



Escuela Superior Politécnica del Litoral
Facultad de Ingeniería en Electricidad y Computación
Artificial Intelligence

Final Projects and Homework # 3 and # 4.

The final project aims to evaluate the ability to analyze a problem, identify and define the computing requirements appropriate for later implementation of a computer system using AI techniques as reviewed in class.

The final project will be developed in phases configured as homework #3 and #4, which will report the progress of the project, and a final product, which will be due at the end of the semester.

Homework #3 and #4 as well as the final project will be written in English and will be implemented in groups. Each group will hand-in a printed report and a CD containing all source code generated during implementation, as well as the collected data and the final “ppt” presentation, which will be used to present the project at the end of the semester. The written report will contain the following sections:

- A. The requirement analysis and problem conceptualization;
- B. Analysis of the selected development tool;
- C. A prototype description; and
- D. The final product documentation using a formal language.

Each group will present the results of the project on Friday, August 25th, 2017. The presentation includes a session of Q&A to each one of the group members. Hence, be prepared and ready to answer questions about the developed project from the audience.

Each group must also up-load each homework and the final report in SIDWeb, section “Trabajos”, as indicated in the “Delivery schedules” section below.

Homework # 3 – First final project review: The first review of the project will be handed-in as indicated in the “Delivery schedules” section below. Each group must hand-in a written report and load the homework in SIDWeb in the “Trabajos” section. This first deliverable must include at least:

- Project title
- Name of the group members
- Group number
- The requirement analysis and problem conceptualization using a formal language such as UML:
 - Definition of the problem definition,
 - A general feasibility analysis, describing if it is justified, possible and appropriate to develop the project using AI techniques,
 - Acquisition of preliminary knowledge needed to solve the problem,
 - A description of the problem proposed to be solved, using AI techniques.



Homework # 4 – Second final project review: The second review of the project will be handed-in as indicated in the “Delivery schedules” section below. Each group must hand-in a written report and load the homework in SIDWeb in the “Trabajos” section. This first deliverable must include at least:

- Project title
- Name of the group members
- Group number
- An analysis of the selected development tool (shell) which will be used to implement the solution
- A description of a prototype.
- A demo of the prototype of the implementation
- Some preliminary results

Prepare also a ppt or pdf presentation of **5 minutes** and be ready to defend this second advance of the project, according to the scheduled indicated in the “Delivery schedules” section below. Include the printed version of the presentation in the written report.

Final report of the project: Each group must hand-in a written final report and load the project in SIDWeb in the “Trabajos” section. Include a CD with all the source code and data generated during the project implementation.

For the report: The final report of the project will be handed-in as indicated in the “Delivery schedules” section below. The report must contain at least the following:

- Project title
- Name of the group members
- Group number
- Introduction
- The requirement analysis and problem conceptualization
- Analysis of the selected development tool
- A prototype description
- The final product documentation using a formal language
- Test cases and the results
- Conclusion and what have you learned
- References (using a standard format)

Presentation:

Prepare also a ppt or pdf presentation of **10 minutes**, which summarizes the main points of the final report; focus on the analysis and problem conceptualization, analysis of the selected development tool, and the final product; be ready to defend the project, according to the scheduled indicated in the “Delivery schedules” section below. Include the printed version of the presentation in the written report. The final presentation includes a demo of the final product implemented.



Delivery schedules:

Feedback of the final project will be given in homework #3 and #4.

Homework # 3 – First review of the project: July 14th, 2017.

Homework # 4 – Second review of the project: July 28th, 2017. Also, be ready to present the advance of the project in class.

Final report and project presentations: Friday, August 25th, 2017. Turns will be assigned on August 18th, in class.



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PROJECTS:

Project Group 1: In a programming language of your preference or using a “Shell” (available in Internet, such as: CLIPS, ECLIPS from NASA o JESS de Sandia National Laboratories, or any other) and the Artificial Intelligence techniques discussed in class, develop a system for recommending a client the best wine, based on a set of rules that describe the kind of food, and other parameters used by the experts, when defining the selection of a wine.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Before implementing the system, the group needs to evaluate the tools (Shells) available, for this type of problem, and report on the characteristics, strengths and weakness identified.
- c) The system must provide a graphical user interface of the shell, to be able to define the problem and receive the recommended solution.

Project Group 2: In a programming language of your preference or using a “Shell” (available in Internet, such as: CLIPS, ECLIPS from NASA o JESS de Sandia National Laboratories, or any other) and the Artificial Intelligence techniques discussed in class, implement a system for recommending the best Ecuadorian tourist route from Guayaquil to Quito, based on the shortest route. Use the “Hill Climbing” search algorithm.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Before implementing the system, the group needs to evaluate the requirement and tools (Shells) available, for implementing this type of problem, and report on the characteristics, strengths and weakness identified.
- c) The system must provide a graphical user interface of the shell, to be able to define the problem and receive the recommended solution.

Project Group 3: In a programming language of your preference or using a “Shell” (available in Internet, such as: CLIPS, ECLIPS from NASA o JESS de Sandia National Laboratories, or any other) and the Artificial Intelligence techniques discussed in class, implement a system for recommending the best Ecuadorian tourist route from Guayaquil to Quito, based on the shortest route. Use the “Simulated Annealing” search algorithm.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Before implementing the system, the group needs to evaluate the requirement and tools (Shells) available, for implementing this type of problem, and report on the characteristics, strengths and weakness identified.
- c) The system must provide a graphical user interface of the shell, to be able to define the problem and receive the recommended solution.



Project Group 4: In a programming language of your preference implement a neural network to emulate the behavior of an XOR logical gate, with two inputs.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Before implementing the system, the group needs to evaluate the requirement and tools available, for implementing this type of networks, and report on the characteristics, strengths and weakness identified.
- c) The system must provide a graphical user interface, to be able to define the parameters needed for training and to show the how the learning of the network progresses.

Project Group 5: In a programming language of your preference implement a genetic algorithm that draws a circle, based on the definition of a continuous closed curve.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Analyzed the requirement, design and implement two (2) selection methods to reproduce the next descendants of the individuals.
- c) The graphical user interface of the system must allow selecting the reproduction method, the initial parameters of the curve and show how the drawing process develops, highlighting the descendants and the best curve so far. The user decides when to stop the process.

Project Group 6: In a programming language of your preference implement a neural network that interprets the 10 first numbers (from 0 to 9).

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Analyzed the requirement, design and implement a 3 layer network.
- c) Decide the number of neurons at each layer, based on the number of inputs and outputs.
- d) The system should be able to get trained based on the Delta Learning function.
- e) The graphical user interface of the system must allow drawing the number to be interpreted, and show the results highlighting the interpreted number.

Project Group 7: In a programming language of your preference, implement the “Master Mind” game. The game must allow the user to configure its initial state. The game can be played either against the machine or with another user, in this case, the user interface can be put or not in an “advice” mode to inform the user, which could be the next best move, based on the heuristic function.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Analyze the requirement, design and implement the game using HILL CLIMBING. The algorithm must use a heuristic function to evaluate the next potential move in the game.



- c) Write an *expand* function to determine the next possible states of a given state in the game. That is, provided the initial state of the game; the system should show the next successors legal states, based on the selected search algorithm and heuristic function.
- d) The graphical user interface of the game must show how the search process progresses in the tree; it must allow the selection of the heuristic function; as well as, the initial state of the game

Project Group 8: In a programming language of your preference, implement the “Master Mind” game. The game must allow the user to configure its initial state. The game can be played either against the machine or with another user, in this case, the user interface can be put or not in an “advice” mode to inform the user, which could be the next best move, based on the heuristic function.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Analyze the requirement, design and implement the game using a Genetic Algorithm. The algorithm must use at least two (2) heuristic functions to evaluate the next potential move in the game. The game must allow the user to select the heuristic function.
- c) Write an *expand* function to determine the next possible states of a given state in the game. That is, provided the initial state of the game; the system should show the next successors legal states, based on the selected search algorithm and heuristic function.
- d) The graphical user interface of the game must show how the search process progresses in the tree; it must allow the selection of the heuristic function; as well as, the initial state of the game

Project Group 9: In a programming language of your preference or using a “Shell” (available in Internet, such as: CLIPS, ECLIPS from NASA o JESS de Sandia National Laboratories, or any other) and the Artificial Intelligence techniques discussed in class, implement a system for recommending a student the best next courses to take in given semester at FIEC, based on a set of rules that describe the level, difficulty of a course, etc. and other aspects used by the experts, when selection a course.

- a) The group will follow a methodology for developing intelligent systems and will report using a formal language, such as UML.
- b) Before implementing the system, the group needs to evaluate the requirement and tools (Shells) available, for implementing this type of problem, and report on the characteristics, strengths and weakness identified.
- c) The system must provide a graphical user interface of the shell, to be able to define the problem and receive the recommended solution.