ASSESSMENT OF PARKINSON'S DISEASE PROGRESSION USING NEURAL NETWORK AND ANFIS MODELS

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Abstract: Patients suffering from Parkinson's disease must periodically undergo a series of tests, usually performed at medical facilities, to diagnose the current state of the disease. Parkinson's disease progression assessment is an important set of procedures that supports the clinical diagnosis. A common part of the diagnostic train is analysis of speech signal to identify the disease-specific communication issues. This contribution describes two types of computational models that map speech signal measurements to clinical outputs. Speech signal samples were acquired through measurements from patients suffering from Parkinson's disease. In addition to direct mapping, the developed systems must be able of generalization so that correct clinical scale values can be predicted from future, previously unseen speech signals. Computational methods considered in this paper are artificial neural networks, particularly feedforward networks with several variants of backpropagation learning algorithm, and adaptive network-based fuzzy inference system (ANFIS). In order to speed up the learning process, some of the algorithms were parallelized. Resulting diagnostic system could be implemented in an embedded form to support individual assessment of Parkinson's disease progression from patients' homes.

Key words: *Parkinson's disease, speech signal, artificial neural networks, error backpropagation, fuzzy logic, ANFIS, UPDRS*

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1. Introduction

Parkinson's disease (PD) is the second most common neurodegenerative disorder after Alzheimer's [8]. It particularly affects older people, after the age of 60. Therefore, as the population in general grows older, new methods for early diagnosis are crucial to monitor the progression of PD and allow intervention.

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