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CelebroSense: A Dual AI System for Stroke Prediction and MRI-Based Detection



Abstract

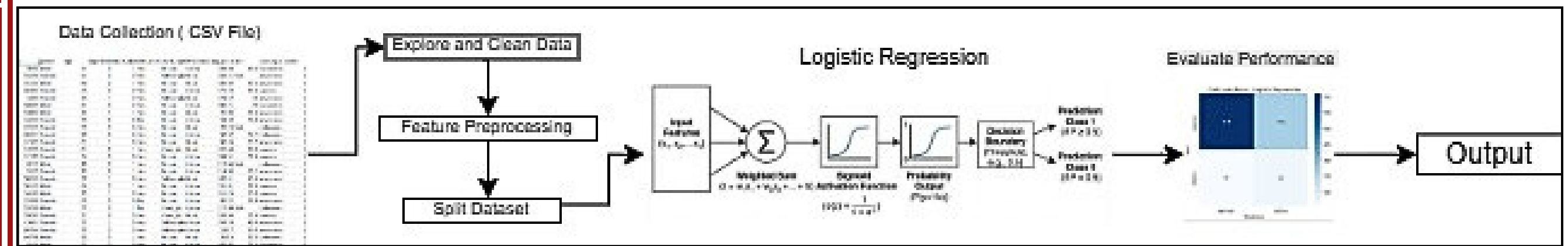
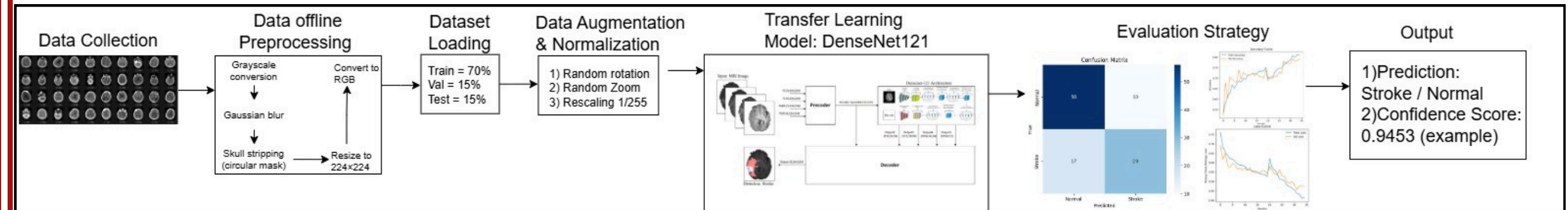
Stroke is a leading cause of death and disability, where timely identification greatly improves outcomes. This project introduces a dual-stage system that predicts stroke risk using clinical data and detects stroke-related abnormalities from MRI scans. By integrating applied machine learning techniques across both datasets, the system enhances the speed and accuracy of stroke assessment, supporting more informed clinical decision-making.

Data Description

Clinical CSV: Demographic, medical, and lifestyle features (age, hypertension, heart disease, glucose level, BMI, smoking status) with a binary stroke label; includes preprocessing such as cleaning, encoding, balancing, and scaling.

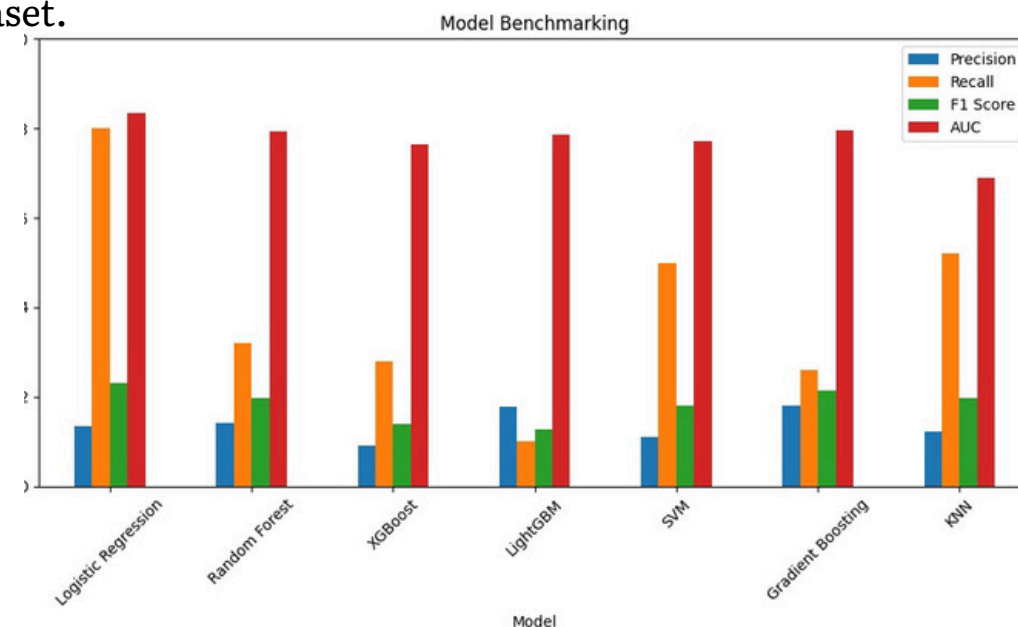
MRI Dataset: Labeled brain scans (stroke / non-stroke) processed through resizing, denoising, normalization, and texture-based feature extraction for classification.

Pipeline:



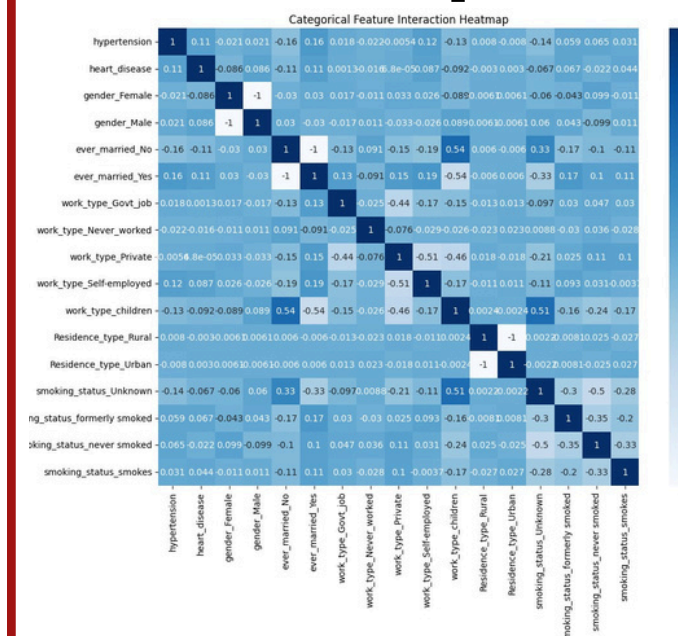
Benchmark

- Highest Recall → Minimizes false negatives, essential in clinical prediction.
- Strong Recall + AUC → **Logistic Regression** is the best model for this healthcare dataset.

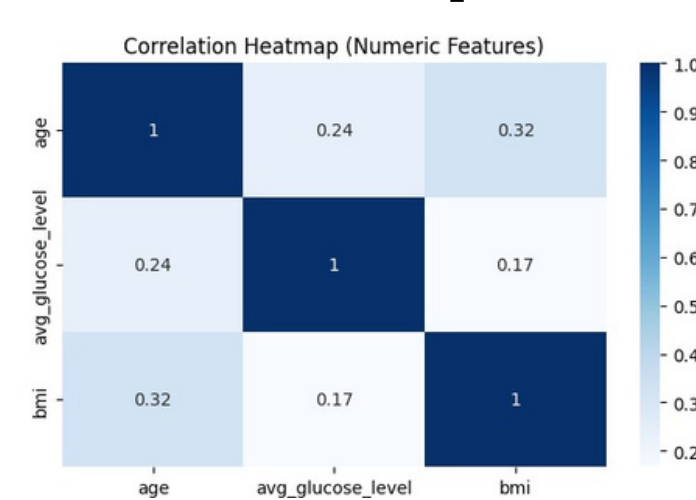


EDA

Categorical Features - Heatmap



Numerical Features - Heatmap



Result

Logistic Regression provided reliable performance for clinical stroke prediction, while DenseNet-121 achieved strong accuracy for MRI-based stroke detection. Together, the models delivered consistent and effective results across both datasets.

Future Work

- Expand datasets for better model generalization.
- Add more clinical features (lab values, history).
- Improve class-imbalance handling methods.
- Test additional ML models for MRI classification.
- Develop a deployable web or mobile interface.

Reference

- 1) <https://pmc.ncbi.nlm.nih.gov/articles/PMC8641997/>
- 2) <https://data.mendeley.com/datasets/s2nh6fm925/1>