An Adaptive, Low-Cost Device for Automated & Offline Medical Analysis Utilizing Neural Networks with Reinforcement Learning Optimization

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Diagnosing diseases automatically has been an immense challenge, owing to their variable properties and symptoms. On the other hand, Neural Networks (NNs) have developed into a powerful tool in the field of machine learning, one that is showing to be promising at computing diagnosis even with inconsistent variables. In this research, a low-cost device was developed for straightforward analysis and treatment of human diseases. By utilizing NNs, architecturally optimized through reinforcement learning, the device can detect diseases and conditions, all automatically, using end-to-end deep learning. It does so with an extremely high accuracy rate, comparable to medical personnel. The Deep NN algorithm can identify 1557 various diseases, along with providing treatment advice. Biometric values such as oxygen saturation and electrocardiogram (ECG) values are calculated using a Recurrent NN (RNN), developed to detect anomalies: myocardial arrhythmias and ischemias. A Convolutional NN is on the device to identify and segment dermatological lesions. Vocal tone analysis, through an RNN, is in progress to detect cognitive decline. These algorithms all run on a Raspberry Pi processor. This device can augment doctors by speeding up the time needed for diagnosis by pre-analyzing the user and providing estimated conditions. This scalable method of detecting anomalies before they pose a threat, holds the ability to create clinical impact around the world by profoundly increasing access and scope of medical care. Overall, this device will help alert physicians to high-risk patients, while making the doctors' analysis much more efficient; therefore, saving people, while decreasing costs and time.

Awards Won:

Fourth Award of $500

Association for the Advancement of Artificial Intelligence: Honorable Mention

U.S. Agency for International Development: USAID Science for Development Third Place Award of $2,000.