

# Introductory Applied Machine Learning

## Fall 2022 Syllabus

**Time and place:** Mon 2:20-4:10pm & Fri 10:20-11:10pm at Rm. 201, Tseng-Jiang Hall South

**Prerequisites:** Calculus, Linear Algebra, and Programming (C++, Matlab, or Python)

**Instructor:** Yan-Fu Kuo ([ykuo@ntu.edu.tw](mailto:ykuo@ntu.edu.tw))

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Office: Rm. 203, Tseng-Jiang Hall South

### Course description:

This course covers the theory and practical algorithms for machine learning from a variety of perspectives. Typical tasks for machine learning are the classification of data, automatic regression, and unsupervised model fitting. Topics covered in this course include: statistical learning methods, shrinkage regression, principle component analysis, decision tree learning, support vector machines, artificial neural network, k-means, k-nearest neighbor, and etc. Short theoretical and programming assignments will be given. Students will also work on final projects of their choice.

### Tentative schedule:

Week	Date		Event
1	9/05	<del>9/09</del>	Introduction / Basic statistics and math review
2	9/12	9/16	Linear regression
3	9/19	9/23	Overfitting
4	9/26	9/30	PCA, PCR, and PLSR
5	10/03	10/07	Ridge regression and LASSO
6	<del>10/10</del>	10/14	LDA
7	10/17	<del>10/21</del>	Support vector machine
8	10/24	10/28	Decision tree
9	10/31	<del>11/04</del>	Midterm exam
10	11/07	<del>11/11</del>	Project midterm check
11	11/14	11/18	Artificial neural network
12	11/21	12/25	K-nearest neighbor and naïve Bayesian
13	11/28	12/02	k-means and hierarchal clustering
14	<del>12/05</del>	<del>12/09</del>	Sparse coding
15	12/12	<del>12/16</del>	Project presentation
16	12/19	<del>12/23</del>	Final exam

**Evaluation:**

- Homework assignments (written and programming): 60%
- Midterm exam: 10% (2 hrs, in-class, open or closed book)
- Final exam: 10% (2 hrs, in-class, open or closed book)
- Final project: 20% (presentation and report)
  - Level of challenge and performance: 10%
  - Midterm presentation: 3%
  - Final presentation + report: 7%
- No makeup exams shall be made except for those who have valid reasons of absences, and can present official documents that prove the reasons of absences

**Course policies:**

- **Academic dishonesty:**
  - First time a student is found guilty of academic dishonesty, the penalty is a zero on the assignment, exam or report
  - All other academic dishonesty cases will be reported to the university
- **Late assignments:**
  - All homework assignments are due two weeks after release and before class
  - A 20% per day penalty will be applied to LATE homework, mid-term report, and final report
- **Homework collaboration:** Copying from any outside sources (e.g., fellow students, Internet, etc.) on any material to be graded is not permitted, and will be considered cheating
- **Attendance:** There is no official attendance requirement
- **Cell Phones:** Please turn off the ringer on your cell phone before coming to class

**Textbooks and reference books:**

1. James, Witten, Hastie, and Tibshirani. 2013. *An introduction to statistical learning*. Springer.
2. Hastie, Tibshirani, and Friedman. 2009. *Elements of Statistical Learning*, 2<sup>nd</sup> Ed. Springer.
3. Tan, Steinbach, and Kumar. 2005. *Introduction to Data Mining*. Addison Wesley.
4. Bishop. 2007. *Pattern Recognition and Machine Learning*. Springer.
5. Mitchell. 1997. *Machine Learning*. McGraw-Hill.