

Biostat 788: Functional Data Analysis

This is a Ph.D. level advanced elective class. The course covers both the applied aspects and recent methods developments in functional data analysis. We will follow the textbook by Ramsay and Silverman (2005) closely. We will first cover the first 16 chapters of the book, including graphical representations, smoothing techniques, curve registration, functional linear models, functional principal component analysis and discriminant analysis. The remaining time will be spent on recent developments in FDA, including dependent data, functional clustering, time series data and sparse functional data etc. The amount to cover in the advanced topics will depend on the progress of the class.

The pace of the class will be relatively fast, aiming to cover a wide range of topics instead of all the technical details. Students interested in the technical details are encouraged to read the related papers and to make appointments to meet with the instructor for help.

We assume that the students have substantial background in either R or Matlab. The homework and final term project may use some software, but the use of the packages will not be covered in the class. The students are referred to the related websites for information.

Each student is required to do a term project, give a presentation on the project and turn in a 12-25 pages final report. The project can be a comprehensive real data analysis, a new method development, a simulation to compare different methods or a critical review of a particular area in the context of functional data analysis.

Course Director:

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Grading: 30% homework
70% term project (including presentation).

Office Hour: by appointment.

Textbooks:

Ramsay, J. O. and Silverman, B.W. (2005) *Functional data analysis*, 2nd ed., New York : Springer, ISBN 0-387-40080-X
Functional Data Analysis with R and MATLAB, by Ramsay, Hooker & Graves, (2009), Springer, ISBN: 0387981840

References:

Nonparametric Functional Data Analysis: Theory and Practice, by Ferraty & Vieu, (2006), Springer, ISBN: 0387303693
Applied Functional Data Analysis, by Ramsay & Silverman, (2002), Springer, ISBN: 0387954147.

