CLAIMS

What is claimed is:

1. An HRV-data preprocessing method, comprising:

obtaining HRV data corresponding to a sliding window;

determining, based on the HRV data, a plurality of target peaks corresponding to the HRV data, calculating a variance of the plurality of target peaks, and determining HRV data having the variance that falls within a predetermined variance range as first target HRV data, wherein the plurality of target peaks are peaks in the HRV data that exceed a voltage threshold; and the voltage threshold is determined by: determining a maximum amplitude difference between a first upper envelope and a first lower envelope of the HRV data, determining a product of the maximum amplitude difference and a predetermined percentage threshold, and determining a sum of the product and an amplitude of the first lower envelope corresponding to the maximum amplitude difference as the voltage threshold;

determining an RR interval sequence of the first target HRV data based on the plurality of target peaks of the first target HRV data, determining whether each RR interval in the RR interval sequence falls within a predetermined heartbeat time interval range, and determining, from the first target HRV data, HRV data for which all RR intervals fall within the predetermined heartbeat time interval range as second target HRV data; and

extracting a time-domain feature, a frequency-domain feature, and a nonlinear feature of the second target HRV data.

2. The method according to claim 1, wherein said determining, based on the HRV data, the plurality of target peaks corresponding to the HRV data comprises:

determining a plurality of initial peaks in the HRV data based on a minimum cardiac cycle point count, wherein the minimum cardiac cycle point count represents a quantity of data points comprised in one heartbeat in the HRV data;

determining a first upper envelope and a first lower envelope of the HRV data;

determining a voltage threshold of the HRV data based on a percentage threshold, the first upper envelope, and the first lower envelope; and

selecting, from the plurality of initial peaks, peaks exceeding the voltage threshold to obtain the plurality of target peaks of the HRV data.

3. The method according to claim 1, wherein said obtaining the HRV data corresponding to the sliding window comprises:

obtaining first initial HRV data corresponding to the sliding window, and determining a second upper envelope and a second lower envelope of the first initial HRV data;

determining a maximum amplitude difference between the second upper envelope and the second lower envelope;

determining an amplitude adjustment ratio of each data point in the first initial HRV data based on a second upper envelope value and a second lower envelope value that correspond to each data point in the first initial HRV data, and the maximum amplitude difference; and

performing an amplitude adjustment on each data point in the first initial HRV data based on the amplitude adjustment ratio corresponding to the data point to obtain the HRV data.

4. The method according to claim 3, wherein said performing the amplitude adjustment on each data point in the first initial HRV data based on the amplitude adjustment ratio corresponding to the data point to obtain the HRV data comprises:

performing the amplitude adjustment on each data point in the first initial HRV data based on the amplitude adjustment ratio corresponding to the data point to obtain amplitude-adjusted first HRV data;

performing an anomaly detection on the amplitude-adjusted first HRV data to determine an anomalous point; and

correcting a value of the anomalous point based on a mean or a median corresponding to a plurality of data points preceding or following the anomalous point to obtain the HRV data.

5. The method according to claim 4, wherein said performing the anomaly detection on the amplitude-adjusted first HRV data to determine the anomalous point comprises:

determining, in the amplitude-adjusted first HRV data, a first difference between a target data point and a preceding data point and a second difference between the target data point and a following data point, wherein the target data point is any data point in the first HRV data;

calculating a first ratio of the first difference to the target data point and a second ratio of the second difference to the target data point; and

when each of the first ratio and the second ratio for the target data point is greater than a predetermined ratio threshold, determining the target data point as the anomalous point.

6. The method according to claim 4, wherein said performing the anomaly detection on the amplitude-adjusted first HRV data to determine the anomalous point comprises:

determining a median of the amplitude-adjusted first HRV data, and determining a median deviation of a target data point in the amplitude-adjusted first HRV data based on the

median; and

when the median deviation of the target data point is greater than a predetermined deviation threshold, determining the target data point as the anomalous point.

7. The method according to claim 3, wherein said obtaining the first initial HRV data corresponding to the sliding window comprises:

obtaining second initial HRV data corresponding to the sliding window;

performing a fast Fourier transform on a time-domain signal corresponding to the second initial HRV data to obtain a frequency-domain signal corresponding to the second initial HRV data;

determining whether the frequency-domain signal corresponding to the second initial HRV data is a valid frequency-domain signal based on a predetermined frequency-domain range; and

performing segmented filtering on the valid frequency-domain signal when the frequency-domain signal corresponding to the second initial HRV data is the valid frequency-domain signal, integrating the segmented-filtered valid frequency-domain signal, and performing an inverse fast Fourier transform on the integrated signal to obtain filtered first initial HRV data.

8. The method according to any one of claims 1 to 7, wherein said extracting the nonlinear feature of the second target HRV data comprises:

drawing a Poincaré scatter plot and a difference scatter plot based on the second target HRV data;

determining a standard deviation of a major axis and a standard deviation of a minor axis of an ellipse fitted to the Poincaré scatter plot; and

determining a quantity of points in each of a first quadrant and a third quadrant of the difference scatter plot,

wherein the nonlinear feature comprises the standard deviation of the major axis of the ellipse, the standard deviation of the minor axis of the ellipse, the quantity of points in the first quadrant, and the quantity of points in the third quadrant.

9. An HRV-data preprocessing apparatus, comprising:

an obtaining module configured to obtain HRV data corresponding to a sliding window;

a first processing module configured to determine, based on the HRV data, a plurality of target peaks corresponding to the HRV data, calculate a variance of the plurality of target peaks, and determine HRV data having the variance that falls within a predetermined variance range as first target HRV data, wherein the plurality of target peaks are peaks in the

HRV data that exceed a voltage threshold; and the voltage threshold is determined by: determining a maximum amplitude difference between a first upper envelope and a first lower envelope of the HRV data, determining a product of the maximum amplitude difference and a predetermined percentage threshold, and determining a sum of the product and an amplitude of the first lower envelope corresponding to the maximum amplitude difference as the voltage threshold;

a second processing module configured to determine an RR interval sequence of the first target HRV data based on the plurality of target peaks of the first target HRV data, determine whether each RR interval in the RR interval sequence falls within a predetermined heartbeat time interval range, and determine, from the first target HRV data, HRV data for which all RR intervals fall within the predetermined heartbeat time interval range as second target HRV data; and

an extraction module configured to extract a time-domain feature, a frequency-domain feature, and a nonlinear feature of the second target HRV data.

10. An electronic device, comprising:

at least one processor;

a memory; and

at least one application stored in the memory and configured to be executed by the at least one processor to implement the HRV-data preprocessing method according to any one of claims 1 to 8.