

Block 0

Presentation and guidelines of the course Intelligent Systems (SIN)

2019-2020

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Intelligent systems: presentation

Workload: 4.5 credits (3 + 1.5) / 2 h + 1.5 h per week (see scheduling)

Objectives:

Introduce the concept of Intelligent System under a practical standpoint.

Contents are organized in two thematic blocks:

- **Knowledge representation and search**
- **Automated learning**

The techniques we will study in this course will provide Computer Engineers with competences to understand and solve problems that require cognitive abilities or capabilities associated to the intelligent systems development.

Theory syllabus: 15 sessions organized in three blocks

Block 0: Presentation and guidelines (1 session)

Block 1: Knowledge representation and search (7 sessions)

0. Introduction to Artificial Intelligence. Concepts, fields and applications.
1. Rule-based systems (RBS). Representation in RBS: facts and rules. Pattern-matching.
2. Inference and control in RBS. 'Rete' match algorithm.
3. State-based problem design with RBS.
4. Problem solving in state-based representations: uninformed search.
5. Problem solving in state-based representations: heuristic search, algorithm A*.
6. Adversarial search. Minimax, Alpha-Beta algorithms

Block 2: Automated learning (7 sessions)

0. Introduction to Pattern Recognition and Automated Learning.
1. Probabilistic reasoning.
2. Learning discriminant functions. Perceptron.
3. Induction of rules and patterns. Decision Trees.
4. Unsupervised learning: k-means algorithm.
5. Structured representation. Markov Models. Forward algorithm.
6. Viterbi algorithm. Estimation of Markov models. Viterbi re-estimation.

Lecture scheduling

	3D	3G	3B	3E	3C	3A	3F	4GIA (double degree)
	Spanish	Spanish	Spanish	English	Spanish	Valencian	Spanish	Spanish
	Joan Andreu	Luis	Fede/Enrique	Eva	Albert/Jorge	Alfons	Paco	Vicent
	TUE	WED	WED	THU	THU	THU	THU	FRI
Session	15:00-17:00	11:30-13:30	12:00-14:00	08:30-10:30	08:30-10:30	10:30-12:30	17:00-19:00	11:00-13:00
0: B0	3-Sep	4-Sep	4-Sep	5-Sep	5-Sep	5-Sep	5-Sep	6-Sep
1: B1	10-Sep	11-Sep	11-Sep	12-Sep	12-Sep	12-Sep	12-Sep	13-Sep
2: B1	17-Sep	18-Sep	18-Sep	19-Sep	19-Sep	19-Sep	19-Sep	20-Sep
3: B1	23-Sep	23-Sep	23-Sep	23/09 (9:00-11:00)	23-Sep	23-Sep	23-Sep	23-Sep
4: B1	24-Sep	25-Sep	25-Sep	26-Sep	26-Sep	26-Sep	26-Sep	27-Sep
5: B1	1-Oct	2-Oct	2-Oct	3-Oct	3-Oct	3-Oct	3-Oct	4-Oct
6: B1	15-Oct	8-Oct	8-Oct	10-Oct	10-Oct	10-Oct	10-Oct	11-Oct
7: B1	22-Oct	16-Oct	16-Oct	17-Oct	17-Oct	17-Oct	17-Oct	18-Oct
EB1 (A2,A3)	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct	31-Oct
8: B2	5-Nov	23-Oct	23-Oct	24-Oct	24-Oct	24-Oct	24-Oct	8-Nov
9: B2	12-Nov	6-Nov	6-Nov	7-Nov	7-Nov	7-Nov	7-Nov	15-Nov
10: B2	19-Nov	13-Nov	13-Nov	14-Nov	14-Nov	14-Nov	14-Nov	22-Nov
11: B2	26-Nov	20-Nov	20-Nov	21-Nov	21-Nov	21-Nov	21-Nov	29-Nov
12: B2	3-Dec	27-Nov	27-Nov	28-Nov	28-Nov	28-Nov	28-Nov	5-Dec
13: B2	10-Dec	4-Dec	4-Dec	12-Dec	12-Dec	12-Dec	12-Dec	13-Dec
14: B2	17-Dec	11-Dec	11-Dec	19-Dec	19-Dec	19-Dec	19-Dec	18-Dec
EB2 (A5,A6)	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan	14-Jan
Final-Retake	23-Jan	23-Jan	23-Jan	23-Jan	23-Jan	23-Jan	23-Jan	23-Jan

Adjustments: extra session for all the groups to complete 15 weeks

8-Oct, 5-Dec, 18-Dec: academic scheduling swap

Lab assignments

P1. Knowledge representation and search (5 sessions)

- CLIPS: a toolkit to develop Rule Based Systems (RBS).
- Design and implementation of a problem with a RBS.
- Application of search techniques in the RBS.

P2. Automated learning (5 sessions)

- Development of a pattern recognition system.
- Application to a classification task.

Work teams: 1-2 people.

Evaluation of lab assignments: **INDIVIDUAL lab test, in-person evaluation.**

Lab sessions scheduling

No lab sessions on weeks: **7-11 Oct, 21-25 Oct, 28 Oct-1 Nov, 2-6 Dec, 16-20 Dec**

	3C1	3D2	3F2	3A2	3G1	3G2	3E1	4GIA1	3B1	3B2	3F1	3D1	3C2	3A1	4GIA2
	SPANISH	SPANISH	SPANISH	VALENC	SPANISH	SPANISH	ENGLISH	SPANISH	SPANISH	SPANISH	SPANISH	SPANISH	SPANISH	VALENC	SPANISH
	Jorge	Joan Andreu	Carlos	Alfons	Luis	VJulian	Eva	Vicent	Fede B1, JAndreu B2	Fede B1, JAndreu	Carlos	Joan Andreu	Jorge	Alfons	Vicent B1
	MON	MON	MON	TUE	TUE	TUE	WED	WED	WED	WED	WED	THU	FRI	FRI	FRI
Session	15-16:30	17-18:30	17-18:30	8-9:30	13-14:30	17-18:30	8:00-9:30	8-9:30	15-16:30	16:30-18	20-21:30	19-20:30	8-9:30	11:30-13	13-14:30
1: B1	9-Sep	9-Sep	9-Sep	10-Sep	10-Sep	10-Sep	11-Sep	11-Sep	11-Sep	11-Sep	11-Sep	12-Sep	13-Sep	13-Sep	13-Sep
2: B1	16-Sep	16-Sep	16-Sep	17-Sep	17-Sep	17-Sep	18-Sep	18-Sep	18-Sep	18-Sep	18-Sep	19-Sep	20-Sep	20-Sep	20-Sep
3: B1	23-Sep	23-Sep	23-Sep	24-Sep	24-Sep	24-Sep	25-Sep	25-Sep	25-Sep	25-Sep	25-Sep	26-Sep	27-Sep	27-Sep	27-Sep
4: B1	30-Sep	30-Sep	30-Sep	1-Oct	1-Oct	1-Oct	2-Oct	2-Oct	2-Oct	2-Oct	2-Oct	3-Oct	4-Oct	4-Oct	4-Oct
5: EB1 (A1)	14-Oct	14-Oct	14-Oct	15-Oct	15-Oct	15-Oct	16-Oct	16-Oct	16-Oct	16-Oct	16-Oct	17-Oct	18-Oct	18-Oct	18-Oct
6: B2	4-Nov	4-Nov	4-Nov	5-Nov	5-Nov	5-Nov	6-Nov	6-Nov	6-Nov	6-Nov	6-Nov	7-Nov	8-Nov	8-Nov	8-Nov
7: B2	11-Nov	11-Nov	11-Nov	12-Nov	12-Nov	12-Nov	13-Nov	13-Nov	13-Nov	13-Nov	13-Nov	14-Nov	15-Nov	15-Nov	15-Nov
8: B2	18-Nov	18-Nov	18-Nov	19-Nov	19-Nov	19-Nov	20-Nov	20-Nov	20-Nov	20-Nov	20-Nov	21-Nov	22-Nov	22-Nov	22-Nov
9: B2	25-Nov	25-Nov	25-Nov	26-Nov	26-Nov	26-Nov	27-Nov	27-Nov	27-Nov	27-Nov	27-Nov	28-Nov	29-Nov	29-Nov	29-Nov
10: EB2 (A4)	9-Dec	9-Dec	9-Dec	10-Dec	10-Dec	10-Dec	11-Dec	11-Dec	11-Dec	11-Dec	11-Dec	12-Dec	13-Dec	13-Dec	13-Dec

Evaluation (1/4)

Grading policy

(B1="Block 1"; B2="Block 2"; Exam="Open answer questions", Test="Multiple choice questions")

A1. B1 individual lab exam (1.25 points) → **Oct 16**

A2. B1 test (1.75 points) → **Oct 31**

A3. B1 exam (2 points) → **Oct 31**

A4. B2 individual lab exam (1.25 points) → **Dec 11**

A5. B2 test (1.75 points) → **Jan 14**

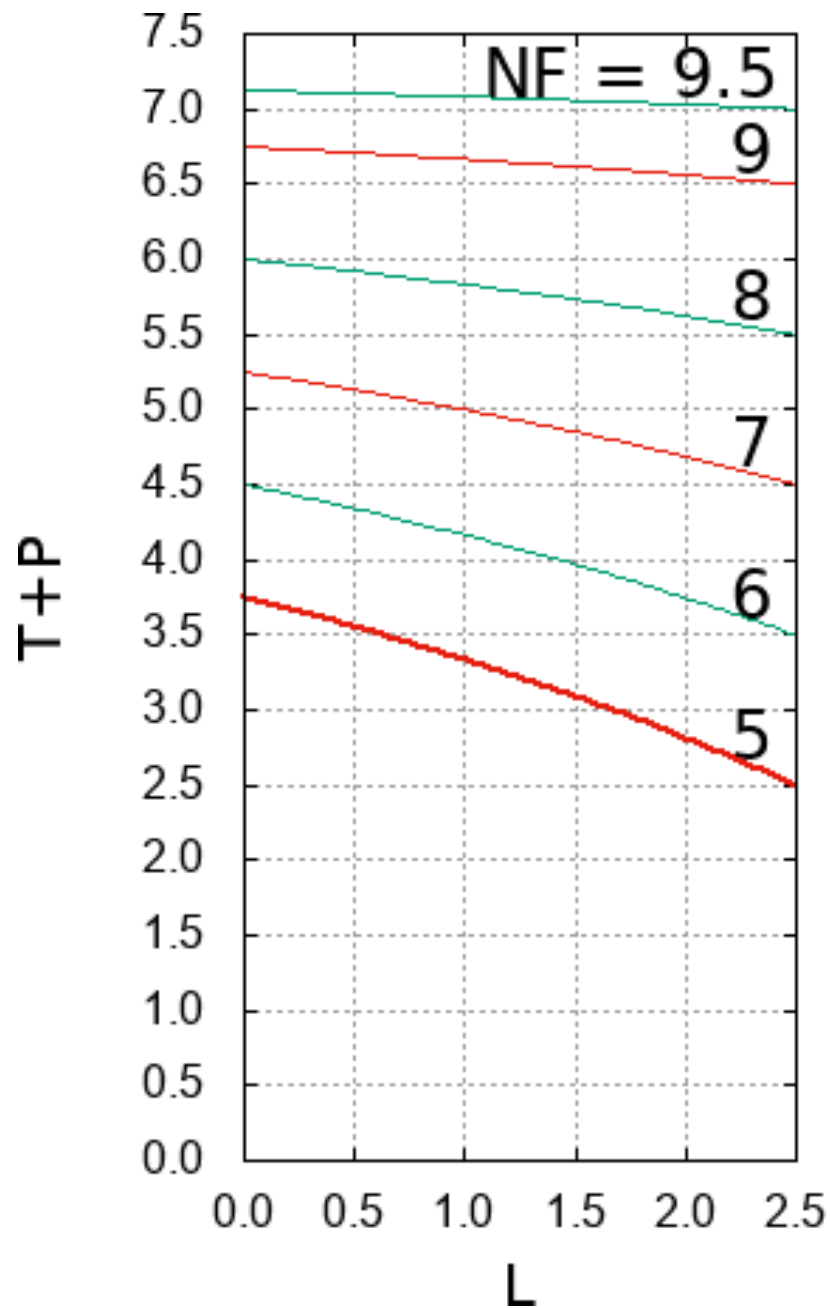
A6. B2 exam (2 points) → **Jan 14**

- L -> lab score $L = A1 + A4$ (up to 2.5 points)
- T -> test score $T = A2 + A5$ (up to 3.5 points)
- P -> problem score $P = A3 + A6$ (up to 4 points)

Final Grade (Nota Final – NF):

$$NF = L + (1 - L/10) * (T+P) * 10/7.5 \quad (>=5 \text{ to pass})$$

Evaluation (2/4)



Evaluation (3/4)

Final retake exam → **Jan 23**

Students who get $NF < 5$ are allowed to take the 'final retake exam':

A7. Test of all the course material (3.5 points)

A8. Exam (problems) of all the course material (4 points)

$$\mathbf{NFR = L + (1 - L/10) * (A7+A8) * 10/7.5} \quad (\geq 5 \text{ to pass})$$

Evaluation (4/4)

- ***NO attendance requirements!!***
- *Evaluation for students with attendance exemption:* same as for students with no attendance exemption.
- *Minimum score:* no minimum score is required in any evaluation activity.
- *‘Matrículas de honor’:* the staff will decide on granting ‘MH’ among the final grades equal or close to 10.
- Official group change (theory or lab): address the ETSINF staff, not SIN staff.
- Non-official group change (theory or lab): anyone can attend a group other than the one is officially enrolled -if room is available- AS LONG AS the evaluation tests are taken in the official group (**exception for ERASMUS students in theory**).

Lecturers

Lecturer	Theory group	Lab group
Federico Barber	3B (B1)	3B1 (B1) and 3B2 (B1)
Vicent Botti	4GIA	4GIA1 and 4GIA2 (B1)
Paco Casacuberta	3F	-
Jorge Civera	3C (B2)	3C1 and 3C2
Luis Hernández	3G	3G1
Alfons Juan	3A	3A1 and 3A2.
Vicent Julián	-	3G2
Carlos Martínez	-	3F1 and 3F2
Joan Andreu Sánchez	3D	3D1, 3D2, 3B1 (B2) and 3B2 (B2)
Eva Onaindía	3E	3E1 and 4GIA2 (B2)
Albert Sanchis	3C (B1)	-
Enrique Vidal	3B (B2)	-

Bibliography

All the material is available in PoliformaT (online resources).

Basic

- S. Russell, P. Norvig. ***Artificial Intelligence. A modern approach.*** Pearson, 3rd ed., 2010.
- R.O. Duda, D.G.Stork, P.I.Hart. ***Pattern Classification.*** Wiley, 2001.
- S. Theodoridis, K. Koutroumbas. ***Pattern Recognition.*** Elsevier, 2009.
- Nilsson, N. J. ***Artificial Intelligence. A new synthesis,*** McGraw Hill, 2001
- *Varios autores. Inteligencia Artificial. Técnicas, métodos y aplicaciones.* McGraw Hill, 2008.
- A. R. Webb, K. D. Copsey. ***Statistical Pattern Recognition.*** Wiley, 3ª ed., 2011.

Complementary:

- Slides, problems and exercises.
- Specific material that will be given during the course (manuals, articles, ...).