

Submission Summary

Conference Name

International Conference on Computational Complexity and Intelligent Algorithms

Paper ID

5

Paper Title

Developing an IoT Driven BCI Framework for Real-Time Neural Signal Decoding to Speech Conversion

Abstract

This study introduces an innovative method for converting EEG brain signals into phonemes, facilitating communication for those with speech disorders. The research utilizes a machine learning system that analyzes multi-channel EEG data from 14 electrodes to predict phonemes associated with intended speech. Unlike traditional approaches that require expensive EEG equipment, this project incorporates a budget-friendly simulation framework, combining random signal generation for dynamic authenticity and dataset-driven signal replication for accurate predictions. The methodology involves EEG data preprocessing, feature extraction, and training a fusion model to achieve effective phoneme classification. The findings show considerable accuracy in phoneme prediction, underscoring the potential of EEG-based systems in augmentative and alternative communication (AAC) technologies. Additionally, a simulated hardware prototype and an interactive graphical user interface are created to offer a realistic system demonstration, addressing the limitations of restricted access to EEG hardware. This research addresses a crucial need for accessible speech synthesis systems and paves the way for affordable, scalable solutions in brain-computer interface technology.

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Submission Files

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