MLKD 2024
The First International Conference on
Machine Learning and Knowledge Discovery
Amirkabir University of Technology, December 18-19, 2024

Early Detection of Alzheimer's-like Behavior Using Deep Learning and Sensor Data in a Smart Home Environment

Mohammad Sadegh Rezaei* Mobina Riahi† Mohammadamin Ahanin‡

Abstract

In order to provide effective treatment and management, early detection of Alzheimer's disease is crucial. This study investigates the potential of deep learning models to identify early signs of Alzheimer's-like behavior using sensor data collected in a smart home environment. We employed four deep learning architectures: GRU, LSTM, Bidirectional LSTM, and Conv1D, to distinguish between normal activity patterns and those indicative of Alzheimer's-like behavior. However, the results showed that recurrent neural networks (GRU, LSTM, and Bidirectional LSTM) performed better than the biggest convolutional model (Conv1D) due to their capability in capturing temporal dependencies within sensor data more accurately than any other model. The Bidirectional LSTM had an excellent ROC AUC score suggesting it was capable of taking information from both previous states as well as future ones into account which made it very efficient in detecting Alzheimer's disease. These findings indicate that sensor-based data analysis has the potential for developing non-invasive continuous monitoring systems capable of supporting early diagnosis, improving care and perhaps even better management strategies for this condition over the long term. It is necessary to conduct further research with a view of refining deep learning models and designing sophisticated systems for Alzheimer's detection in real-world smart home settings.

Keywords: Alzheimer, Lstm, and Smart Home

*Assistant Professor, Department of Computer Engineering and Information Technology, Shiraz University of Technology (SUTECH), rezaei@sutech.ac.ir

†Computer Engineering student, Department of Computer Engineering and Information Technology, Shiraz University of Technology (SUTECH), mriahiiii77@gmail.com

‡Computer Engineering student, Department of Computer Engineering and Information Technology, Shiraz University of Technology (SUTECH), maahaninir@gmail.com