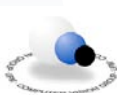




Pattern Recognition (PR) & Neural Networks (NN)

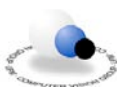
by
Pascual Campoy
pascual.campoy@upm.es

*Computer Vision Group
Universidad Politécnica Madrid*



Guide to the subject

- *Objectives*
- *Methodology*
- *Learning materials*
- *Evaluation*
- *Topics*
- *Schedule*





Objectives:

- **Be able to explain following terms and relate them to real-word problems:**
 - learning, pattern recognition, classification, dimensionality reduction, supervised learning, unsupervised learning
- **Ability to apply classical PR techniques**
 - PCA, Bayesian Decision & K-means
- **Ability to apply supervised ANN:**
 - MLP to PR
- **Ability to apply unsupervised ANN:**
 - SOM to PR



SCALE-UP Methodology

- <http://www.youtube.com/watch?v=tw1VVjvMF9k>



classroom at MIT

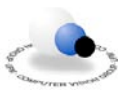
- <http://scaleup.ncsu.edu/>





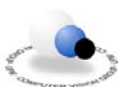
Methodology

- **In the classroom:**
 - Lecture
 - Colaborative working on the computer
 - Tutorial
 - Presentation of practical works
- **Out of the classroom:**
 - Individual study (before-after)
 - 2 Practical Works



Learning material

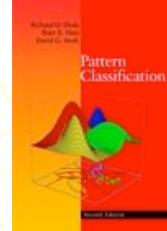
- **Aulaweb:**
 - invited student in 70038, password “aprendizaje”**
 - This guide: “0_guide_PR_NN.pdf”
 - Dslides for every topic, including classroom exercises
 - Dataset for exercises and practical works, including exercise form “_plantilla_ejercicios_clase.doc”
 - 2 Practical work statement



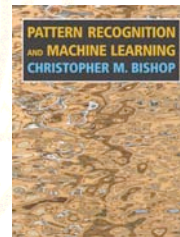


Learning material

- **"Pattern Classification"**
Duda-R, Hart-P, Stork-D
Wiley-Interscience , 2004



- **"Neural Networks for Pattern recognition"**
Christopher M. Bishop
Oxford Press , 1995



Further reading ...

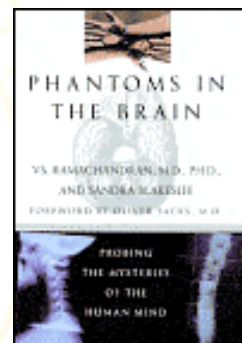
- **biological inspiration**



Christof Koch



Rodolfo Llinás



V.S. Ramachandran



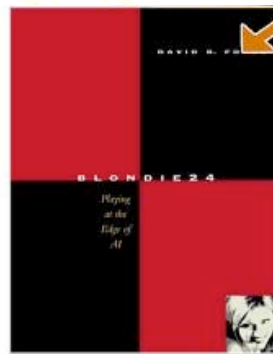


...further reading

making things to work



Jeff Hawkins



David Fogel



Evaluation

▪ Continuous evaluation

- Class-room exercises _____ 2
- Practical works _____ 4
- Exam (min 5/10) _____ 4

▪ Momentary evaluation

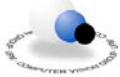
- Practical works (compulsatory) _____ 1,5
- Exam (min 5/10) _____ 8,5





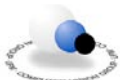
Topics:

1. **Intelligence: PR & learning**
2. **Classical techniques**
3. **Learning methodology: ANN**
4. **Supervised ANN: multilayer perceptron**
5. **Non supervised ANN: Self-organized maps**
6. **Research & challenges**



Schedule (1/2)

Schedule 2009-2010 for "Pattern Recognition & Neural Networks"		
Topic	Subject	Week/day
0	Guide to the subject	30-S
1	Introduction: Intelligence, Learning & Pattern Recognition	7-O
2	Classical techniques: PCA	14-O, 21-O
2	Classical techniques: Classifiers	28-O
3	Machine learning and Neural Networks	4-N
4	Supervised Neural Networks: MLP	11-N 18-N
1-2	Presentation Parctical Work #1	25-N
5	Unsupervised Neural Networks: SOM	2-D, 9-D
1-2-3-4-5	Review	16-D
	X-mas rest	
4-5	Presentation Parctical Work #2	13-E
6	"State of the art & research"	20-E
	Exam	26-E

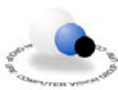




Schedule (2/2)

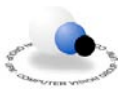
3 ECTS x 25 hours/ECTS = 75 hours

- Classroom:
28 hours = 14 weeks x 2 hours/week
- Outside the classroom 47 hours:
 - 18.5 hours for studying + 18.5 hours for practical works (2,7 hours/week)
 - 10 hours for preparing final exam



Classroom exercises ...

1. Create a word document from the template “plantilla_ejercicios_clase.doc” (downloaded from Aulaweb/contenidos/problemas) with the name: eX_YY_AAAAA_BBBBB_CCCCC.doc
where X is the chapter number
YY is the exercise number within the chapter
AAAAA, BBBBB and CCCCC are the students ID numbers
2. Save this document in your PC at Documentos compartidos/entregar





... classroom exercises

3. Fullfill the heading:

Redes Neuronales y Reconocimiento de Patrones – Ejercicios de clase

Día (dd/mm/aa): Ejercicio n°:

Autores		matricula	1 ^{er} apellido, nombre	e-mail	Horas *
Alum. 1					
Alum. 2					
Alum. 3					
Alum. 4					

* Horas invertidas desde el último ejercicio entregado

Autoevaluación:

Evaluación profesor:

Evaluación cruzada:

Evaluadores:

Evaluadores:		matricula	1 ^{er} apellido, nombre	e-mail
Alum. 1				
Alum. 2				
Alum. 3				
Alum. 4				

Resolución (esquema Simulink o programa Matlab, valores de parámetros, cálculos realizados, gráficas y análisis de resultados):

4. Write in the document the required solution that includes the explanation, the Matlab code, the obtained graphics and results, and the comments and conclusions
5. The document has to be closed in order to allow to be collected



Example 0.1

- change Matlab working directory to Documentos_compartidos/entregar
- download "datos_D2_C3_S1" from Aulaweb into this directory

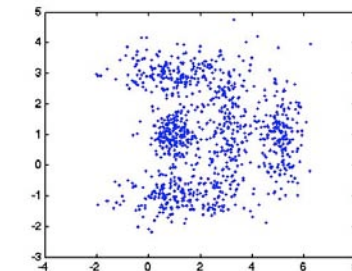
```
>> load datos_D2_C3_S1
```

```
p.valor 2x1000
```

```
p.clase 1x1000
```

```
p.salida 1x1000
```

```
>> plot(p.valor(1,:),p.valor(2,:),'b.');
```

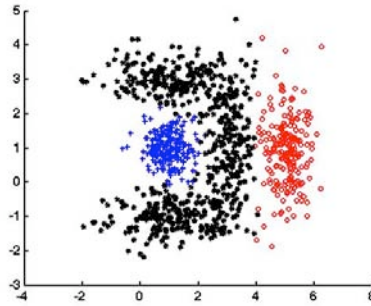




Exercise 0.1

```
>> load datos_D2_C3_S1.mat
```

- Print p.valor using a different color/prompt for each clase determined in p.clase



What is PR by learning?

