

Application of artificial intelligence techniques in the diagnosis and assessment of multiple sclerosis

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The application of artificial intelligence (AI) in medicine is a new research area that integrates sophisticated representational and computing techniques with physicians' expertise. The complexity and heterogeneity of multiple sclerosis (MS) make the disease a suitable domain for AI applications. In this review, we will cover some of these applications.

MRI-defined lesion burden may serve as a useful measure of MS activity and treatment efficacy. Quantitation of lesion burden in clinical trials involving large number of images requires techniques with minimal manual interventions. Segmentation, i.e. the process of identifying and isolating a given tissue, allows for automatic lesions burden quantitation. To accomplish segmentation, AI techniques of machine learning, pattern recognition and the use of domain knowledge are employed. Automatic expanded disability status scale (EDSS) has been proposed as another AI application to overcome the major shortcoming of EDSS, inter-rater variability. Automatic EDSS expert system has been developed to reproduce a senior neurologist's skill in applying EDSS rules. It takes as input the functional systems scores and starts its inference process using encoded human knowledge and reasoning capabilities. It constrains the neurologist to follow precise reasoning steps, enhancing EDSS reliability. Another AI technique with potential use in MS diagnosis is case-based reasoning (CBR) approach i.e. the use of all previous experiences in form of cases for better decision making. CBR may reduce the gap between experienced experts and beginner physicians.

In conclusion, AI applications in the study of MS may help towards breakthroughs in MS diagnosis and evaluation and therefore calls for closer collaboration of computer scientists and MS healthcare professionals.