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| Methodology | Results |
|  Neural Networks [1]  |  Assists in automatic detection and classification of adventitious lung sounds.  |
|  Classifiers [2, 3]  |  Used for automatic detection and classification of lung sounds.  |
|  Non-negative Matrix Factorization (NMF) [4]  |  Assists in automatic detection and classification of adventitious lung sounds.  |
|  Deep Learning Algorithms [5]  |  Trains the machine to automatically learn the characteristics of the signals or waveforms of lung sounds. |
|  Convolutional Neural Network (CNN) [6-11] |  Extracts breathing sound features from a two-dimensional spectrogram image. Accuracy ranges from 63% to 99%. CNN-based model generally has the highest accuracy. |
|  Recurrent Neural Network (RNN) Model [12, 13] |  Used for lung sound classification.  |
|  Convolutional-Recurrent Neural Network (CRNN) [5, 14] |  Combination of CNN and RNN for lung sound classification.  |
|  AI-based Lung Sound Analysis [15, 16] |  Suggested for determining the degree of airway inflammation or risk of a number of lung diseases. |
|  Collection of Breathing Sounds from Smartphones or Real-time Lung Sounds from Wearable Devices [17-22] |  Used to develop automated AI-based solutions for lung sound analysis and classification. Through this technological advancement, abnormal respiratory and asthmatic symptoms could be detected or diagnosed at an early stage via real-time self-monitoring or telemedicine. |
|  Our study: 1D-CNN and LSTM Network Model  |  Achieved a detection accuracy of 90%. Not only identifies abnormal sounds within each breath but also captures comprehensive data on their location, duration, and relationships within entire respiratory cycles. Capable of handling continuous data. Utilizes a substantial dataset consisting of 535 respiration cycles from diverse sources. |

**S1 Table. Research trends in lung sound analysis and related papers.**

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