Diagnosing COVID-19 and Prioritizing Treatment via Fuzzy Parameterized Fuzzy Soft Matrices

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In the fight against the COVID-19 pandemic, it is vital to rapidly diagnose possible contagions, treat patients, plan follow-up procedures, with correct and effective use of resources, and ensure the formation of herd immunity. The use of machine learning and statistical methods provides great convenience in dealing with many data produced during research. Since the access to the PCR test used for the diagnosis of COVID-19 may be limited, the test is relatively too slow to yield results, the cost is high, and its reliability is controversial, making a symptomatic classification before the PCR is timesaving and far less costly. In this study, by modifying a state-of-the-art classification method, namely Comparison Matrix-Based Fuzzy Parameterized Fuzzy Soft Classifier (FPFS-CMC), an effective method is developed for a rapid diagnosis of COVID-19. It then presents the accuracy, sensitivity, and specificity values that represent the diagnostic performances of the modified method. The results show that the modified method can be adopted as a competent, accurate diagnosis procedure. In the treatment follow-up priority section, a tirage study is performed by calculating the patients' risk scores to manage inpatient overcrowding in healthcare institutions. In the vaccination priority planning section, a vaccine priority algorithm is proposed to be used in a possible crisis until the supply shortage of a newly developed vaccine is over if a possible variant of COVID-19 that is highly contagious is insensitive to the vaccine. The accuracy of the algorithm was tested with real-life data. Finally, the need for further research is discussed.

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