

Presentation and guidelines of the course Intelligent Systems (SIN)

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Intelligent systems: presentation

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

Objectives:

Introduce the concept of Intelligent System under a practical standpoint.

Contents are organized in two thematic blocks:

- **Knowledge representation and search**
- **Machine learning**

The techniques presented will provide the computer scientist competences to understand and solve problems that require cognitive abilities or capabilities associated to the development of intelligent systems.

Theory syllabus: 14 sessions in two blocks

Block 0: Presentation and guidelines

Block 1: Knowledge representation and search (7 sessions)

0. Introduction to Artificial Intelligence. Concepts, fields and applications.
1. Uninformed search.
2. Informed search: heuristic functions, A* algorithm.
3. A* algorithms with memory limitations.
4. Adversarial search.
5. RBS, components and architecture. CLIPS. Pattern-matching.
6. Inference with RBS: chaining and control. Inference engine.

Block 2: Machine Learning (5 sessions)

0. Introduction to machine learning.
1. Probabilistic reasoning: Bayes rule.
2. Supervised learning: Logistic regression.
3. Unsupervised learning: K-means algorithm.

Theory schedule (groups by columns chronologically sorted)

Exams in red: A2 08/01, A4 XX/12, A5,A6 24/01

| | 3D | 3G | 3B | 3E | 3C | 3A | 3F | 4GIA |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | Spanish | Spanish | Spanish | English | Spanish | Valencian | Spanish | Spanish |
| | VJ/JA | Luis | Eva | Jorge | Eva | Albert | CF/Jorge | Albert |
| | Tuesday | Wednesday | Wednesday | Thursday | Thursday | Thursday | Thursday | Friday |
| 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 | 10/09 | 11/09 | 11/09 | 12/09 | 12/09 | 12/09 | 12/09 | 13/09 |
| 1: B1 | 10/09 | 11/09 | 11/09 | 12/09 | 12/09 | 12/09 | 12/09 | 13/09 |
| 2: B1 | 17/09 | 18/09 | 18/09 | 19/09 | 19/09 | 19/09 | 19/09 | 20/09 |
| 3: B1 | 24/09 | 25/10 | 25/09 | 26/09 | 26/09 | 26/09 | 26/09 | 27/09 |
| 4: B1 | 01/10 | 02/10 | 02/10 | 03/10 | 03/10 | 03/10 | 03/10 | 04/10 |
| 5: B1 | 15/10 | 08/10 | 08/10 | 10/10 | 10/10 | 10/10 | 10/10 | 11/10 |
| 6: B1 | 22/10 | 16/10 | 16/10 | 17/10 | 17/10 | 17/10 | 17/10 | 18/10 |
| 7: B1 | 29/10 | 23/10 | 23/10 | 24/10 | 24/10 | 24/10 | 24/10 | 25/10 |
| A2 | 08/01 | 08/01 | 08/01 | 08/01 | 08/01 | 08/01 | 08/01 | 08/01 |
| 8: B2 | 12/11 | 13/11 | 13/11 | 14/11 | 14/11 | 14/11 | 14/11 | 15/11 |
| 9: B2 | 19/11 | 20/11 | 20/11 | 21/11 | 21/11 | 21/11 | 21/11 | 22/11 |
| 10: B2 | 26/11 | 27/11 | 27/11 | 28/11 | 28/11 | 28/11 | 28/11 | 29/11 |
| 11: B2 | 03/12 | 04/12 | 04/12 | 12/12 | 12/12 | 12/12 | 12/12 | 05/12 |
| 12: B2 | 10/12 | 11/12 | 11/12 | XX/XX | XX/XX | XX/XX | XX/XX | 13/12 |
| A4 | XX/12 | XX/12 | XX/12 | XX/12 | XX/12 | XX/12 | XX/12 | XX/12 |
| A5, A6 | 24/01 | 24/01 | 24/01 | 24/01 | 24/01 | 24/01 | 24/01 | 24/01 |

Lab assignments

B1. Search (5 sessions)

- Presentation of the search environment: 8-puzzle.
- Analysis and evaluation of heuristic functions.

B2. Machine learning (4 sessions)

- Development of pattern recognition systems.
- Application to classification tasks.

Work teams: 1-2 people.

Evaluation of lab assignments performed: Individual lab test evaluation.

Lab schedule (groups by columns chronologically sorted)

Exams in red: A1 23/10-29/10 (B1), A3 16/01-20/01 (B2)

| | 3C1 | 3D2 | 3A2 | 3E2 | 3G2 | 3E1 | 3B1 | 3B2 | 3F1 | 3D1 | 3C2 | 3A1 | 4GIA1 | 3G1 |
|----------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|--------------|
| | Spanish | Spanish | Valencian | English | Spanish | English | Spanish | Spanish | Spanish | Spanish | Spanish | Valencian | Spanish | Spanish |
| | Gerard | Ángel | Albert | Jorge | Luis | Gerard | Eva Ángel | Eva | Gerard | VicentJ | Eva | VicentJ | Albert | Luis |
| | Monday | Monday | Tuesday | Tuesday | Tuesday | Wed. | Wed. | Wed. | Wed. | Thursday | Friday | Friday | Friday | Friday |
| Session | 15-16:30 | 15-16:30 | 8-9:30 | 10-11:30 | 17:30-19 | 8-9:30 | 15-16:30 | 16:30-18 | 20-21:30 | 19-20:30 | 8-9:30 | 11:30-13 | 13-14:30 | 13-14:30 |
| 1: B1 | 30/09 | 30/09 | 24/09 | 24/09 | 24/09 | 25/09 | 25/09 | 25/09 | 25/09 | 26/09 | 27/09 | 27/09 | 27/09 | 27/09 |
| 2: B1 | 07/10 | 07/10 | 01/10 | 01/10 | 01/10 | 02/10 | 02/10 | 02/10 | 02/10 | 03/10 | 04/10 | 04/10 | 04/10 | 04/10 |
| 3: B1 | 14/10 | 14/10 | 15/10 | 15/10 | 15/10 | 08/10 | 08/10 | 08/10 | 08/10 | 10/10 | 11/10 | 11/10 | 11/10 | 11/10 |
| 4: B1 | 21/10 | 21/10 | 22/10 | 22/10 | 22/10 | 16/10 | 16/10 | 16/10 | 16/10 | 17/10 | 18/10 | 18/10 | 18/10 | 18/10 |
| 5: A1 | 28/10 | 28/10 | 29/10 | 29/10 | 29/10 | 23/10 | 23/10 | 23/10 | 23/10 | 24/10 | 25/10 | 25/10 | 25/10 | 25/10 |
| 6: B2 | 18/11 | 18/11 | 19/11 | 19/11 | 19/11 | 20/11 | 20/11 | 20/11 | 20/11 | 14/11 | 22/11 | 22/11 | 22/11 | 22/11 |
| 7: B2 | 25/11 | 25/11 | 26/11 | 26/11 | 26/11 | 27/11 | 27/11 | 27/11 | 27/11 | 21/11 | 29/11 | 29/11 | 29/11 | 29/11 |
| 8: B2 | 02/12 | 02/12 | 03/12 | 03/12 | 03/12 | 04/12 | 04/12 | 04/12 | 04/12 | 28/11 | 05/12 | 05/12 | 05/12 | 05/12 |
| 9: B2 | 09/12 | 09/12 | 10/12 | 10/12 | 10/12 | 11/12 | 11/12 | 11/12 | 11/12 | 12/12 | 13/12 | 13/12 | 13/12 | 13/12 |

Evaluation (1/2)

Grading policy

(B1="Block 1"; B2="Block 2")

A1. Lab. test B1 (1,25 points).

A2. Exam B1 (3,75 points).

A3. Lab. test B2 (1,25 puntos).

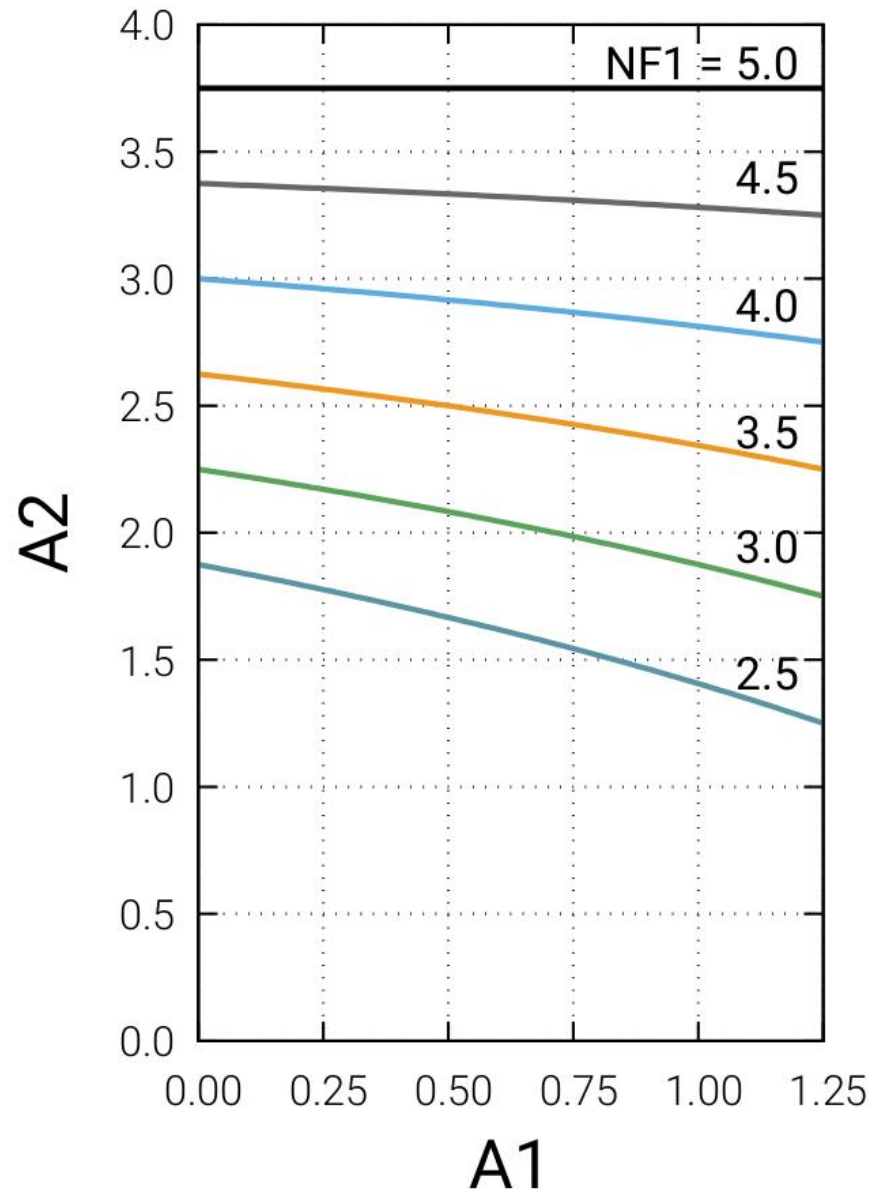
A4. Exam B2 (3,75 puntos).

Final grade (≥ 5 to pass):

$$NF = NF1 + NF2$$

where

- NF1 is the final grade on B1:
- $NF1 = A1 + (1 - A1/5) * A2 * 5/3,75$
- NF2 is the final grade on B2:
- $NF2 = A3 + (1 - A3/5) * A4 * 5/3,75$



Evaluation (2/2)

- Students can modify their final grade taking two additional exams:
 - A5. Retake exam B1 (3,75 points).
 - A6. Retake exam B2 (3,75 points).
- The final modified grade (NFM) is computed as $NFM = NFM1 + NFM2$ where
 - $NFM1 = A1 + (1 - A1/5) * A5 * 5/3,75$
 - $NFM2 = A3 + (1 - A3/5) * A6 * 5/3,75$
- If the student does not take A5, then $A5=A2$
- If the student does not take A6, then $A6=A4$
- It is required a NFM no lower than 5 to pass the course.
- No minimum attendance required.
- *Evaluation for students with attendance exemption is the same as without.*
- *Minimum score: no minimum score is required in any evaluation activity.*
- *“Matrículas de honor”*: decided by lecturers on those final grades close to 10.
- Official group changes (theory and lab): please address ETSINF staff, no SIN lecturers.
- *Non-official group changes (theory and lab): students can attend a group other than the officially signed up group as long as room is available, but exams must be taken in the official group.*

Lecturers

| Lecturers | Theory groups | Lab groups |
|---------------------|---------------|---------------------|
| Ángel Aso | - | 3B1 (B2), 3D2 |
| Jorge Civera | 3E, 3F (B2) | 3E2 |
| Carlos Fernández | 3F (B1) | - |
| Luis Hernández | 3G | 3G1, 3G2 |
| Vicent Julián | 3D (B1) | 3A1, 3D1 |
| Gerard Mas | - | 3C1, 3F1, 3E1 |
| Eva Onaindía | 3B, 3C | 3B1 (B1) , 3B2, 3C2 |
| Joan Andreu Sánchez | 3D (B2) | - |
| Albert Sanchis | 3A, 4GIA | 3A2, 4GIA1 |

Bibliography

All the materials are available in PoliformaT and GitHub.

Basic:

- S. Russell, P. Norvig. *Artificial Intelligence. A modern approach*. Pearson, 3rd ed., 2010.
- K.P. Murphy. **Probabilistic Machine Learning: An Introduction**. MIT Press, 2022.

Supplementary:

- PoliformaT: slides, problems, exercises, papers, etc.
- GitHub: github.com/jorcisai/SIN
- Videolectures (recorded sessions)