Identifying the Features Effective in Neuropathy in Patients with Chronic Pain by Using Deep Neural Networks

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Abstract

This research aims to determine clinical features effective in the diagnosis of neuropathy in patients with chronic pain. This type of disorder has various causes such as war, car accidents or sports accidents. This research investigated the pain questionnaire developed in Shafa Neuroscience Research Center, Khatam-ol-Anbia Specialty Hospital, Tehran. By using deep neural networks, the nearest neighbor and the genetic algorithm, a list of features was obtained with an accuracy of 75%. The results show that McGill pain questionnaire includes the most effective features of neuropathy in patients with chronic pain.

Keywords: neuropathy, chronic pain, McGill questionnaire, deep neural network (DNN), pain clinic..

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Sensor Data Stream Segmentation in Pervasive Smart Environments

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Abstract

In many activity recognition approaches, the input data stream is segmented at the first step. Then the activity for each segment is identified. During this procedure, sensor data stream segmentation is a primary and important step, which is examined in this study. A novel approach based on the difference-of-convex programming is presented to obtain a solution. In the proposed method, a feature vector is calculated for each sensor event in the data stream using a Bayesian approach, and the sequence of these vectors is used in a difference-of-convex cost function. The cost function and feature vectors are calculated by considering heuristics adapted to pervasive smart environments. Data segments are extracted by minimizing the function. A smart home simulator is used in evaluations to generate a sensor data stream. The segment purity and conditional entropy have been calculated to measure the performance of the approach. Evaluations show that the proposed method has an acceptable performance in comparison with some of the existing approaches.

Keywords: *convex optimization, pervasive smart environments, segmentation, sensor data stream.*

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Proposing a Method for the Automatic Identification of the Melodic Patterns (Gusheh) in the Repertoires (Radif) of Iranian Traditional Music Using the Micro Approach

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Abstract

Designing a system that can automatically identify melodic patterns (Gusheh) and scales (Dastgāh) of Iranian traditional music has attracted the attention of Iranian researchers in the field of music information retrieval for a while. Since these studies mainly focus on the automatic classification of the five major scales, and not on the segmentation of melodic patterns from each other, the present study aims to propose an algorithm and approach for automatic identification of melodic patterns within the repertoire (Radifs) of Iranian traditional music. Therefore, in the first step, a systematic definition and analysis of the two main concepts in Iranian traditional music, Dastgāh and Gusheh, is proposed in this research. After introducing the two basic approaches in the automatic identification of Dastgāh and Gusheh, the methodology and algorithms applied in some of the related studies have been presented. After that, an algorithm and approach for the identification of Gushehs in the repertoire of Iranian Dastgāh music has been proposed based on the micro approach. In the proposed method, it has been tried to identify melodies in a piece of Iranian traditional music as a basic and important step in the identification of Gushehs and the improvement of its parameters. In the next step, the right Gusheh can be identified by defining the melodic sequences in the representative phrases (Moarref) of each Gusheh and examining its level of similarity with a music piece.

Keywords*: Algorithm for Melodic Pattern Identification, Automatic Music Identification, Gusheh, Iranian Traditional Music, Music Information Retrieval (MIR), Repertoire (Radif) Of Iranian Dastgāh Music*

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Diagnosis of Coronary Heart Diseases Using Hybrid Intelligent Systems Based on Whale Optimization Algorithm, Simulated Annealing and Support Vector Machine

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Abstract

In recent years, machine learning algorithms are widely used for the diagnosis and timely treatment of diseases. Moreover, the diagnosis of the disease in its early stages is very effective in improving the disease's condition and reducing treatment costs for the patient. Heart disease is one of the main causes of death in the world. Many studies have been conducted to diagnose the disease and to design an intelligent and efficient system. In this paper, a hybrid algorithm made up of whale optimization algorithm and simulated annealing is presented to identify the factors effective in the diagnosis of the disease. The support vector machine algorithm is also applied for the effective classification of the disease. The proposed approach is evaluated using Cleveland heart disease dataset from the UCI repository. The proposed algorithm has been able to diagnose the disease with an accuracy of 87.78% with fewer attributes. The results demonstrate the superiority of the proposed method, which can help physicians to diagnose the disease in early stages.

Keywords: Coronary Heart Disease, Hybrid Algorithm, Simulated Annealing Algorithm (SA), Support Vector Machine (SVM), Whale Optimization Algorithm (WOA)

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Breast Cancer Prediction Using the Affinity Propagation Clustering with Regard to the Weights of Variables

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Abstract

By using data mining tools in medical diagnosis, some limitations such as costly or time consuming tests will be overcome. In addition, the existence of errors in laboratory medicine has led researchers to focus on classification methods. In this regard, by combining clustering and classification methods, the present study has proposed a new method for the diagnosis of breast cancer malignancy, in which an iterative heuristic algorithm and the affinity propagation clustering algorithm are combined. This method assigns weights to variables using a heuristic algorithm, and forms weighted clusters based on the affinity propagation algorithm. Then the number of clusters is added to the data as a new variable. In the next step, the classifier algorithm is applied on the modified dataset which contains the main data and the number of clusters. According to the accuracy index, the weight assignment continues to reach the highest possible accuracy. According to the numerical experiments performed in this study, the combination of the affinity propagation clustering algorithm, with an average accuracy of 98.36, was the most accurate one. In addition, the Wilcoxon signed-rank test confirmed the superiority of combined neural network over other methods.

Keywords: *Artificial Neural Network, Breast Cancer, Clustering, Support Vector Machine (SVM), Wilcoxon Signed-Rank Test.*

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The Improvement of CRF-Based Saliency Detection Algorithm Using Matrix Decomposition-Based Features

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Abstract

Since the image saliency map can be used in algorithms such as segmentation, compression and image retrieval, researchers have focused on providing an effective model for saliency detection. Although a lot of work has been done in this area, no efficient and effective model has so far been proposed to provide the image saliency detection with less computation. For this purpose, we propose a simple supervised algorithm for saliency detection using a conditional random field (CRF) and saliency cues. In the proposed method, the features local contrast, center-bias, and backgroundness have been used for CRF training. Additionally, a new feature based on matrix decomposition has been employed to improve the performance. Below, CRF is trained according to the features of 20 images, close to those of the input image. Finally, the input image saliency is estimated according to the calculated weights in the training phase, the saliency cues of the input image, and the ground truth. The proposed approach outperforms other methods in terms of algorithm accuracy and speed.

Keywords: conditional random field (CRF), saliency detection, saliency cues, super pixel.

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