Review of: "Application of Ensemble Learning in CXR Classification for Improving COVID-19 Diagnosis"

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Potential competing interests: No potential competing interests to declare.

The article "Application of Ensemble Learning in CXR Classification for Enhancing COVID-19 Diagnosis" presents a comprehensive study on utilizing ensemble learning and various machine learning classifiers to improve the diagnostic accuracy of COVID-19 using chest X-ray (CXR) images. Here's a critique of the methodology, proposed approaches, results, and some recommendations to enhance the scientific quality of the study:

- The article lacks details on the preprocessing steps and specific parameters used in the HOG feature extraction, which are crucial for reproducibility and understanding the impact on classifier performance.
- There is no mention of how imbalanced classes, if present, were handled. This is critical given the varying prevalence of COVID-19 cases in different datasets.
- The article could explore more sophisticated ensemble techniques beyond majority voting, such as weighted voting or stacking, to potentially improve performance.
- The choice of classifiers and the rationale behind the selection of these specific models over others (like deep learning models) is not thoroughly justified.
- The discussion on the results is somewhat limited. The implications of these results in a clinical setting and how they compare to current diagnostic methods like RT-PCR are not explored.
- There is a lack of a detailed analysis of false positives and false negatives, which is crucial in the medical diagnosis context.
- Provide more detailed information on data preprocessing and feature extraction techniques. Include parameters used, data augmentation strategies, and handling of class imbalances.
- Consider validating the model on an independent external dataset to assess generalizability and robustness.
- Include advanced ensemble methods and deep learning models to compare performance. Techniques like transfer learning from pre-trained models on similar tasks could be beneficial.
- Conduct a more in-depth error analysis to understand where and why certain models fail, particularly in distinguishing between COVID-19 and other types of pneumonia.
- Compare the diagnostic performance of the proposed model directly with traditional methods, such as RT-PCR, to contextualize its utility.
- Discuss potential integration into clinical workflows, including real-time analysis capabilities, user interface design, and system integration.
- Explore the application of the models to other diseases beyond COVID-19 to maximize the utility of the developed

models in broader medical imaging tasks.

- Investigate the use of explainable AI methods to provide insights into the decision-making process of the models, enhancing trust and adoption in clinical settings.