

BMIF330—Machine Learning for Biomedicine

Spring

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This course builds on the material covered in BMIF315 by introducing several additional machine learning concepts and algorithms with a focus on biomedical decision making and discovery. Note that even though biomedical applications and examples will be discussed, the methods have broad applicability in science and engineering. The following are the core topics that we plan to cover in this course. However, certain topics may be expanded or modified based on the background of the class participants.

Pre-requisites:

For DBMI students: Methodological foundations of Biomedical Informatics (BMIF315).

For non-DBMI students:

1. A course in data structures or algorithm design and analysis.
2. Ability to program in Matlab version 6 or later.
3. Basic concepts of machine learning and fundamental mathematical concepts needed in machine learning at the level covered in BMIF315. CS260/360 would provide an appropriate background.

Grading: Based on mid-term, term project, assignments and class participation.

Recommended Course Textbook: [1].

There will also be other reading assignments as appropriate.

Topics

1. Decision support systems—History and background.
2. Cognitive issues in decision making
3. Bayesian networks (Definition, properties, inference, applications)
4. Data pre-processing for machine learning
5. Decision trees
6. Clustering
7. K-Nearest neighbors
8. Neural networks
9. SVM regression and unsupervised SVMs
10. Bayesian network learning
11. Causal discovery using Bayesian networks

References

[1] Tom M. Mitchell. *Machine Learning*. McGraw-Hill, 1997.