Gaussian Process Assignment

This assignment assumes that you know how to set up a kernel function for a Gaussian Process,
with parameters sigma, length and noise sigma_n.

Gradient descent : You also need to be familiar of algorithms for learning the appropriate parameters from 3D x-y-z position data.

The data to be analyzed consists of three dimensional coordinates of human kinematics. There are 50 such curves generated from the human's tracing of a 3D curve.

Normally you might a single set of kernel parameters to be used to fit each curve, but in your assignment this is not necessarily the case.

In your data set, it can be expected that the kernel parameters might change for different regions of the trace. Thus the assignment is to find best sets of parameters by a *sliding window* method, which works as follows.

Choose an window length and starting from the initial point for one of the coordinates, determine the kernel parameters using the gradient descent algorithm. Next advance the start coordinate by a delta and refit the kernel parameters. As long as the parameters are stable, continue, but if they change determine a new start point at the stage and start the setting process anew.

Continue this process until the entire process has been accounted for.

The scientific question being asked in this assignment is whether a Gaussian Process can determine the state of muscle co-contraction as revealed in a correlate with kernel parameters used to fit tracing data.

A data link will be posted on Canvas. You need to determine which coordinate of 50 three dimension curves that you fit.

You can borrow a gradient fitting algorithm from scipy but the choice of sliding window parameters and the code to change them should be your own.