StrokeSight: An End-to-End Multimodal AI Platform for Prehospital Stroke Risk Prediction and Clinical Decision Support

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Acute stroke is a time-critical emergency. Current screening relies on subjective observation, missing up to 32% of cases. Moreover, relying on a single data modality yields over a 45% false-positive rate in elderly patients due to age-related morphological asymmetry. To bridge this diagnostic gap, we present StrokeSight, a multimodal software pipeline engineered as comprehensive risk prediction and clinical decision tools. The system operates in three seamless phases. Phase 1 provides a proactive first-line alert by utilizing CCTV streams to continuously monitor and detect abnormal gait (ataxia). Upon alert,Phase 2 a web-based front end to evaluate remaining external symptoms, featuring a novel 3D facial assessment module that filters out non-pathological skin laxity. To fuse these asynchronous inputs, a graph-based synchronization algorithm optimizes cross-modal processing time complexity from O(N2) to O(NlogN) for real-time performance. Extending to in-hospital care,Phase 3 provides an automated ASPECT computation module from CT scans. Built upon a robust API architecture ensuring end-to-end data pipeline stability, the system was evaluated on a comprehensive clinical dataset using k-fold cross-validation. Backed by this, the pipeline processes inputs in just 850 ms, achieving 93.2% screening accuracy, while the ASPECT module yields a minimal error of 0.87 points. StrokeSight delivers a scalable software solution that directly addresses current diagnostic flaws. Integrating proactive CCTV alerts and 3D facial assessment mitigates the 45% false-positive rate, while comprehensive multimodal analysis minimizes the 32% missed case rate. Future phases prioritize IRB approval for multi-center validation, optimizing early neurological care within decentralized networks.

Awards Won:
The Scientific and Technological Research Council of Türkiye TUBITAK: 1st Prize Award
Association for the Advancement of Artificial Intelligence: AAAI Student Memberships for each finalist that is part of the 1st, 2nd, and 3rd Prize Winning projects and 5 Honorable Mention winning projects (up to 3 students per project) (in-kind award / part of the 1st-3rd prize)