Syllabus

BINF 6210 / ITSC 8210
Numerical Methods and Machine Learning for Bioinformatics

Fall 2014

Instructor
Xiuxia Du
xiuxia.du@uncc.edu
(704) 250-5754

Textbook
No textbook is required

Course Description
The aim of this 3-credit course is to introduce commonly used numerical methods and machine learning techniques in the field of bioinformatics. Basic concepts from linear algebra, optimization, and information theory will be explained. How to apply these concepts to solving bioinformatics problems will be illustrated using examples from the literature.

Pre-requisites
Calculus and statistics

Objectives
• Understand the concepts underlying machine learning and numerical methods
• Design and apply machine learning algorithms to solve practical bioinformatics problems

Course Content
• Dimensionality reduction
  o Principal component analysis
  o Singular value decomposition
• Clustering
  o k-means clustering
  o Hierarchical clustering
  o Expectation maximization
• Classification
  o K-nearest neighbor
  o Linear discriminant analysis
  o Partial least squares discriminant analysis
  o Support vector machines (optional)
  o Decision trees (optional)
• Regression

Grading
Evaluation will be based on understanding of concepts and the ability to apply theory in solving practical problems.
• Three homework assignments: 60%
• Final project: 35%
• Classroom participation: 5%
**Attendance**
Attendance at lecture is required, although exceptions will be made for reasons such as illness or family emergency. Excessive absences will result in a reduced classroom participation score at the instructor’s discretion, and will negatively impact the overall course grade.

**University Integrity**
All students are required to read and abide by the Code of Student Academic Integrity. Violations of the Code of Student Academic Integrity, including plagiarism, will result in disciplinary action as provided in the Code. Definitions and examples of plagiarism are set forth in the Code. The Code is available from the Dean of Students Office or online at: http://www.legal.uncc.edu/policies/ps-105.html. A set of links to various resources on plagiarism and how to avoid it is available at the UNCC Library website: http://library.uncc.edu/display/?dept=instruction&format=open&page=920.