business Management, Al-Imam University College, Balad 34011, Iraq

[5]Department of Computer Science and Software Engineering, Jaramogi Oginga Odinga University of Science and Technology, Bondo 40601, Kenya.

[6]Department of Applied Electronics, Saveetha School of Engineering, SIMATS, Chennai, Tamil Nadu, 602105, India.

* Corresponding author's Email: rana.jabbar@uobasrah.edu.iq

ARTICLE INFO

Received: 29 Dec 2024

Revised: 14 Feb 2025

Accepted: 26 Feb 2025

ABSTRACT

Convolutional neural networks (CNNs) have performed exceptionally well in various computer vision tasks. Previously, researchers relied on feature extraction and then classification. With CNNs, feature extraction and classification are performed in a single step. Therefore, incorporating a set of convolutional neural networks, known as an ensemble, can help increase the effectiveness of their behavior. This paper presents an architecture that is the result of collaborative efforts, consisting of three types of CNN: Densenet121, Resnet101, and MobileNetV2. We also present experimental results using the Cifar10 and Cifar100 datasets, achieving impressive classification accuracy of 99% for Cifar10 and 86% for Cifar100. This case study contributes to deep learning optimization and benefits researchers and practitioners looking for optimal approaches in various computer vision applications. We also evaluate the scalability and robustness of our proposed method in the context of different CNN structures by using more than one model.

Keywords: deep learning, convolutional neural networks, densenet121, resnet101, and mobilenetv2.

INTRODUCTION

In depth learning, the computer vision and image recognition industries have been entirely transformed by convolutional neural networks, a powerful type of artificial neural networks [1]. These networks have achieved impressive accuracy in a number of fields during the past ten years and are especially created to analyze visual data effectively [2]. Researchers are widely interested in image processing, feature extraction, and classification because of their influential role in serving society. Convolutional neural networks, in particular, have demonstrated a high level of efficiency in image processing, and as a result, researchers are constantly developing new models employing deep learning. CNN's advantage in handling images was demonstrated by their ability to learn from the depth and the absence of feature extraction beforehand [3]. Several methods have been suggested to improve CNN's performance, one of which is ensemble learning. To achieve better performance and generalizability than training convolutional networks, a single Ensemble learning method trains multiple base learners and combines their expectations [4]. Ensemble learning is one effective technique in the field of artificial intelligence for resolving a variety of issues [5]. Combining several models to act as experts or classifiers is the outcome. The performance of models in a variety of tasks, including classification and prediction, is enhanced by this kind of learning. Additionally, it effectively lowers the likelihood that poorly performing models would be incorrectly selected and increases confidence in the model's decision. In ensemble learning, mixing and matching learners yields various benefits regarding statistics, computation, and representation [6].

To support ensemble learning in making the best decisions and achieving high accuracy, a combination of multiple pre-trained models that have achieved state-of-the-art image classification in this field with high capacity and high accuracy in extracting features have been developed. Today there are a lot of real-life applications where multi-class classification problems are used such as: image classification. In multi-class classification problem appear imbalanced in datasets an imbalanced dataset means the number of the majority class is much more than the minority class. The Ensemble learning technique is the one solution for this problem, where with ensemble learning