Mild Cognitive Impairment Detection using Association Rules Mining

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Abstract:

A single Mild cognitive impairment (MCI) is a transitional state between normal cognition and dementia. The typical diagnostic procedure relies on neuropsychological testing, which is insufficiently accurate and does not provide information on patient clinical profiles. The objective of this paper is to improve the recognition of older primary care (PC) patients with MCI by using approach typically applied in the market basket analysis – association rules mining. In our case, the association rules represent various combinations of the clinical features or patterns associated with MCI. The analytical process was performed in line with the CRISP-DM, the methodology for the data mining projects widely used in various research or industry domains. In the data preparation phase, we applied several approaches to improve the data quality like the k-Nearest Neighbour, correlation analysis, Chi Merge and K-Means algorithms. The success of the analytical solution was evaluated not only by the novelty and correctness of new knowledge, but also by simple understandable form of their visualization for domain experts. This iterative approach provides a set of rules (patterns) that meet minimum support and reliability. The extracted rules may help medical professionals recognize clinical patterns however the final decision depends on the expert. A medical expert has a crucial role in this process by enabling the link between the information contained in the rules and the evidence-based-knowledge. It markedly contributes to the interpretability of the results.

Keywords: association rules, patterns, mild cognitive impairment, interpretability

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