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A Comparative Review of Machine Learning Algorithms for Edible and Poisonous Mushroom Classification

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Abstract: *Mushroom identification plays a crucial role in public safety, as consuming poisonous mushrooms can lead to severe health consequences, including death. Traditional methods of mushroom classification rely on expert knowledge and visual inspection, which can be unreliable due to the morphological similarities between edible and poisonous species. To address these challenges, machine learning (ML) techniques offer an automated and more accurate solution for classifying mushrooms based on their characteristics, such as cap shape, gill size, and spore print color. This review paper focuses on a comparative analysis of three widely used machine learning algorithms—Logistic Regression, Random Forest, and Support Vector Machine (SVM)—for distinguishing between edible and poisonous mushrooms.*

The paper explores the underlying principles and strengths of each algorithm, highlighting the ways in which they process mushroom features to achieve accurate classifications. Logistic Regression, a linear model, provides interpretability and simplicity, while Random Forest, an ensemble method, enhances classification performance by aggregating predictions from multiple decision trees. On the other hand, SVM, with its ability to handle non-linear decision boundaries, has shown promise in complex classification tasks. The comparative review examines the performance of each model using metrics such as accuracy, precision, recall, and F1-score, providing a detailed assessment of their effectiveness in mushroom classification.

The review identifies key challenges and opportunities in using machine learning for mushroom classification, including the need for comprehensive datasets and the handling of imbalanced data. By analyzing the advantages and limitations of each algorithm, this paper aims to contribute valuable insights into the optimal approach for developing reliable and efficient mushroom identification systems. Such systems could aid both experts and non-experts in ensuring safer mushroom foraging practices, ultimately reducing the risk of poisoning and enhancing public safety.

Keywords: Mushroom classification, machine learning, Logistic Regression, Random Forest, Support Vector Machine