Homework 5

STAT 547, Fall 2019

You are encouraged to discuss the homework questions with classmates or the instructor, but you must write and submit your individual copy. Please write down the name of the persons with whom you discussed the homework, and submit your homework in a single pdf file through Canvas. Due on Nov 12 before class.

1. Using `fdapace`, simulate $n = 50$ curves for each scenario and perform a functional principal component analysis. Consider the following scenarios:

   - Dense or sparse observations are available.
   - The true number of components K equals 3 or 20. For $K = 20$, use an appropriate eigenvalue sequence (you can visualize the curves to decide what is appropriate).
   - Vary the noise level to be high or low.

   Write a short paragraph reporting what you find for each of the following tasks. You may need `FPCA`, `MakeGPFunctionalData`, and `MakeSparseGP`.

   (a) Investigate the number of components chosen by different selection methods. Hint: use the `methodSelectK` option of `FPCA`.

   (b) For dense observation, compare the estimated FPC scores using the BLUP method and the integration method. Hint: use the `methodXi` option of `FPCA`.

   (c) For sparse observations, compare the estimated FPC scores using the BLUP method and the true scores.

2. Extend the PACE method for bivariate sparsely observed longitudinal data, and create a rudimentary implementation. Apply your implementation to analyze the bivariate process of height and body length growth of Tammar wallabies. Since the scales of the two processes vastly differ you may want to normalize them before the analysis.

   Reference: Chiou, Chen and Yang (2014), `https://www.jstor.org/stable/24310959`