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EEG EMOTION RECOGNITION OF INTELLIGENT HEALTH MONITORING IN LONG-TERM SPACE FLIGHT

Abstract

In the manned mission to Mars, the health status of astronauts directly determines the success or failure of the mission. However, long-term space flight have a great impact on the psychology of astronauts. In order to ensure the successful completion of the task, it is very important to carry out intelligent health monitoring for astronauts, in which emotion recognition has become the most effective means. Because EEG signals can provide a simple, cheap, portable and easy-to-use emotion recognition solution, it has become an important choice for health monitoring tasks in recent years. However, the more effective subject independent model in EEG emotion recognition has two disadvantages, privacy protection and large-scale data. In order to deal with these two disadvantages, this paper designs a novel Frame level teacher-student framework based on data privacy, FLTSDP, for EEG emotion recognition in few-shot learning. The framework firstly proposes a teacher-student network without prior professional information for automated filtering useful frame-level features by gated mechanism and extracting high-level features by using knowledge distillation to capture the results of EEG emotion recognition from a teacher network and student networks. Then, the results from subnetworks are integrated by using the novel decision module which, motivated by voting mechanism, adjusts the composition of feature vectors and improves the weight of accurate prediction to optimize the integration effect. During training, an innovative data privacy protection mechanism is applied for avoiding data sharing, where each student network only inherits weights from all trained networks and doesn't inherit training dataset of small sample. Here, the framework can be repeatedly optimized and improved by only training the next student subnetwork on new EEG signals. Experimental results show that our framework improves the accuracy of EEG emotion recognition by more than 5% and gets state-of-the-art performance for EEG emotion recognition in subject independent mode.