ATCI Final Exam
Date: 10/6/2016
Duration: 12h to 14h

Answer the exam in three different pages: questions from 1 to 5, 6 to 10 and 11 to 15. Do not forget to write your name in ALL the sheets.

1. Imagine that you are modeling a system by means of FIR methodology and that you have already chosen a set of discretization parameters. If we keep the same training set and you increase the number of classes to represent each variable and choose a mask of higher complexity, what will probably happen when you perform the prediction? Why?

2. Explain the role of the depth of the mask in the FIR methodology. Which do you think could be a good value of this parameter if you need to model the following systems: a) daily urban water demand; b) diagnosis of renal disease.

3. How do you expect that the pure Mamdani and Sugeno fuzzy systems (FS), the pure FIR and the UNFIR (mixed FIR-FS) schemes perform in real applications from the point of view of the accuracy and model understandability?

4. Which are the main differences between Pittsburgh and Michigan approaches? Comment the main advantages and disadvantages of each approach.

5. What is the major problem that appears when designing fuzzy rule based systems through evolutionary algorithms? Explain it.

6. Enumerate several issues that motivate the use of constructive algorithms for neural networks.

7. In Deep Learning, each layer is supposed to learn different features. Which is the relationship among the features learned in the different layers?

8. In which step of the training process of Restricted Boltzmann Machines it is needed to use Gibbs sampling? Why?

9. Explain briefly the main ideas behind the Contrastive Divergence algorithm CD-k.

10. Which is the main idea of Denoising Auto-encoders?

11. List some consequences of encoding to real numbers other input data types such as categorical or ordinal data when learning a task using a common artificial neural network (versus not encoding them, as in the case of Heterogeneous Neural Networks).

12. Which are the basic characteristics of the Breeder Genetic Algorithm (BGA) within the family of evolutionary algorithms? Which are the parameters that must be set to run BGA, once recombination and mutation operators have been defined for each data type?

13. What is the main feature of partially recurrent neural networks? Do you know any named network architecture within this family of networks? What training methods can be applied to them? Which one should be preferred?

14. What are the advantages and drawbacks of using Recurrent Neural Networks (RNNs) in front of Time-Delay Neural Networks (TDNNs) for learning dynamic input-output tasks?

15. Do you think the LSTM recurrent network can be considered as a Deep Learning method? Why? Justify your answer according to the features of LSTM.