DengueScreen: A Novel Computer Vision-Based Diagnostic Alternative for Dengue Fever Prioritizing Efficiency, Cost-Effectiveness, and Accuracy

Wilson, Jackson (School: Highlands High School)

Dengue (break-bone fever) is an endemic viral infection in more than 100 countries. Each year, approximately 3.9 billion people are at risk. Dengue fever infects 100-400 million of them. It is extremely difficult to diagnose dengue fever in an accurate, low-cost, and efficient manner. Because of this, the number of clinically manifested cases (96 million) is significantly less than the projected 390 million per year. This difference is a strong indication of frequent undiagnosed infections. There is a demonstrable need for additional improved diagnostic tools to fill these gaps. Artificial intelligence-based tools are a powerful alternative, capable of combining the predictive accuracy, accessibility, and cost-effectiveness of the traditional best tools. Specifically, machine learning has been effectively applied to dermatological identification problems, achieving above 99% accuracy in several cases. This study was designed to transfer these effective techniques to a similarly high-performing tool for dengue diagnosis that analyzes smartphone images of cutaneous rashes. Therefore, the researcher evaluated the diagnostic performance of modified ResNet-50, ResNet-18, GoogLeNet, ShuffleNet, and RegNet architectures on a balanced dataset of 300 dermatological images. Performance metrics such as accuracy, precision, recall/sensitivity, specificity, and AUC were analyzed. The highest accuracy was 99.62%, a tie between the ResNet-50 and RegNet architectures. These results demonstrate that neural networks such as the above models can accurately identify dengue fever with a novel combination of efficiency, cost-effectiveness, and distributability. These models have the potential to revolutionize dengue identification, as they can be deployed on a variety of accessible devices.