HONEY ADULTERATION DETECTION USING MICROSCOPIC IMAGES

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Introduction:

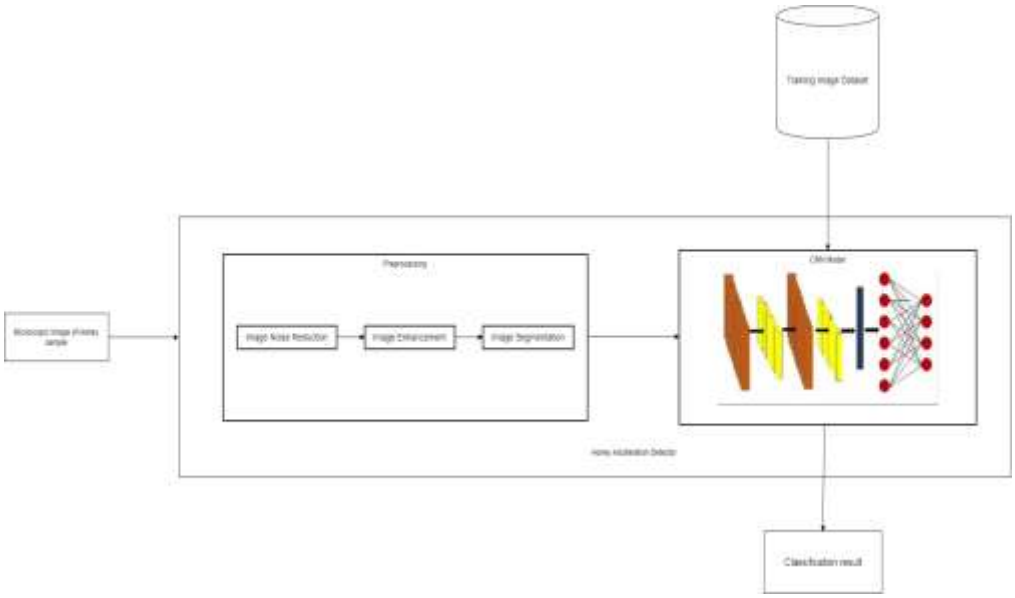
Honey, valued for its purity, faces widespread adulteration, requiring thorough analysis. Our method begins with capturing high-resolution microscopic images to examine composition. Preprocessing techniques like noise reduction enhance clarity. Key features such as particle size, shape, and pollen density are extracted to identify adulteration. Convolutional Neural Networks (CNNs), trained on labeled datasets, classify honey as pure or adulterated. Recurrent training improves accuracy. This approach integrates preprocessing, feature extraction, and CNN-based machine learning to ensure honey purity, protect consumers, and combat fraud, maintaining market trust and product integrity.

Objectives:

- Build and prepare a dataset of microscopic images of different honey samples.
- Develop and evaluate a model for detecting honey adulteration.
- Predict adulterated honey samples.

Methodology:

The project begins with data collection, where microscopic images of honey samples are captured using a 40x objective lens. Fuchsin stain is applied to enhance pollen grain visibility, ensuring clear differentiation between pure and adulterated honey. In the data preprocessing phase, contrast adjustment and histogram equalization are used to improve image clarity. The predictive modeling stage employs a Convolutional Neural Network (CNN) to classify honey as pure or adulterated, using extracted features and an HSV-based pollen detection method. The evaluation phase assesses model performance using accuracy, precision, recall, and F1-score. Finally, a user-friendly system is developed for real-time honey purity analysis.



Result and Conclusion:

The honey adulteration detection system successfully classified pure and adulterated honey samples using Convolutional Neural Networks (CNNs). The model extracted key features such as pollen grain density and particle shape, enabling reliable classification. The system processed microscopic images in real time, identifying adulterants effectively. By integrating high-resolution microscopy and machine learning, this approach ensures detailed analysis of honey samples. The combination of preprocessing, feature extraction, and classification provides a structured method for detecting adulteration. Future improvements, including expert validation and

dataset expansion, will enhance the system's reliability, making it a valuable tool for maintaining honey authenticity and quality.

Future Scope:

- Collecting honey samples from various geographical regions to improve model generalization.
- Developing a mobile or web-based platform for user-friendly honey purity analysis.
- Integrating spectral analysis and chemical composition testing to enhance detection accuracy.