TECH OFFER

Unlocking ALS Through Predictive Insights From Deep Learning and Stem Cells

KEY INFORMATION

TECHNOLOGY CATEGORY:
Healthcare - Pharmaceuticals & Therapeutics
Healthcare - Telehealth, Medical Software & Imaging
Healthcare - Diagnostics

TECHNOLOGY READINESS LEVEL (TRL): TRL3
COUNTRY: JAPAN
ID NUMBER: TO175256

OVERVIEW

Amyotrophic Lateral Sclerosis (ALS) is a neurological disorder that affects motor neurons in the spinal cord and brain which causes progressive degeneration of muscle control. The onset of ALS usually starts between the ages of 40 to 70 and affects approximately two to seven individuals per 100,000 people globally, with an average survival time after diagnosis ranging from two to five years. ALS is hard to diagnose at an early stage due to similar symptoms with other diseases and no one single test to specifically diagnose ALS. Several diagnosis methods include electromyogram, nerve conduction study, MRI, blood and urine tests, lumbar puncture, muscle and nerve biopsy. The absence of definitive biomarkers complicates early diagnosis and monitoring of disease progression, while the subtle and variable symptoms often leads to misdiagnosis or delays in care.

This research introduces a novel predictive model for ALS that leverages deep learning techniques alongside patient-derived induced pluripotent stem cells (iPSCs). By employing advanced machine learning algorithms, the study analyzes cellular and genetic data from iPSCs to uncover patterns associated with ALS progression. It also incorporates image analysis of motor

neurons derived from iPSCs of both ALS patients and healthy individuals, utilizing a convolutional neural network (CNN) model that achieves classification accuracy.

This innovative approach aims to deepen the understanding of ALS mechanisms and facilitate early diagnosis and personalized treatment strategies, potentially transforming the management of neurodegenerative diseases. The research institute is seeking for clinical studies partners and pharmaceutical companies for collaboration.

TECHNOLOGY FEATURES & SPECIFICATIONS

1. **Induced Pluripotent Stem Cells (iPSCs):** Use of patient-derived iPSCs to study cellular responses related to ALS.
2. **Convolutional Neural Network (CNN):** Implementation of a CNN model for image classification of motor neurons derived from both ALS patients and healthy controls. Identification of patterns in cellular and genetic data correlated with ALS progression is used to develop a model that can predict disease outcomes.
3. **High Classification Accuracy:** Achieving a high area under the curve (AUC) of 0.97, indicating effective classification performance.
4. **Clinical Relevance:** Focus on enhancing early diagnosis and personalized treatment strategies for ALS.

POTENTIAL APPLICATIONS

1. Early Diagnosis: It helps in diagnosing diseases like ALS at earlier stages, which is crucial for timely treatment.
2. Personalized Medicine: iPSCs reflect a patient's unique genetic background, enabling tailored treatments and drug testing.
3. Disease Modeling: The method allows for creating precise disease models to understand progression.
4. Drug Screening: Researchers can test the efficacy of potential treatments on iPSC-derived cells before clinical trials.

MARKET TRENDS & OPPORTUNITIES

The global neurodegenerative disease therapy market is valued at around $30 billion to $40 billion and is expected to expand significantly over the coming years, with projected annual growth rate (CAGR) of approximately 6% to 8% through the next decade, driven by increasing prevalence of neurodegenerative disorders, advancements in research and technology, and growing demand for effective treatments. Major segments within the market include therapies for Alzheimer's disease, Parkinson's disease, Amyotrophic Lateral Sclerosis (ALS), Huntington's disease, and Multiple Sclerosis (MS).

UNIQUE VALUE PROPOSITION

By using patient-derived iPSCs, the method reflects an individual's genetic makeup, allowing precise modeling of ALS-affected motor neurons. The integration with a convolutional neural network (CNN) provides high diagnostic accuracy (AUC of 0.97), outperforming human analysis. This approach holds promise for early diagnosis, personalized treatment, and advancing our understanding of neurodegenerative diseases through non-invasive, patient-specific models.