

# Edge Optimized CNN For Real Time Aerial Image Analysis

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[B. Azhagusundari](#) ; [A. Nithya](#) ; [R. Padmavathi Ramamoorthi](#) ; [V. Subha](#) ; [O. R. Aruna](#) ; [JaiSingh W.](#) [All Authors](#)

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## Abstract

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### Abstract:

UAVs are in dire need of fast and reliable aerial image analysis for applications like surveillance, disaster response, and environment monitoring. However, due to their limited computational power and energy constraints, it is challenging to deploy any conventional CNN models on UAV mounted edge devices. This paper proposes an edge optimized CNN model that enables real time processing of aerial images with depthwise separable convolutions, factorized kernels, feature re use blocks, and a lightweight spatial attention module. It adopts a hybrid optimization strategy combining structured pruning, mixed precision quantization, and knowledge distillation to reduce computational load and model size. The proposed approach achieves accuracies of 92.8%, 95.4%, and 90.1% with F1 scores of 90.9%, 93.8%, and 88.3 % on DOTA, UCMerced, and DeepGlobe datasets, respectively. The model deployment on Jetson Nano, Raspberry Pi 4, and Coral TPU achieves as low as 18.4 ms latency with up to 149 FPS using a 3.7 MB model. Extensive experiments have demonstrated that the proposed model outperforms well known, efficient lightweight architectures and is very suitable for UAV edge inference.

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