**Early Detection of Alzheimer’s using Blood Gene Expression Data**

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**Abstract:**

**Alzheimer’s Disease (AD) a type of neurological disorder is seeing a surge in the numbers of cases from the past decade. This paper focuses to explore the various feature extraction and classifier algorithms that can make use of blood gene expression data and design a system using the analysis for early detection of AD. We also aim to explore explainable artificial intelligence methods (XAI) of classification for a simple human interpretation and measure its trustworthiness.**

***Keywords: Blood Gene Expression, Feature Extraction, Explainable Artificial Intelligence***

INTRODUCTION:

Alzheimer's disease (AD) is a progressive neurodegenerative disorder characterized by the gradual loss of cognitive function and memory. It is the most common cause of dementia among older adults. Especially in India the cases are expected to grow to 11,422,692 by 2050 from 3,848,118 measured in 2019 according to Lancet report as of July 2022 [1]. The disease is caused by the accumulation of amyloid plaques and tau tangles in the brain, leading to the death of nerve cells and the disruption of communication between brain cells. As the disease progresses, individuals may have trouble with everyday tasks, behavioral changes, and eventually, complete dependence on caregivers. Despite intense research efforts, there is currently no cure for AD and available treatments only offer temporary symptom relief. Early detection and diagnosis of AD is crucial for the planning of appropriate care and support for individuals and their families, as well as for the development of disease-modifying therapies. However, current diagnostic methods for AD often involve invasive and expensive procedures, such as brain imaging or lumbar punctures. In recent years, there has been increasing interest in the use of blood-based biomarkers, such as gene expression patterns, as a less invasive and more cost-effective approach for the early detection of AD. The identification of specific gene expression patterns in the blood that are associated with AD may enable the development of simple and reliable diagnostic tools that can be used in a clinical setting.

Gene expression refers to the process by which the genetic information contained in DNA is used to synthesize the various proteins and other molecules that perform specific functions within cells. This process is regulated by a complex network of signaling pathways that control which genes are turned on or off in each cell at a given time. The measurement of gene expression, or transcriptomics, allows scientists to understand how cells respond to different stimuli and how they differ from one another. By analyzing gene expression data, researchers can gain insights into the underlying mechanisms of biological processes and diseases, such as cancer or Alzheimer's disease. Gene expression data can be obtained from a variety of sources, including tissues, cells, and biofluids such as blood. The use of blood-based gene expression data has the advantage of being non-invasive and easily accessible, making it a promising tool for the diagnosis and monitoring of diseases. In recent years, there has been growing interest in the use of gene expression data for the early detection and treatment of a wide range of conditions, including cancer, cardiovascular disease, and neurological disorders. The major problem that we have to address while use blood gene expression data is the High Dimensionality of the dataset, since blood tissue can be used to extract around 10,000-30,000 genes on average and each of these genes might have 1-3 gene probes. DNA probes are usually single-stranded DNA molecules that are labeled with a detectable molecule, such as a fluorescent dye or a radioactive isotope. They are designed to bind to a complementary DNA sequence and are often used to detect the presence of specific genes or to analyze DNA modifications, such as methylation. RNA probes are like DNA probes, but they are designed to bind to complementary RNA sequences. They are often used to detect the presence and abundance of specific RNA molecules, such as mRNA or non-coding RNA. Protein probes are molecules that are designed to specifically bind to and detect the presence of a particular protein. They can be antibodies, small molecules, or other types of protein-binding molecules and are often used to analyze protein expression, localization, and function.

Methods:

Conclusion:

References: