



ECG signal

Multi-resolution
wavelet-based
approach

Wavelet Components

1. P wave
2. QRS complex
3. T wave

Wave Intervals

1. PP interval
2. RR interval
3. QT interval
4. R peak
5. PR interval

Gabor
Filter

Gabor
features

Wavelet
Transform

Wave
features

Feature Extraction

Deep
Convolutional
neural networks
(Deep CNN)

Arrhythmia Classification

Proposed Bat Rider
Optimization
Algorithm (BaROA)

Rider
Optimization
Algorithm (ROA)

Multi-objective
bat algorithm
(MOBA)

Non-arrhythmia

Arrhythmia