



## Swing Data Coding Challenge

Our sensors record data from a three-axis accelerometer and a three-axis gyroscope. In order to appropriately use that data, we also need to record the timestamp at which the samples were taken. For any one swing, we'll have about a thousand such samples. We'd like you to put together a data structure that would represent all of this data. [Here](#) is a sample data file arranged in a CSV format. The columns are (in order) timestamp, ax, ay, az, wx, wy, wz. This is an actual data file from a real swing from our sensor.

To help inform your data structure choices, we typically operate on this data in a sequential fashion starting from either the first element or important indices in the swing data that we identify during processing (swing start, impact, swing end, etc.). All of the operations described below will occur on only one (or two, in the case of `searchContinuityAboveValueTwoSignals`) of the columns.

Once you've got a good data structure in place, we'd like you to implement four of our typical operations on this data set:

- `searchContinuityAboveValue(data, indexBegin, indexEnd, threshold, winLength)` - from `indexBegin` to `indexEnd`, search data for values that are higher than `threshold`. Return the first index where data has values that meet this criteria for at least `winLength` samples.
- `backSearchContinuityWithinRange(data, indexBegin, indexEnd, thresholdLo, thresholdHi, winLength)` - from `indexBegin` to `indexEnd` (where `indexBegin` is larger than `indexEnd`), search data for values that are higher than `thresholdLo` and lower than `thresholdHi`. Return the first index where data has values that meet this criteria for at least `winLength` samples.
- `searchContinuityAboveValueTwoSignals(data1, data2, indexBegin, indexEnd, threshold1, threshold2, winLength)` - from `indexBegin` to `indexEnd`, search `data1` for values that are higher than `threshold1` and also search `data2` for values that are higher than `threshold2`. Return the first index where both `data1` and `data2` have values that meet these criteria for at least `winLength` samples.
- `searchMultiContinuityWithinRange(data, indexBegin, indexEnd, thresholdLo, thresholdHi, winLength)` - from `indexBegin` to `indexEnd`, search data for values that are higher than `thresholdLo` and lower than `thresholdHi`. Return the the starting index and ending index of all continuous samples that meet this criteria for at least `winLength` data points.

These operations are called multiple times with multiple thresholds and index bounds during the normal course of analyzing a swing. Because of this, it is very important that these functions are correct and performant.

Feel free to use any language of your choosing. We are more than happy to answer any questions you have about this problem set - or Diamond Kinetix in general.

When you have a solution in place you'd like to share, feel free to upload it to GitHub or Bitbucket for us to take a look at.

As a bonus question, at what index do you think impact happens in this data file?