Integrating Intelligent Visualization to Elevate Diagnostic Performance in Medical Imaging

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Abstract

Contagious and non-contagious illnesses represent a major contributor to global death rates, with their varied and complex manifestations often hindering accurate evaluation and classification of disease severity. Different geographic regions face unique obstacles in addressing these health issues. This research employs four advanced AI-powered decision support frameworks to enhance diagnostic accuracy through medical imaging. Initially, a decision support method based on entropy has been utilized, wherein entropy is calculated either at the pixel or regional level from medical images (like MRI or CT scans) to pinpoint zones of diagnostic uncertainty. Secondly, a similarity-based diagnostic model is utilized to determine disease presence by analyzing the input imagery. Thirdly, a decision-making model incorporating the TOPSIS (Technique for Order Preference by Similarity to Ideal Solution) method, integrated with AI algorithms, is employed to accurately classify the specific disease type, utilizing images from diverse imaging techniques. Fourth, an AHP (Analytic Hierarchy Process) framework is used to support diagnostic decisions through multi-criteria analysis, aiding in selecting the most suitable diagnosis. All computational processes and algorithms are executed in Python. Hypothetical datasets are used to demonstrate the implementation of these models in a medical diagnostic context. Visual aids are incorporated to enhance clarity and emphasize the significance and impact of the results.

Keywords

Artificial Intelligence, Decision support system, Medical imaging.