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A Deep ResNet-SVM Integrated Framework for High-Precision Satellite Image Classification

G. Sarthak¹, V. Pavan Pranesh², K. Sivamani³, B. Lakshmiprasad⁴ UG Student, Department of CSE^{1,2,3,4}

GITAM (Deemed to be University), Visakhapatnam, India

Abstract: Satellite image classification plays a pivotal role in remote sensing applications such as land cover mapping, urban planning, and environmental monitoring. In this study, we propose a novel hybrid framework that integrates deep residual learning with Support Vector Machine (SVM) classification to achieve high-precision results. Specifically, we leverage a pre-trained Residual Neural Network (ResNet) to extract deep hierarchical features from high-resolution satellite images. These features, rich in spatial and contextual information, are then fed into an SVM classifier to enhance decision boundaries and reduce overfitting, particularly in scenarios with limited labeled data. The proposed Deep Residual–SVM framework is evaluated on benchmark satellite imagery datasets, demonstrating superior classification accuracy and robustness compared to conventional CNN-based and standalone SVM models. The results validate the effectiveness of combining deep feature representation with classical machine learning techniques for remote sensing image analysis.

Keywords: Satellite image classification, Deep Residual learning, Support Vector Machine (SVM), ResNet-50, Feature extraction, Remote sensing, Deep learning, Hybrid framework

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503