

## WE-BA: Covid-19 detection by Wavelet Entropy and Bat Algorithm

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### Abstract

**INTRODUCTION:** Covid-19 is a kind of fast-spreading pneumonia and has dramatically impacted human life and the economy.

**OBJECTIVES:** As early diagnosis is the most effective method to treat patients and block virus transmission, an accurate, automatic, and effective diagnosis method is needed.

**METHODS:** Our research proposes a machine learning model (WE-BA) using wavelet entropy for feature extraction to reduce the excessive features, one-layer FNNs for classification, 10-fold cross-validation (CV) to reuse the data for the relatively small dataset, and bat algorithm (BA) as a training algorithm.

**RESULTS:** The experiment eventually achieved excellent performance with an average sensitivity of  $75.27\% \pm 3.25\%$ , an average specificity of  $75.88\% \pm 1.89\%$ , an average precision of  $75.75\% \pm 1.06\%$ , an average accuracy of  $75.57\% \pm 1.21\%$ , an average F1 score of  $75.47\% \pm 1.64\%$ , an average Matthews correlation coefficient of  $51.20\% \pm 2.42\%$ , and an average Fowlkes–Mallows index of  $75.49\% \pm 1.64\%$ .

**CONCLUSION:** The experiments showed that the proposed WE-BA method yielded superior performance to the state-of-the-art methods. The results also proved the potential of the proposed method for the CT image classification task of Covid-19 on a small dataset.

**Keywords:** Covid-19 diagnosis, wavelet entropy, bat algorithm, feedforward neural network, K-fold cross-validation

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### 1. Introduction

Covid-19 is a kind of pneumonia caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The World Health Organisation (WHO) defined the COVID-19 outbreak as a public health emergency of international concern (PHEIC) in January 2020. Covid-19 has

dramatically impacted human life and caused significant damage to the economy. Over 100 million people are facing a return to extreme poverty because of Covid-19 [1, 2].

COVID-19 can cause cough, fever, taste loss, smell, dry cough, and other symptoms [3] and may develop into severe disease and lead to rapid death. Some infected people are asymptomatic but can also be a source of infection. At the same time, early diagnosis is the most

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