VoiceEDx: A Novel, Voice-Based End-to-End Multi-Disease Diagnostic Platform Using a Highly Accurate and Expandable Artificial Intelligence Engine for an Early, Secure and Reliable Diagnosis of Disease

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Disease diagnosis today is often late, unreliable, and expensive, leading to ineffective treatments, decreased quality of life, and premature death. In this project, we developed a novel end-to-end software platform to accurately diagnose 18 diseases, including Lung Cancer, Cardiovascular Disease, Concussion, Laryngeal Cancer, Alzheimer's, and more. Our novel approach utilizes voice dysphonia, a powerful biomarker, to diagnose disease using a three-stage supervised machine-learning pipeline. The platform extracts dysphonic features to determine linear and non-linear measures, relaying the information to a tree-based binary decomposition framework with optimized heterogeneous stacking ensembles at the nodes. Trained with over 95000 unique voice samples, the algorithms classifies not only the diagnostic affliction but also its stage. The traversal complexity of the algorithm, coupled with the backend architecture, allows for the platform to be highly expandable with the capability to rapidly incorporate new diseases without the need to extensively restructure the backend. The blockchain implementation establishes a decentralized, immutable record of patient data and increases accessibility across supported platforms through strict authorization procedures. A mobile application for iOS and Android, a web application, and call-in diagnosis system were developed and tested, providing universal accessibility to the diagnostic system, even in low-resource settings. Currently, the platform holds an average accuracy of 97.6% (obtained via k-fold cross evaluation) for all 18 diseases - a significant improvement over current diagnostic methods. This project presents a first-of-its-kind diagnostic software capable of diagnosing multiple diseases in an accurate and scalable manner.

Awards Won:
Fourth Award of $500
American Statistical Association: Certificate of Honorable Mention
Samvid Education Foundation: Geno Second Place Award of $500
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Award of $1,000 for research in Innovative Technology.