CI Final Exam
Date: 20/1/2022
Duration: 15h to 16:30h

Answer the exam in three different page sets: questions from 1 to 2, 3 to 5 and 6 to 8. Do not forget to write your name in ALL the sheets.

1. Which is the role of membership functions in fuzzy rule-based systems? What is expected to happen when we use a small number of MFs? And when we use a big number of MFs?

2. Are the following statements true? Reason the answers.
   - Although not based on *a priori* knowledge, the initial parameters of ANFIS are intuitively reasonable and all the input space is covered properly.
   - ANFIS consists of fuzzy rules which are global mappings and allow a remarkable generalization capability.
   - ANFIS deals with parameter and structure identification, allowing a highly nonlinear mapping.

3. Apart from the type of problem (classification, regression, ...), which is usually fixed a priori, what are the main elements you will need to set when learning with Neural Networks (and Machine Learning in general)? Can you give you an example for a particular system?

4. Is it true that Multi-layer Perceptrons always compute non-linear functions? Why? If not, can you give an example of a Multi-layer Perceptron that computes a linear function?

5. Describe (briefly) the cross-validation and double cross-validation schemes for model selection. In which situations are typically used?

6. List the seven main components of an Evolutionary Algorithm. Which of them decrease diversity in a population (exploitation)? Which of them increase diversity in a population (exploration)?

7. What is the difference between Generational Genetic Algorithms (GGA) and Steady-State Genetic Algorithms (SSGA)? Which replacement strategies can be applied in SSGA? In your opinion, which of them is the most appropriate and why?

8. Regarding GA theory, explain briefly and in your own words:
   a) the schema theorem;
   b) the building blocks hypothesis;
   c) what is a deceptive problem.