

Tutorial on Artificial hydrocarbon networks and its applications

Speaker: Dr. Hiram Ponce

Abstract

Artificial hydrocarbon networks (AHN) are a supervised learning method inspired on the structure and the inner chemical mechanisms of organic molecules. This recent machine learning technique has been mainly used for: regression and classification data, image processing, audio filtering, online sales prediction, human activity recognition, breast cancer diagnosis, and hybrid methodologies for intelligent control systems. Currently, the output response of artificial hydrocarbon networks in human activity recognition has been compared with deep neural networks, and preliminary results have shown that AHN might be used as a low computational-cost alternative to deep learning. To accomplish the learning task, artificial hydrocarbon networks package information in basic units known as molecules, and they can be related among them using chemical heuristics resulting in complex units of information so-called compounds. Lastly, compounds are combined together to form mixtures that respond to inputs. Thus, the aim of this tutorial is to present an overview of artificial hydrocarbon networks, describe the main components, relationships and heuristics at the inner algorithm, and to implement solutions with AHN for simple prediction and classification problems.

Contents (4 hours)

1. Artificial organic networks paradigm.
2. Artificial hydrocarbon networks.
3. Training algorithm for AHN.
4. MATLAB and R resources for artificial hydrocarbon networks.
5. Artificial hydrocarbon networks for regression and classification.
6. Introduction to fuzzy-molecular inference systems.
7. Examples of artificial hydrocarbon networks.

Pre-requisites

- Basic skills in MATLAB and R programming.
- Basic knowledge of artificial neural networks and fuzzy logic.

Target Audience

- Undergraduate and graduate students.
- Professionals, researchers, data scientists and machine-learning practitioners.

About the Speaker

Hiram Ponce is research professor at Universidad Panamericana in Mexico City. He holds a Ph.D. in Computer Sciences from Tecnológico de Monterrey (Mexico City, 2013). He authored Artificial Organic Networks, a class of learning algorithms, and Artificial Hydrocarbon Networks. He has published several journal articles, books, book chapters and articles proceedings on the fields of artificial intelligence and mechatronics. He has served as advisory board member in SpringerPlus journal during 2015 – 2017, and as guest editor in different special issues related to soft computing in international JCR journals such as Soft Computing, Sensors, and Computing. He has been recognized for his contributions with different awards as the “Mexico City’s Youth Award” from the Government of Mexico City in

2014, and the “Outstanding Ph.D. Dissertation on Artificial Intelligence National Award” granted by the Mexican Society for Artificial Intelligence (SMIA) in the same year. Currently, he is member of the National System of Researchers in Mexico, member of the Executive Board of SMIA (2016 - 2018), adherent member of the Mexican Academy of Computing, member of the CONACYT Thematic Network on Applied Computational Intelligence, and member of the International Neural Network Society.

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Technical Requirements

- Projector and whiteboard.
- Computer with MATLAB and R, for each participant.
- MATLAB 2011 or earlier.
- R version 3.4.1.