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In Collaboration with

UNIVERSITY OF WESTMINSTER

Grade-Brew

**A User-Driven Web-Based Application for Tea Grade, Tea Type,
and Tea Elevation Detection.**

A Dissertation by

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Abstract

When applied to large amounts and a variety of tea leaf variations, manually identifying and grading tea types is laborious, subjective, and frequently unreliable. Customer trust, market pricing, and product quality may all be impacted by this discrepancy. Furthermore, the tea industry's ineffective data integration techniques, lack of automated grading tools, and restricted traceability provide difficulties for growers and exporters. By developing a web-based application that recognizes tea grade, tea type and elevation, this project seeks to close these gaps and specifically target the Sri Lankan tea market.

The project combines cutting-edge geospatial data visualization and machine learning technology to achieve these objectives. A deep learning-based solution was created to overcome these obstacles by integrating OpenCV for picture preprocessing with the YOLOv8 model. Through feature extraction from picture datasets, the model was trained to identify and categorize three distinct tea grades across different varieties. RESTful APIs were constructed using Flask, allowing the backend classification engine and the React-based frontend to communicate in real time. To handle structured data, such as pictures, forecasts, and traceability metadata, MongoDB was used.

Several data science measures were used to assess the system's performance. Throughout the test set, the model's accuracy was over 80%, and its precision and recall values showed that it performed well in reducing false positives and false negatives. F1-scores demonstrated outcomes that were balanced between recall and precision. For BOP (92%) and Silver Needle (89%), the model's confidence was high; however, for OP, it was lower (71%), indicating that there may be space for improvement in OP classification. These outcomes open the door for the system's implementation in actual tea production and export settings by confirming its resilience in accurately recognizing tea varieties and grades.

Subject Descriptors:

- Computing methodologies -> Machine learning -> Machine learning applications
- Information systems -> Geographic information systems

Keywords

Classification of Tea, Machine Learning in Agriculture and Quality and Traceability in the Sri Lankan Tea Industry