

## EOSC 510/410 Assignment 2:

Note: Please do **not** submit your code; only submit your assignment as a PDF with the figures/results/tables embedded inside the document. **Include your name(s) in the document name**, e.g. Assignment1\_Anderson.pdf

Please submit the assignment to the TA (Geena Littel): glittel@eoas.ubc.ca

### Problem 1 (total of 8 points):

Following the guidelines below, analyze the given data (**PCA.mat** or **PCA.txt**) using principal component analysis (PCA). The dataset contains time series of four variables: x1, x2, x3 and x4. Guidelines:

- Plot the time series for each variable. [*1 point for the plot(s)*]
- Perform PCA on the data. [*1 point for correct size of input data and correct output of PCA*]
- Find which modes you want to keep in order to reconstruct the data and provide a rationale for your selection. [*1 point for the choice of modes and 1 point for the rationale*].
- Plot the PCs of the significant modes (i.e. those that you kept) in time. Briefly discuss the results (what are these plots telling you?) [*1 point for the plot(s) and 1 point for the discussion.*]
- Plot PC1 vs PC2. Discuss any feature that you find interesting. [*1 point for the plot, 1 point for the discussion.*]

### Problem 2 (total of 11 points):

Following the guidelines below, perform canonical correlation analysis (CCA) between the two datasets X and Y (**CCA.mat** or **CCA.txt**). Dataset X contains time series x1, x2, x3, and dataset Y contains time series y1, y2, y3.

Guidelines:

- Plot the original series (you can plot all X data points in 3-D x-space, and all Y data points in 3-D y-space). [*1 point for X data plot, 1 point for Y data plot.*]
- Perform CCA on the datasets. [*1 point for correct size of input data and correct output of CCA*]
- Plot the vectors that correspond to the modes of high correlation in the 3-D x-space and in the 3-D y-space. For example, if only first two CCA modes have high correlation (e.g. p-value < 0.01) then plot vector **F1** and vector **F2** in x-space, and **G1** and **G2** in y-space. [*1 point for the plot in x-space, and 1 point for the plot in y-space.*]
- Plot U(t) versus V(t) (scatter plot) for each mode. What are these plots telling you? [*1 point for the plot(s), and 1 point for the discussion.*]
- Plot **F** (only the significant modes) in 2-D (e.g. x1 vs x2; x1 vs x3; x2 vs x3) to see whether the vectors **F** (i.e. **F1**, **F2**, ...) point in the same direction as PCA eigenvectors of this dataset. Investigate the same for **G** in y-space. [*1 point for the plot(s) in x-space and 1 point for the investigation with PCA; 1 point for the plot(s) in y-space and 1 point for the investigation with PCA*]