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PREDICTION ANALYSIS OF COVID-19 IN SELANGOR BY USING BACKPROPAGATION ALGORITHM WITH CONJUGATE GRADIENT METHOD

(Analisis Ramalan COVID-19 di Selangor dengan Menggunakan Algoritma Perambatan Balik dengan Kaedah Kecerunan Konjugat)

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ABSTRACT

COVID-19 is a disease that can spread rapidly among individuals in a population. COVID-19 is a kind of coronavirus. Patients infected with COVID-19 can lead to death, especially people with lung difficulties or a weakened immune system. COVID-19 is transmitted to humans through contact, coughing, sneezing, or close contact. As a result, using previous COVID-19 data in Selangor, an artificial neural network (ANN) is used as an effective future prediction method. Backpropagation is a form of artificial neural network (ANN) algorithm that may be used to resolve issues in prediction analysis. Predictive analysis is utilized to take some earlier action to produce more effective outcomes, which is minimizing the number of COVID-19 patients, to avoid the COVID-19 disease spreading drastically and becoming worse. However, total performance is determined by the optimization approach discovered throughout the training phase. The Fletcher-Reeves approach can improve the efficiency of the backpropagation algorithm by having a faster convergence rate than other methods such as the scaled conjugate gradient method. Based on this theory, this study developed a backpropagation neural network using the conjugate gradient method to create the prediction analysis of COVID-19 patients in Selangor. The result of the experiment will show how many COVID-19 patients can be obtained from the mean square error (MSE) of the test data at various learning rates. The effective learning rate is determined by applying the MSE to both the test and training data, which results in the lowest number of MSE, which is the ideal option. From the output of testing data, the number of predicted confirmed COVID-19 patients can be determined.

Keywords: COVID-19; artificial neural network (ANN); Fletcher-Reeves; backpropagation algorithm; mean square error (MSE); training data; learning rates

ABSTRAK

COVID-19 merupakan penyakit yang boleh merebak dengan cepat dalam kalangan individu dalam sesuatu populasi. COVID-19 adalah sejenis coronavirus. Pesakit yang dijangkiti COVID-19 boleh menyebabkan kematian, terutamanya orang yang mengalami masalah paru-paru atau sistem imun yang lemah. COVID-19 berjangkit kepada manusia melalui sentuhan, batuk, bersin, atau sentuhan rapat. Hasilnya, menggunakan data COVID-19 sebelum ini di Selangor, rangkaian saraf tiruan (ANN) digunakan sebagai kaedah ramalan masa depan yang berkesan. Perambatan balik ialah satu bentuk algoritma rangkaian saraf tiruan (ANN) yang boleh digunakan untuk menyelesaikan isu dalam analisis ramalan. Analisis ramalan digunakan untuk mengambil beberapa tindakan lebih awal untuk menghasilkan hasil yang lebih berkesan, iaitu meminimumkan bilangan pesakit COVID-19, untuk mengelakkan penyakit COVID-19 merebak secara drastik dan menjadi lebih teruk. Walau bagaimanapun, jumlah prestasi ditentukan oleh pendekatan pengoptimuman yang ditemui sepanjang fasa latihan. Pendekatan Fletcher-Reeves boleh meningkatkan kecekapan algoritma perambatan belakang dengan mempunyai kadar penumpuan yang lebih cepat daripada kaedah lain seperti kaedah kecerunan konjugat berskala. Berdasarkan teori ini, kajian ini membangunkan rangkaian neural perambatan balik menggunakan kaedah kecerunan konjugat untuk mencipta analisis ramalan pesakit COVID-19 di Selangor. Hasil eksperimen akan menunjukkan berapa ramai pesakit

COVID-19 boleh diperoleh daripada ralat min kuasa dua (MSE) data ujian pada pelbagai kadar pembelajaran. Kadar pembelajaran yang berkesan ditentukan dengan menggunakan MSE pada kedua-dua data ujian dan latihan, yang menghasilkan bilangan MSE terendah, yang merupakan pilihan yang ideal. Daripada output data ujian, bilangan pesakit COVID-19 yang diramalkan yang disahkan boleh ditentukan.

Kata kunci: COVID-19; rangkaian saraf tiruan (ANN); Fletcher-Reeves; algoritma perambatan balik; ralat min kuasa dua (MSE); data latihan; kadar pembelajaran

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