

**In The Name of God, The Merciful, The Compassionate**

**Statistical Pattern Recognition  
Department of Computer Engineering  
Sharif University of Technology  
Spring 2012 – CE-725**

**Instructors:** Hamid R. Rabiee, PhD

**Class Hours & Location:** Saturday-Monday 13:30 – 15:00 (CE department #201)

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**Course Website:** [http://dml.ir/?page\\_id=241](http://dml.ir/?page_id=241) and <http://ce.sharif.edu/courses/90-91/2/ce725-1/>

**Course Objectives:** To make the graduate students acquainted with the fundamental concepts of statistical pattern recognition and its applications in computational intelligence.

**Course Text:** Lecture notes + selected papers + following references:

- Duda, Hart and Stork, "Pattern Classification", 2nd Edition, Wiley, 2001.
- Bishop, "Pattern Recognition and Machine Learning", Springer, 2006.

**Grading:** Based on Homework, Quizzes, Project, Mid-Term and Final Exams. The grade will be determined by:

- Homework: 15%, Only best 5 homework marks will be considered!
- Quiz: 10%, Only best 8 homework marks will be considered!
- Mini-exam: 5%
- Project: 10%
- Mid-Term Exam: 30%
- Final Exam: 30%

**Prerequisites:** Probability Theory, Stochastic Processes

**Course Description:** The course includes fundamental concepts of statistical pattern recognition, supervised, unsupervised and semi-supervised classification using; decision theory, linear and nonlinear discriminant functions, statistical classification; parametric & non-parametric methods, unsupervised learning and clustering, fuzzy clustering, support vector machines, artificial neural networks, Hidden Markov Models, feature selection and reduction techniques, cluster validation techniques, kernel based classification/learning and selected advanced topics.

**Tentative Course Outline:**

Date	No	Topic	Comments
90.11.15	1	Overview to the course	--
90.11.17	2	Feature space and feature selection	--
90.11.22		Holiday	
90.11.24	3	Dimensional reduction (feature extraction)	Quiz 1
90.11.29	4	Dimensional reduction (feature extraction)	HW 1
90.12.01	5	Dimensional reduction (feature extraction)	Quiz 2
90.12.06	6	Classification – Introduction	--
90.12.08	7	Classification – Probabilistic methods	Quiz 3
90.12.12 – HW1 due date			
90.12.13	8	Classification – Probabilistic methods	HW 2
90.12.15	9	Classification – Linear discriminant methods	Quiz 4
90.12.20	10	Classification – Linear discriminant methods	--
90.12.21 – The due date of phase 1 of the course project			
90.12.22	11	Classification – Non parametric modeling	Quiz 5
90.12.26 – HW2 due date			
90.12.27	12	Classification – Neural Networks (Introduction and concepts)	HW 3
<b>Nourooz Holidays</b>			
91.01.14	13	Classification – Neural Networks (Introduction and concepts)	--
91.01.18 – HW3 (Except NN problems) due date			
91.01.19	14	Classification – Support vector machines (Linear case)	--
91.01.21	15	Classification – Kernel methods	Quiz 6
91.01.26	16	Classification – Kernel methods and non-linear SVM	--
<b>Monday (91.01.28) - Midterm Exam</b>			
91.02.02	18	Classification – Graphical methods (HMM and Bayesian nets)	--
91.02.04	19	Classification – Graphical methods (HMM and Bayesian nets)	Quiz 7
91.02.08 – HW3 (NN problems) due date			
91.02.09	20	Clustering	HW 4
91.02.11	21	Clustering	--
91.02.15 – HW4 due date			
91.02.16	22	Expectation maximization and mixture models	Mini Exam 1, HW 5
91.02.18	23	Expectation maximization and mixture models	--
91.02.22 – HW5 due date			
91.02.23	24	Semi supervised methods	HW 6
91.02.25	25	Combining methods	Quiz 8
91.02.30	26	Applications	--
91.03.01	27	Applications	Mini Exam 2
91.03.05 – HW6 due date			
91.03.06	28	Applications	--
91.03.08	29	Applications	Quiz 9
91.03.16 – The due date of phase 2 of the course project			
91.03.31 – The due date of phase 3 of the course project			
<b>Monday (91.04.06) - Final Exam</b>			

# Course Regulations

## Attendance

Attending the class and TA sessions are mandatory.

## Homework Problems

Homework problems will be handed out on every other Saturdays and will be due two weeks later (on Fridays). The problems will cover the following week materials so do not expect to cover the whole problem set related materials right after the release. There will be some simple programming semi-projects using MATLAB. Course policy for late submission is mentioned below:

- 50% of the whole point for delivery up to three days after the deadline.
- 20% of the whole point for delivery up to one week after the deadline.
- Do not even think of submission after more than one week delay!

The homeworks grades will be announced three weeks after submission deadline, in the course web page.

## Quizzes and Exams:

Each Monday there will be a quiz, at the beginning of the lectures. Each quiz will cover the facts discussed in the previous week.

The quizzes grades will be announced three days later, in the course web page.

## Statement on Collaboration, Academic Honesty, and Plagiarism

We encourage working together whenever possible on; homework, working problems in tutorials, and discussing and interpreting reading assignments. Talking about the course material is a great way to learn.

Regarding homework, the following is a fruitful (and acceptable) form of collaboration; discuss with your classmates possible approaches to solving the problems, and then have each one fill in the details and write her/his own solution **independently**. An unacceptable form of dealing with homework is to copy a solution that someone else has written.

We discourage, but do not forbid, use of materials from prior terms that students may have access to. Furthermore, at the time that you are actually writing up your solutions, these materials must be set aside; copy-editing from other's work is not acceptable.

There will be a zero tolerance policy for Cheating/Copying HW's. The first time you are caught, you will receive a zero for the task at hand. If you are caught for a second time, you will fail the course.

In general, we expect students to adhere to basic, common sense concepts of academic honesty. Presenting another's work as if it was your own, or cheating in exams will not be tolerated.