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**Intelligent Approach on Diagnosing Dementia at Early
Stages Based on Machine Learning**

A Dissertation By

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ABSTRACT

Dementia is a major disorder which losses the cognitive functioning and behavioural abilities to some extent. Alzheimer's disease has been considered as the most common type of dementia. Also, there are other diseases which have been known to be converted into dementia such as epilepsy. The cure for dementia is yet to be found, hence recognizing the disease in early stages and delaying the progress is highly important and will remain as an open challenge.

To address the above problem, a machine learning based prediction system is introduced as a helper tool for doctors. The doctor is required to upload the EEG data record of the patient so that the system will check and display dementia and epilepsy status as well as the precautions that can be taken. This system consists of a dementia prediction module to predict Alzheimer's, mild cognitive impairment status and epilepsy module to diagnose epilepsy status. The system has been developed using the jinja2 framework as a web application and REST API has been built using the Flask framework to predict dementia and epilepsy stages. Ensemble voting classifier has been used for each module and the best classifiers to be used along with the voting classifier have been selected according to the accuracy percentages which have been gained using GridSearchCV. The models have been trained and saved into persistent storage and will be used for the prediction later.

A novel architecture with around 10% of improvement has been proposed to address the accuracy reduction of multi-class classifications compared to binary-classifications. A significant improvement has been achieved from each module compared to existing benchmarked systems along with 97.32%, 94.53%, 72.56% and 98% when dealing with HCvsMCI, HCvsAD, MCIvsAD and epilepsy models respectively. The implemented system has been thoroughly tested and the final system has been evaluated by domain experts and stakeholders.

Keywords

Machine Learning Classifications, Dementia, Alzheimer's disease, Mild cognitive impairment, Epilepsy, Prediction