Standardized Syllabus for the College of Engineering

BME 6938: Machine Learning for Health & Biomedical Applications

1. **Catalog Description** (3 credits)
   This is a graduate level course designed for students with no prior machine learning experience. It explores major concepts of machine learning and their application in healthcare and biomedical applications.

2. **Pre-requisites and Co-requisites**
   Basic knowledge of Programming, Statistics, Probability

3. **Course Objectives**
   At the end of the semester, students are expected to be able to

   - Understand what machine learning is,
   - Understand different machine learning techniques,
   - Identify when and why a certain machine learning technique should be used,
   - Use machine learning algorithms for solving health and biomedical problems,
   - Use machine learning tools such as scikit-learn, R, RapidMiner

4. **Instructor**
   a. Office location: NEB 459
   b. Telephone: (352)-392-9469
   c. E-mail address: parisa.rashidi@ufl.edu
   d. Class Web site: Canvas
   e. Office hours: Tuesday/Thursday 10:40 am-11:40 am

5. **Meeting Times**
   - Tuesdays Period 5-6 (11:45 AM - 1:40 PM) , Thursdays Period 6 (12:50 PM - 1:40 PM)
   - Exam 1: Tuesday, October 06, 11:45 am-1:40 pm, Room: CHE 0237
   - Exam 2: Tuesday, December 08, 11:45 am-1:40 pm, Room: CHE 0237

6. **Class Session**
   2G49

7. **Meeting Location**
   Room: CHE 0237

8. **Material and Supply Fees**
   N/A

9. **Textbooks and Software Required**
   Course notes are developed and provided by the instructor.

10. **Recommended Reading**
    Recommended:

- Title: Introduction to Machine Learning
- Author: Ethem Alpaydin
- Publication date and edition: Third edition, 2014
- ISBN number: 0262028182

Optional:
- Title: Pattern Recognition and Machine Learning
- Author: Christopher M. Bishop
- Publication date and edition: First edition, 2007
- ISBN number: 0387310738

11. Course Outline (subject to change)
- Introduction to Machine Learning
- Review: Statistics, Linear Algebra, Optimization
- Supervised Techniques
  - Basic Classification: Decision Trees, Nearest neighbor
    - Application: Tumor Type Prediction
  - Advanced Classification: Neural network, SVM, Ensemble
    - Application: Cognitive State detection
    - Application: Joint movement detection in Microsoft Kinect
  - Basic Regression: Linear Regression, Nonlinear regression
    - Application: Vital Sign Monitoring
  - Probabilistic Approach
    - Learning, Inference
    - Logistic Regression, Bayesian Network
- Features
  - Feature Selection: Filter-based, embedded, Wrapper
    - Application: Bioinformatics, fMRI data
- Unsupervised Techniques
  - Dimensionality Reduction: Linear, Non-linear
    - Application: drug discovery
  - Cluster analysis: k-Means, DBSCAN, Hierarchical
    - Application: Gene Expression
  - Frequent Itemset Mining
    - Application: Genome Wide Association (GWA)
  - Graph Mining
    - Application: Medical Imaging
- Time Series Processing
  - Preprocessing, Similarity measures, Motif Discovery
    - Application: ECG, EEG, accelerometer data

12. Attendance and Expectations
Requirements for class attendance and make-up exams, assignments, and other work are consistent with university policies that can be found at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx.

13. Grading
Final grade is calculated as:
- Homework 20%
- Quiz 5%

- Term Paper 15%
- Final Presentation 15%
- Exam1 20%
- Exam 2 25%

14. **Grading Scale**

Grades may be curved. Undergraduate students, in order to graduate, must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. Graduate students, in order to graduate, must have an overall GPA of 3.0 or better (B or better). Note: a B- average is equivalent to a GPA of 2.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit:

https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

- A: 100-95
- A-: 94-90
- B+: 89-87
- B: 86-83
- B-: 82-80
- C+: 79-77
- C: 76-73
- C-: 72-70
- D+: 69-67
- D: 66-63
- D-: 62-60
- F: 59-0

15. **Honesty Policy**

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Note that failure to comply with this commitment will result in disciplinary action compliant with the UF Student Honor Code Procedures.
See http://www.dso.ufl.edu/sccr/procedures/honorcode.php

16. **Accommodation for Students with Disabilities**

Students Requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the course instructor when requesting accommodation.

17. **UF Counseling Services**

Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:

- UF Counseling & Wellness Center, 3190 Radio Rd, 392-1575, http://www.counseling.ufl.edu/cwc/Default.aspx, counseling services and mental health services.
- Career Resource Center, Reitz Union, 392-1601, career and job search services.
- University Police Department 392-1111

18. **Software Use**

All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

19. **Instructor Evaluation**

Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results. "