Evaluation:

The total mark will be obtained as follows:
- Practice reports: 50% of the total mark.
- Final test (multiple choice test): 50% of the total mark.

Objectives:

- To understand the interrelation between Computer Vision, Pattern Recognition and Machine Learning.
- To review the main computer vision techniques both in theory and in practice.
- To learn some pattern recognition fundamentals.
- To build in practice a face recognition system.
- To analyse the different machine learning techniques, showing their advantages and drawbacks.

Course description:

SEMINAR #1: COMPUTER VISION

Unit 1: Wednesday September 13th 09:45-11:15 (lecture).

1. Introduction.

- General aspects of Computer Vision.

- Digital images.

- Applications.

Unit 2: Wednesday September 13th 11:30-13:00 (lecture).

2. Capturing images.

- Introduction.

- Optics.

- Sensors

- Image transmision

- Frame grabbers.

3. Image features. Transforming images

- Brightness.

- Image Histograms.

- Contrast.

- Point operations.

- Local operations.

- Global operations.

- Geometric operations.

Unit 3: Wednesday September 13th 15:45-17:15 (practice).

Practice session I

- Introduction to Matlab.

- Opening and closing images in Matlab.

- Transforming images.

Unit 4: Thursday September 14th 09:45-11:15 (lecture).

4. Edge Detection

- First derivative operators

- Second derivative operators

5. Segmentation

Unit 5: Thursday September 14th 11:30-13:00 (lecture).

6. Introduction to 3D vision.

- Introduction.

- Binocular settings.

- Single camera equations.

- A simple stereo system.

- Correlation based methods.

<u>**Unit 6: Thursday September 14th 15:45-17:15 (practice).**</u>

Practice session II

- Image segmentation

SEMINAR #2: PATTERN RECOGNITION

<u>**Unit 1: Friday September 15th 8:00-9:30 (lecture).**</u>

1. Introduction.

- Definition of pattern recognition.

- Pattern Recognition Systems

2. Bayesian decision theory.

- Introduction.

- Two-Category Classification

3. Feature Extraction and Selection Methods

- Selection methods

- Feature Extraction methods

o   Principal Component Analysis

o   Linear Discriminant Analysis

o   Independent Component Analysis

o   Non Negative Matrix Factorization

<u>**Unit 2: Friday September 15th 9:45-11:15 (lecture).**</u>

4. Example of pattern recognition system: Face recognition

- Introduction to face recognition

- Face recognition based on appearance

o PCA applied to face recognition tasks

Unit 3: Friday September 15th 11:30-13:00 (practice).

1. Study of PCA with a bidimensional set in Matlab.

2. Study of PCA with images in Matlab.

Unit 4: Friday September 15th 14:00-15:30 (practice).

1. Adquisition of real images of faces.

2. Face databases

3. Description of the acquisition system

4. Preprocessing with Matlab

5. Normalization

6. How many pictures??

Unit 5: Thursday September 14th 15:45-17:15 (practice).

1. Face recognition system based on PCA.

2. Task: use our face database to test the face recognition system.

Tuesday 19th

Test and evaluation

Seminar Schedule (September 2006):

	Monday 11th	Tuesday 12th	Wednesday13th	Thursday14th	Friday 15th		Monday 18th
8:00-9:30					**Lecture**		
9:45-11:15			**Lecture**	**Lecture**	**Lecture**		**Test**
11:30-13:00			**Lecture**	**Lecture**	**Practice**		
14:00-15:30					**Practice**		
15:45-17:15			**Practice**	**Practice**	**Practice**		