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Multimodal Deep Learning for Fine-Grained Classification and Knowledge-Driven Decision Support in Medicinal Plant Recognition

Communication Info

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Abstract

The preservation of Moroccan medicinal plant heritage requires reliable and intelligent identification systems capable of handling visual similarity, regional naming variations, and limited structured data. While deep learning has significantly improved image-based plant recognition, most existing approaches rely solely on visual features and neglect structured semantic knowledge such as taxonomic relations, vernacular synonyms, and medicinal usage context. This limitation reduces robustness, interpretability, and performance in fine-grained and low-data scenarios.

This research proposes a knowledge-enhanced computer vision framework that integrates deep visual representation learning with a structured knowledge graph of Moroccan medicinal plants. By combining convolutional and transformer-based architectures with graph-based semantic embeddings, the proposed system aims to improve fine-grained recognition accuracy, increase robustness to ambiguity, and provide intelligent decision support. Beyond simple classification, the framework delivers confidence-aware predictions, synonym disambiguation, and contextual medicinal information, contributing both to artificial intelligence research and the digital valorization of Moroccan medicinal heritage.

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