Conclusive, Unbiased Medical Diagnosis System Using a p2p Consensus Mechanism

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A hivemind for healthcare: Medical Error is the third leading cause of death after Heart Disease and Cancer. Delayed discovery of these misdiagnoses and preventive overdiagnosis only make the problem worse. Because of the shortage of medical datasets (mostly due to privacy laws), current ML-based screening models are either their left undertrained or overfitted. I develop CrowdCross, a novel decentralized solution—for sharing, storing and diagnosing medical samples—that is conclusive, unbiased by design, and more accurate than any other available solution. All doctors in the peer-to-peer network perform pairwise comparisons between test and control samples. Based on these, samples are placed in or out of their current positions on the malignancy scale by getting swapped with the others until the entire set is clustered into two classes. CrowdCross uses a blockchain to securely store these swaps and their associated costs once they are verified by peer consensus of the network. The system operates on trustless cost-reward model between doctors and patients, reinforcing an equal and incentivized environment for both. Each diagnosis is reevaluated in cycles to identify potential misdiagnoses via a novel cost-of-delay error propagation mechanism. I tested the solution against Lung Cancer LDCT scans. The number of biased misdiagnoses (FDR+) decreased by over 95%. The network became 98.4% conclusive—preventing many unnecessary CT scans—compared to the simple classifier ensemble which remained at 64.8%. Total diagnosis time in the system reached to 1/23 of the window period in the annual NLS trials. Other than this implementation, CrowdCross can be used as a diagnostic tool for diseases in which predisposing factors are not enough to make diagnoses.

Awards Won:
Association for Computing Machinery: Second Award of $3,000
King Abdulaziz &amp
his Companions Foundation for Giftedness and Creativity: Award of $1000 for research in Cyber Security