عنوان مقاله:

Population-based classification of autism from resting-state fMRI using a long short term memory network

محل انتشار:

پنجمین همایش بین المللی نقشه برداری مغز ایران (سال: 1397)

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خلاصه مقاله:

BackgroundResting state functional magnetic resonance imaging (rs-fMRI) can be used to characterize the .1 pathophysiology of brain disorders such as autism spectrum disorders (ASD). In general, the connectivity pattern extracted from rs-fMRI is used as the input features of learning algorithms such as logistic regression and support vector machines. Considering complex pattern of connectivity changes in autism, it is believed that usingdeep learning approach could potentially improve the classification accuracy. 2. MethodIn this study, a long short term memory (LSTM) architecture with a graph convolutional network (GCN) was used to discriminate multi-site rs-fMRI data of ASDs from healthy controls. In the proposed method, instead of precomputed measures of functional connectivity, the rsfMRI time-series was dirrectly used as the input features of classification algorithm. We hypothesized that time-series of rs-fMRI represent dynamics ofthe brain activities, so, it will carry more useful information than static pattern observed in the functional connectivity measures. Therefore, a type of deep neural network based on LSTM was designed to handle long sequence of rs-fMRI data. In addition, for multi-site classification of the rs-fMRI data, phenotypic features including subjects' gender, age and site of data gathering should also be considered. Several approachescould be used for this purpose that a graph caculated from population representations and their similarities was used in this study. In this paradigm, imaging feature vectors are derived from rs-fMRI data using a LSTM network and then are fed into a graph of subjects' phenotipic similarities.3. Results Rs-fMRI data were downloaded from 1100 subjects included in autism brain imaging data exchange (ABIDE)[1] that iclude data of ASD and HC individuals from 17 sites of imaging. A classification accuracy of 75% was achieved to discriminate ASDs from HCs which is 6% higher than previously reported methods [2,3]. The reliability of the results were evaluated using a 10-fold cross validation strategy.4. Conclusions A new classification paradigm for population-based disease prediction was proposed based on a deep learning approach. As a proof of concept, the method was tested on the challenging ABIDE data that include a heterog eneous database of ASD subjects as well as HCs. The high accuracy of the proposed learning algorithm confirmed our initial hypothesis about the importance of contextual ... pairwise information for populationbased classification of the disease.5. References 1. http://fcon 1000.projects.ni

کلمات کلیدی: