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# Cough Audio COVID-19 Detection Via Deep Neural Network with Combined Cross Entropy and Focal Loss

-Background With the outbreak of COVID-19 caused by the coronavirus SARS-CoV-2, the severity of infection and associated fatality rates motivate the exploration for rapid and reliable screening approaches. Although reverse transcriptase-polymerase chain reaction (RT-PCR) testing is commonly adopted, coughing sounds have been found to reveal useful COVID-19 signatures which can be used to facilitate rapid, non-invasive and reliable screening strategies. Spectral and waveform signatures of the disease are being investigated as design biomarkers for early diagnosis of the infection. Research on COVID-19 detection through cough sounds have been enabled by the curated Coswara dataset of cough samples collected from patients who tested positive for COVID-19 as well as from patients who tested negative. Similarly, the curated COUGHVID dataset consisting of crowd-sourced cough samples collected from COVID positive and negative patients across a wide range of demographics. These efforts pave the way for the development of automated diagnostic tools for detecting COVID-19 from cough audio samples. Invention Description Researchers at Arizona State University have developed a novel modification of the VGG13 deep neural network architecture in order to automate COVID-19 detection using features directly extracted from the coughing audio. Specifically, focus on the log-mel spectrograms of the audio excerpts was instrumental to this work, as well as a combination of binary cross entropy and focal losses. This modification enabled the model to achieve highly robust classification performance on the DiCOVA 2021 COVID-19 data. Also explored were the use of relevant data augmentation and an ensembling strategy to further improve the performance on the validation and the blind test datasets. The model achieved an average validation Area Under Curve (AUC) of 82.23% and a test AUC of 78.3% at a sensitivity of 80.49%. Potential Applications • Automated COVID-19 detection • Large-scale analysis of respiratory health • Machine learning for audio recognition Benefits and Advantages • Robust and capable of handling different datasets • Highly accurate • Non-invasive technique for COVID-19 detection Related Publication: COVID-19 detection using cough sound analysis and deep learning algorithms (PDF)Homepage of Professor Andreas Spanias