Classifying each min as activity or sleep

1. Get the intensity, position and the heart rate every minute
2. Modify the impossible positional values based on the corresponding intensities
3. To calculate whether the particular minute is sleep or activity
   1. If no intensities or positional values or hr observed during that minute classified as activity
   2. If sleep position during the minute is detected as greater than 4 classified as sleep
4. Further fine tuning done as follows:
   1. If sleep is detected between 2 consecutive activities the current minute classified as activity and vice versa
   2. If sleep is declared consecutively for a duration less than 5 mins the interval would be classified as activity
   3. Only during intervals which are consecutively classified as sleep for 12 mins and more are considered

Sleep staging based on heart rate clustering

1. Classification of sleep done for each minute classified as sleep in this function
2. The heart rate values during sleep are classified into four clusters in a way given below:
   1. First cluster - HR values in the range (minimum hr, overall hr mean) are classified here
   2. Second cluster - HR values in the range (minimum hr, mean of hrs in first cluster) are classified here
   3. Third cluster - HR values in the range (overall hr mean, maximum hr) are classified here
   4. Fourth cluster - HR values in the range (overall hr mean, mean of hrs in third cluster) are classified here
3. The stage calculation is computed in the following manner:
   1. Wake – If the HR falls between (mean of hrs in fourth cluster, maximum hr)
   2. Light - If the HR falls between (mean of hrs in second cluster, overall hr mean)
   3. Deep - If the HR falls between (minimum hr, mean of hrs in second cluster)
   4. REM - If the HR falls between (overall hr mean, mean of hrs in fourth cluster)
4. Further fine tuning done as follows:
   1. Deep sleep should be present in less than 20 percent of the entire sleep duration. Incase more than 20 percent is assigned as deep sleep it is reclassified to light sleep
   2. During the largest continuous sleep duration, wake should be present only for a maximum duration of 30 mins. If this time is exceeded then the remaining time is classified as light sleep
   3. The last 3 mins of sleep windows should be wake. If otherwise than the last 3 mins are classified as wake