

Medical diagnosis of Rheumatoid Arthritis using data driven PSO?FCM with scarce datasets

Salmeron J.L.

Rahimi S.A.

Navali A.M.

Sadeghpour A.

Rheumatoid Arthritis (RA) is a chronic autoimmune disease that affect joints and muscles, and can result in noticeable disruption of joint structure and function. Early diagnosis of RA is very crucial in preventing disease's progression. However, it is a complicated task for General Practitioners (GPs) due to the wide spectrum of symptoms, and progressive changes in disease's direction over time. In order to assist physicians, and to minimize possible errors due to fatigued or less-experienced physicians, this study proposes an advanced decision support tool based on consultations with a group of experienced medical professionals (i.e. orthopedic surgeons and rheumatologists), and using a well-known soft computing method called Fuzzy Cognitive Maps (FCMs). First, a set of criteria for diagnosis of RA, based on previous studies and consultation with medical professionals have been selected. Then, Particle Swarm Optimization (PSO) and FCMs along with medical experts' knowledge were used to model this problem and calculate the severity of the RA disease. Finally, a small-scale test has been conducted at Shohada University Hospital, Iran, for evaluating the accuracy of the proposed tool. Accuracy level of the tool reached to 90% and the results closely matched the medical professionals' opinions. Considering obtained results in real practice, we believe that the proposed decision support tool can assist GPs in an accurate and timely diagnosis of patients with RA. Ultimately, the risk of wrong or late diagnosis will be diminished, and patients' disease may be prevented from moving through the advanced stages. © 2016 Elsevier B.V.

Decision Support System

Diagnosis

Fuzzy Cognitive Maps

Machine Learning

Particle Swarm Optimization

Rheumatoid Arthritis disease

Artificial intelligence

Cognitive systems

Decision support systems

Diseases

Fuzzy rules

Fuzzy systems

Learning systems

Particle swarm optimization (PSO)

Soft computing

Autoimmune disease

Decision support tools

Fuzzy cognitive map

Fuzzy cognitive maps (FCMs)

General practitioners

Medical professionals

Rheumatoid arthritis

Soft computing methods

Diagnosis

algorithm

Article

calculation

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consultation

controlled study

diagnostic accuracy

diagnostic test

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disease severity

fuzzy cognitive map

fuzzy system

general practitioner

human

Iran

job experience

knowledge

machine learning

medical decision making

medical specialist

orthopedic surgeon

particle swarm optimization

rheumatoid arthritis

rheumatologist

symptom