DEGREE CURRICULUM

INTELLIGENT SYSTEMS

Coordination: Course taught during the first semester of the first year of the degree within the module of " Information Technology "

Academic year 2015-16

INTELLIGENT SYSTEMS 2015-16

Subject's general information

Subject name	INTELLIGENT SYSTEMS
Code	103054
Semester	First semester
Typology	Compulsory
ECTS credits	4.5
Groups	1 Grup
Theoretical credits	2.5
Practical credits	2
Coordination	Course taught during the first semester of the first year of the degree within the module of " Information Technology "
Office and hour of attention	Contact me to arrange a mutually suitable time
Department	Informàtica i Enginyeria Industrial
Teaching load distribution between lectures and independent student work	2 hours per each hour of physical class.
Modality	Semipresencial
Important information on data processing	Consult this link for more information.
Language	Castellà/Anglés
Degree	Master in Computer Enginneering
Distribution of credits	Every week the student attends to two hours of physical class, which include theoretical, practical and laboratory sessions. In the theoretical sessions the issues that refer to the content section are presented. In the practical sessions, problems and proposed solutions are discussed . In the laboratory sessions, laboratory activities are conducted. The independent work of the student is fundamental and involves the resolution of exercises and practical tasks .
Office and hour of attention	Contact me to arrange a mutually suitable time
E-mail addresses	carlos@eup.udl.es

INTELLIGENT SYSTEMS 2015-16

Carlos Ansótegui

Subject's extra information

For questions or related issues, it is recommended to send an email to the teachers of the subject.

Learning objectives

See competences

Competences

University of Lleida strategic competences

- Master Information and Communication Technologies.

  Goals

  - Apply and evaluate solvers for optimization problems.
  - Apply and evaluate tools for data mining.
- Master a foreign language.

  Goals

  - Demonstrate knowledge and skill in designing a slide presentation on an intelligent system in English language.
  - Prepare documentation on the architecture, design and implementation of intelligent systems in English language.

Degree-specific competences

- Capacity to apply mathematic, statistical and AI methods to model, design and develop smart and knowledge-based applications, services and systems.

  Goals

  - Design, implement and evaluate advanced search algorithms as subsystems describing the space and time complexities.
  - Select suitable heuristics and implement evaluation functions.
  - Model decision and optimization problems through Minizinc language.
  - Apply and evaluate solvers for combinatorial optimization problems.
  - Evaluate and implement supervised and non supervised learning algorithms.
  - Select the most suitable learning technique depending on the problem domain.

Degree-transversal competences

- Capacity to draft, design and implement projects and/or give novel solutions, using engineering-related tools

  Goals

  - Integrate heuristic search, optimization and machine learning techniques as part of an intelligent system .

INTELLIGENT SYSTEMS 2015-16

Subject contents

The topics of the subject are the following:

- T1. Introduction to Intelligent Systems.

- T2. Advanced Search.

- T3. Combinatorial Optimization problems (through Minizinc).

- T4. Advanced machine learning (through scikit-learn).

- T5. Architecture and implementation of Intelligent Systems.

Methodology

The theoretical classes incorporate illustrative examples and problems to be solvd in the laboratory classes.

In laboratory classes the proposed problems are resolved. The algorithms presented in the lecture are also implemented. In a first phase, the student watches the teacher how to implement an algorithm and how to evaluate its correctness and efficiency. In a second phase the student begins to solve the current laboratory activity. The programming language is Python. Code quality is an important aspect .

Development plan

Week 1:

T1- Introduction to Intelligent Systems.

Activity Lecture **Others** Lab exercises

Physical hours 2 h **Autonomous work hours** 2 h

Weeks 2-7:

T2- Advanced Search

Activity Lecture **Others** Lab exercises

Physical hours 12h **Autonomous work hours** 12h

Weeks 8, 10 i 11:

T3- Combinatorial Optimization problems (through Minizinc)

Activity Lecture **Others** Lab exercises

Physical hours 6h **Autonomous work hours** 6h

Weeks 12-15:

T4- Advanced machine learning (through scikit-learn)

Activity Lecture **Others** Lab exercises

Physical hours 8h **Autonomous work hours** 8h

Note: Theme 5 (T5) is incremental and will be interleaved with the previous ones.

Monitoring tests:

There will be a test at the end of each block.

Exams:

Week 9: first written exam

Weeks 16-17: second written exam

Week 19: recovery of written exams

Lab Activities:

Week 8: deadline for first lab activity

Week 12: deadline for second lab activity

Week 15: deadline for third lab activity

Evaluation

Activity Written exam

Week 9

Percentatge 25% **Type** Compulsory / Individual

Evaluation:

The activity will be evaluated over 10 punts . To approve the subject the mark obtained in this written test must be > = 3 .

Objectives

- Design, implement and evaluate advanced search algorithms as subsystems describing the space and time complexities.
- Select suitable heuristics and implement evaluation functions.

Activity Written exam

Weeks 16-17

Percetatge 25% **Type** Compulsory / Individual

Evaluation:

The activity will be evaluated over 10 punts . To approve the subject the mark obtained in this written test must be > = 3 .

Objectives

- Apply and evaluate solvers for optimization problems.
- Model decision and optimization problems through Minizinc language.
- Evaluate and implement supervised and non supervised learning algorithms.

- Select the most suitable learning technique depending on the problem domain.

Activity Laboratory activity

Week 8

Percentatge 20% **Type** Compulsory / Group

Evaluation:

The activity will be evaluated over 10 punts . This activity can not be recovered.

Objectives

- Design, implement and evaluate advanced search algorithms as subsystems describing the space and time complexities.
- Demonstrate knowledge and skill in designing a slide presentation on an intelligent system in English language.
- Prepare documentation on the architecture, design and implementation of intelligent systems in English language.

Activity Laboratory activity

Week 12

Percentatge 20% **Type** Compulsory / Group

Evaluation:

The activity will be evaluated over 10 punts . This activity can not be recovered.

Objectives

- Model decision and optimization problems through Minizinc language.
- Apply and evaluate solvers for optimization problems.
- Demonstrate knowledge and skill in designing a slide presentation on an intelligent system in English language.
- Prepare documentation on the architecture, design and implementation of intelligent systems in English language.

Activity Laboratory activity

Week 15

Percentatge 10% **Type** Compulsory / Group

Evaluation:

The activity will be evaluated over 10 punts . This activity can not be recovered.

Objectives

- Evaluate and implement data mining algorithms in scikit-learn

- Demonstrate knowledge and skill in designing a slide presentation on an intelligent system in English language.
- Prepare documentation on the architecture, design and implementation of intelligent systems in English language.

Recovery of written exams:

Evaluation

If the final grade in the course is < 5, then the student can decide to recover the 50% represetend by the written exams. In this case, the student must have completed the three laboratory activities with a mark each >= 3, and he/she must have presented the two written exams. The recovery exam will be evaluated over 10 points. To pass the subject the mark obtained in the written test must be > = 3 . The weight of this recovery exam in the final grade is 50 %.

Bibliography

- Artificial Intelligence: A Modern Approach

S. J. Russell and P. Norvig

Prentice Hall, 2009

- Essentials of Artificial Intelligence

Ginsberg

Morgan Kaufmann Pub, 1993

- Inteligencia Artificial.

José T. Palma and Roque Marín Morales.

Mc Graw Hill, 2008

- Handbook of Satisfiability

Biere, Armin and Heule, Marijn J. H. and van Maaren, Hans and Walsh, Toby

IOS Press, 2009

- Data Mining: Practical Machine Learning Tools and Techniques

Ian H. Witten and Eibe Frank

Morgan Kaufmann, 2005

- SCIKIT-LEARN: http://scikit-learn.org/stable/

- MINIZINC: http://www.minizinc.org/