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Identification of surgical practice patterns using evolutionary cluster analysis.

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Summary: Modern data analysis and machine learning are strongly dependent on efficient search techniques. However, in general, further exploration into high-dimensional and multi-modal spaces is needed, and moreover, many real-world problems exhibit inaccurate, noisy, discrete and complex data. Thus, robust methods of optimization are often required to generate results suitable for these data. Some algorithms that imitate certain natural principles, namely the so-called evolutionary algorithms, have been used in different fields with great success. In this paper, we apply a variant of Particle Swarm Optimization (PSO), recently introduced by the authors, to partitional clustering of a real-world data set to distinguish between perioperative practices and associate them with some unknown relevant facts. Our data were obtained from a survey conducted in Spain based on a pool of colorectal surgeons. The PSO derivative we consider here: (i) is adapted to consider mixed discrete-continuous optimization, with statistical clustering criteria arranged to take these types of mixed measures; (ii) is able to find optimum or near-optimum solutions much more efficiently and with considerably less computational effort because of the richer population diversity it introduces; and (iii) is able to select the right parameter values through self-adaptive dynamic parameter control, thus overcoming the cumbersome aspect common to all metaheuristics.

Keywords: particle swarm optimization; evolutionary algorithm; partitional clustering; colorectal surgery; perioperative praxis; multimodal rehabilitation
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