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In Collaboration with

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**BugAtlas: A Deep Ensemble Approach in Insects Identification and
Management**

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ABSTRACT

Insects are a diverse and ubiquitous group of animals that play a crucial role in maintaining ecological balance and facilitating environmental cycles. However, some insects can also cause significant harm to humans by acting as pests, resulting in the destruction of crops and harvests. More than 30% of the crops are being destroyed due to pests all around the world annually. (SARE, 2022) Insects are a major source of pests, causing over 30% of global crop destruction annually (SARE, 2022). Agricultural sector contributes 7.4% to the national GDP of Sri Lanka. (International Trade Administration, 2021), by making it crucial to protect crops from hazards. Correctly identifying insects and understanding their control strategies is crucial for protecting crops from harmful pests while also maximizing the benefits of human-friendly insects. This can help to reduce crop losses and ensure sustainable agricultural practices.

This research focuses on identifying insects, not just limited to pests, which has not been extensively studied in previous research. The proposed approach is a deep ensemble neural network using a customized dataset from multiple sources. The base models used in the ensemble approach are ResNet50 and Xception, and stacking is used as the ensemble technique, with the average output from each base model utilized in the ensemble model.

The study successfully trained and tested multiple base and ensemble models using custom datasets, achieving a high accuracy of 99.09%. However, the approach could be further improved to be applied in more image classification problems across different domains.

Key words: Insects, Deep learning, Ensemble learning, Image classification

Subject Descriptors:

Computing methodologies -> Machine learning -> Neural networks

Applied computing -> Computing in other domains -> Agriculture

Applied computing -> Computing in other domains -> Insect identification