Study of feature selection algorithms to improve arrhythmia detection performance on ECG signal

1st I Putu Bagus Erix Wijaya
School of Computing
Telkom University
Bandung, Indonesia
erixwijaya@student.telkomuniversity.ac.id

2nd Satria Mandala
Human Centric (HUMIC) Engineering, School of Computing
Telkom University
Bandung, Indonesia
satriamandala@telkomuniversity.ac.id

***Abstract*—Arrhythmia, a potentially life-threatening heart rhythm disturbance, requires accurate diagnosis and treatment. The detection of arrhythmias using electrocardiogram (ECG) signals is a widely used method. However, the complex analysis of ECG signals often results in the inclusion of irrelevant features, which can affect the accuracy of arrhythmia detection. This study aims to enhance arrhythmia detection performance by developing an effective feature selection algorithm that identifies the most informative features in ECG signals. The proposed method combines Information Gain (IG) with a Convolutional Neural Network (CNN) architecture. The CNN model consists of the following layers: 1) Three Convolutional layers with Rectified Linear Unit (ReLU) activation; 2) Dropout layer with a dropout rate of 0.2 to prevent overfitting; 3) Three additional Convolutional layers with ReLU activation; 4) Max-pooling layer with a pool size of 2 to downsample feature maps; 5) Flatten layer to convert the output into a one-dimensional vector; 6) Dense layer with ReLU activation to learn complex relationships between features; 7) Dropout layer with a dropout rate of 0.2 to further mitigate overfitting; and 8) Dense layer with Softmax activation for multi-class classification. The proposed method addresses overfitting and ensures robustness in ECG signal analysis. The evaluation of the method was conducted on the MIT-BIH ECG dataset, which contains signals from multiple medical centers. The results revealed that the Information Gain based feature selection algorithm achieved an accuracy rate of 98.79%, with a specificity of 99.41% and sensitivity of 98.79%. The proposed feature selection algorithm can assist doctors in making more accurate diagnoses and selecting appropriate treatments for patients with arrhythmias**

***Index Terms*—arrhythmia, ECG signal, feature selection, deep learning.**