Pertanika Proceedings 1 (5): 89 - 92 (2025)

PERTANIKA JOURNALS

PERTANIKA PROCEEDINGS

Journal homepage: http://www.pertanika.upm.edu.my/

Enhancing Unmanned Aerial Image Classification Through Wider Attention EfficientNet-Based Deep Model

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ABSTRACT

Unmanned Aerial Vehicle imaging has gained significant importance in recent years. Image classification plays a crucial role in Unmanned Aerial Vehicle imaging applications. It enables analysis and interpretation of visual data collected from UAVs. This process extracts valuable insights from visual data. Motivation for this research lies in the increasing demand for effective and accurate image classification systems for UAVs which are critical in tasks such as disaster monitoring and urban planning. This research proposes a modified Wider Attention Efficient Networks for efficient Unmanned Aerial Vehicle image classification. The proposed model has achieved better classification accuracy of 97.71% when compared to other benchmark deep models.

Keywords: Attention mechanism, deep learning, feature fusion, unmanned aerial image classification, wider attention networks

INTRODUCTION

Unmanned Aerial Vehicle (UAV) imaging has gained significant importance in recent years. Initially, it was used for communications and military applications. Now it is widely employed in various sectors. Its applications include surveillance, agriculture, delivery services, infrastructure inspection, etc. UAV imaging allows data collection from difficult areas and performs repetitive tasks with precision. Its expanding use reflects the growing benefits across industries.

Image classification is a key component in UAV imaging. It enables analysis and interpretation of visual data collected from UAVs (Digra et al., 2022). This

ARTICLE INFO

Article history:
Received: 29 August 2025
Published: 31 October 2025

DOI: https://doi.org/10.47836/pp.1.5.017

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process extracts valuable insights from visual data. It supports decision-making in many applications. Fields like agriculture, infrastructure inspection, and environmental monitoring benefit from improved precision, speed, and utility in UAV operations (Jozdani et al., 2019). Image classification accuracy is dependent on various parameters: image resolution, seasonal variations, landcover types, etc. Advanced algorithms and high-quality data are necessary to address these challenges.

LITERATURE SURVEY

UAV image classification identifies various land types such as forests, urban areas, water bodies, and agricultural fields. It helps in monitoring changes over time, supports in managing natural resources, etc. Efficient UAV image classification supports environmental monitoring, urban planning, disaster management, agricultural management, etc (Mahendra et al, 2023).

Traditional image classification methods may fail with increasing volume and complexity of data (Ouma et al, 2023). They may become inefficient while handling large datasets, high-dimensional datasets, etc. Their performance is highly impacted by conditions such as lighting, scaling and orientation in images. These approaches can be less adaptable to new data. They often require retraining and/or extensive modifications to handle different types of images.

PROPOSED METHODOLOGY

Urban environments and agricultural landscapes often exhibit high spatial and temporal variability. They present complex and heterogeneous land cover types. Such datasets challenge image classification tasks (Jagannathan & Divya, 2021). Existing classification models often perform well on specific datasets but struggle to generalize across diverse geographic areas. Models developed for specific types of remote sensing data may not perform well with different data resolutions. There is a need for adaptable models that can handle various data characteristics effectively (Nijhawan et al., 2019). Addressing these issues is essential for UAV image classification methods. Thereby, improving their accuracy, efficiency, and applicability in diverse contexts.

Deep learning has the ability to handle complex and diverse data scenarios. Thereby, making them the preferred choice for complex and large-scale image analysis tasks. Motivation for this research lies in the increasing demand for effective and accurate image classification systems for UAVs which are critical in tasks such as disaster monitoring and urban planning (Li et al., 2024). To achieve this goal, a deep learning model is proposed based on Wider Attention Efficient Networks as shown in Figure 1 (Lee et al., 2023; Li & Cao, 2021).

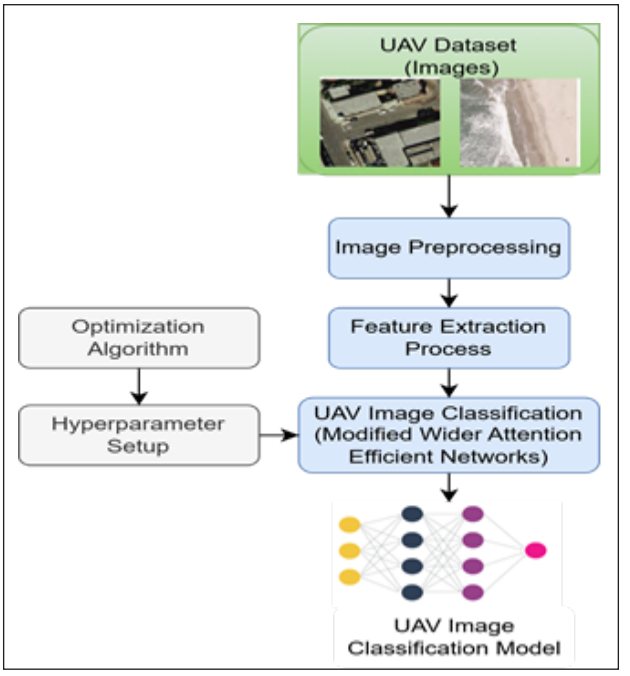

Figure 1. Proposed deep learner model

RESULTS

Experimentation of the proposed modelwas conducted using UAVOD-10 dataset (Han et al., 2022). This dataset comprises high-resolution aerial imagery captured by UAVs for small object detection tasks. Table 1 presents the comparative analysis of the proposed deep models against other deep models.

Table 1
Comparative analysis of proposed deep model

Model	Accuracy
Mask-RCNN	89.45
EDL-MMLCC	77.15
MLCG-OCNN	91.24
Proposed Deep Model	97.71

CONCLUSIONS

Image classification plays a crucial role in various applications by enabling the analysis and interpretation of visual data collected from UAV imaging. Factors such as image resolution, seasonal variations, and diverse landcover types can affect classification accuracy. Advanced algorithms and high-quality data are necessary to overcome these challenges and ensure reliable results. The proposed deep model is based on Wider Attention Efficient Networks. It has exhibited improved feature extraction and the capability to focus on specific regions of interest. This research proposed a modified Wider Attention Efficient Networks for

efficient Unmanned Aerial Vehicle image classification. The proposed model has achieved better classification accuracy of 97.71% when compared to other deep models.

ACKNOWLEDGEMENT

The authors would like to express sincere gratitude to everyone who supported us during the research process.

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