SYST/OR 568 Applied Predictive Analytics

Spring 2016

George Mason University
Department of Systems Engineering and Operations Research

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Course Description: Introduces predictive analytics with applications in engineering, business, finance, health care, and social economic areas. Topics include time series and cross-sectional data processing, data visualization, correlation, linear and multiple regressions, classification and clustering, time series decomposition, factor models and causal models, predictive modeling performance analysis, and case study. Provides a foundation of basic theory and methodology with applied examples to analyze large engineering, social, and econometric data for predictive decision making. Hands-on experiments with $R$ will be emphasized.

Prerequisites: Graduate standing (Undergraduate engineering math: Calculus, probability theory, statistics, and some basic computer programming skills.)

Textbooks:

Recommended References:

Optional Readings:


Assignments and Exams:

There will be five hand-in assignments during the semester, a mini term project, as well as a mid-term exam and a final exam, both in-class. The exams will not be open book. However, you will be permitted a two-sided “cheat sheet” with notes and/or formulae.

Grading:

The assignments, mini project, mid-term, and final exams constitute 25%, 20%, 25% and 30% of the grades respectively.

Schedule:

Unit #1: Introduction; review of predictive modeling, inferential statistics, and R lab
Unit #2: Predictive modeling and data pre-processing
Unit #3: Exploratory data analysis; visualization, transformation and kernel density
Unit #4: Descriptive modeling: univariate and multivariate statistical models
Unit #5: Regression models: linear prediction in business analytics, finance and econometrics
Unit #6: Nonlinear regression models and its applications in predictive analytics
Unit #7: Mid-term exam
Unit #8: Linear classification models and discriminant analysis
Unit #9: Nonlinear classification model, clustering, and classification tree
Unit #10: Multivariate time series models
Unit #11: Factor models and principal components
Unit #12: Bayesian inference and causal models
Unit #13: Performance analysis and case study
Unit #14: Course review
Unit #15: Term project presentation
Unit #16: Final exam