

2017 IEEE CIS Summer School on Computational Intelligence and

Applications (2017 IEEE CIS SSoCIA)

Web link <http://la-cci.org/>

06-07/11/2017, Arequipa, Peru

1. Introduction

This is the first time of this Summer School in CI and Applications (2017 IEEE SSoCIA), will be realized in Arequipa-Peru. In this region of Peru, there are many students, professors, researchers and professionals who are interested in Computer Science and Computational Intelligence, as a scientific research area and as an application tool to address several problems on industry, commerce and government.

This Summer School will be held immediately before the LA-CCI, which will allow complementary objectives of (1) to strengthen fundamental knowledge in CI during the Summer School on November 6-7th, and (2) to update the state of the art understanding in CI during the conference from November 8-10th.

2. Objectives

The objective of this Summer School is to provide a platform for Latin-American young researchers and students to experience the recent developments, get hold of the state-of-the-art in computational intelligence methods and applications in several areas.

The main goal is to provide to young researchers the opportunity to interact with experts and eminences in CI and exchange ideas and experiences.

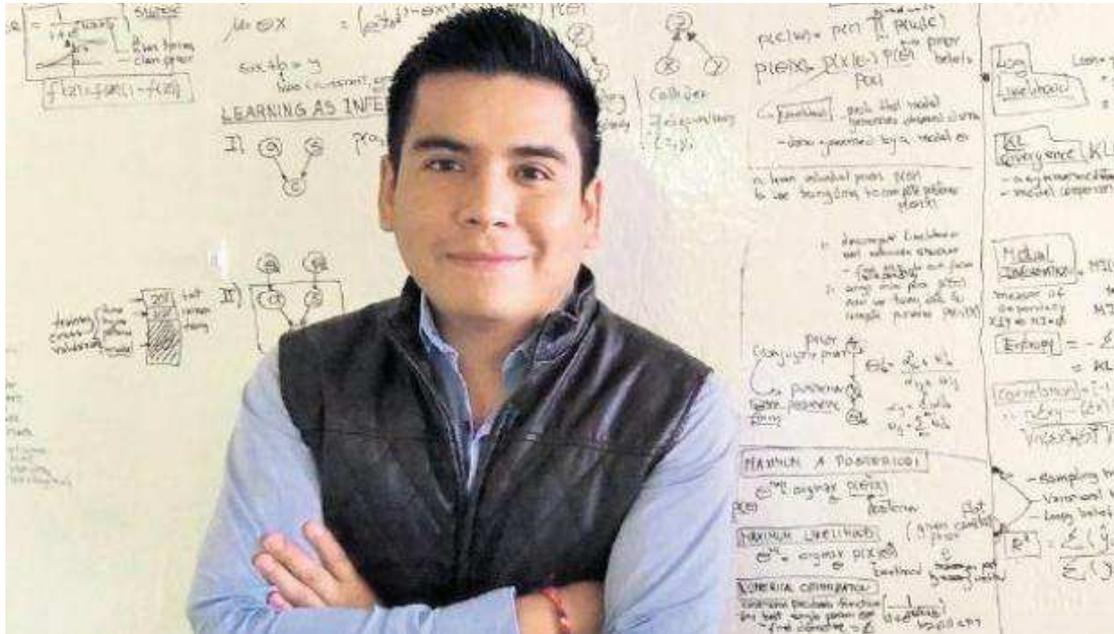
In addition, the summer school provides demonstration sessions on CI method, where the participants can obtain experience in situ for practical applications. As a follow up, the 2017 IEEE Latin American Conference on Computational Intelligence (2017 IEEE LA-CCI) will be held in same place in next days.

3. Venue

The venue is the Main Auditorium San Juan Pablo II
Universidad Católica San Pablo, UCSP
Quinta Vivanco S/N
Urb. Campiña Paisajista
Arequipa 04001, Peru

4. Lectures, Courses and/or Plenary Talks

Omar Florez (Intel Research Labs, California, USA)

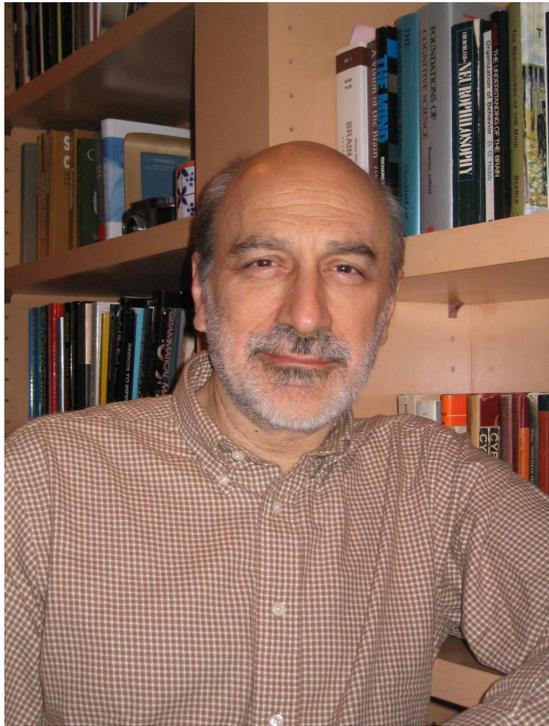


Building your neural network from Scratch

A neural network is a clever arrangement of linear and non-linear modules. When we choose and connect them wisely, we have a powerful tool to approximate any mathematical function that learns to separate classes with a non-linear decision boundary. A topic that is not always explained in depth, despite of its intuitive nature, is the back-propagation technique responsible for enabling learning in this modular data structure.

A neural network learns to remember reoccurring patterns by updating its weights towards a direction that minimizes a predefined error or loss function. In this talk, we will build and train a neural network from scratch, stressing the Math behind it.

José Carlos Principe (University of Florida, USA)



“Requisites for a Cognitive Architecture for Object Recognition in Video”

This lecture will present some of the fundamental ideas from cognitive science to help build cognitive architectures of object recognition in video. We will address how to handle processing in the space of the image, how to process time structure in time series, how we can combine top down with bottom processing, how to create focus of attention and finally how to put it all together in the extraction of information from data with generative models. Because of the breadth of the topics covered, only the foundations of these important topics will be covered.

Ronaldo Menezes (Florida Institute of Technology, USA)



“Human Dynamics Modeling”

Recent years have witnessed an explosion of extensive geolocated datasets related to human movement, enabling scientists to quantitatively study individual and collective mobility patterns, as well as generate models that can capture and reproduce the spatiotemporal structures and regularities in human trajectories. The study of human mobility is especially important for applications such as estimating migratory flows, traffic forecasting, urban planning, and epidemic modeling. In this presentation we'll go through some historical approaches developed to reproduce various mobility patterns, but we'll also include recent works in light of the explosion of relevant data.

Fernando Buarque de Lima Neto

(Escola Politécnica/Universidade de Pernambuco, Brazil)



“FSS (Fish School Search for beginners)”

In 2008, Bastos Filho and Lima Neto proposed a new metaheuristic in the fast growing family of swarm intelligence techniques, namely, Fish School Search (FSS). This new technique greatly benefit from the collective emerging behavior of fish that when in schools, increase their success by (i) mutual protection and (ii) synergistic achievement of collective tasks. In FSS, the school “swims”(searches) for “food”(candidate solutions) in the “aquarium”(search space). The weight of each fish acts as a factual-memory of its individual success; emergently, promising areas regarding quality of solutions can be inferred from regions where bigger ensembles of fish are located.

Similarly, to PSO or GA, the search guidance in FSS is driven by the merit of individual members of the population. The main difference though is that fishes contain only their innate memory (i.e. their weights). In comparison to PSO, this information can obviate the need to keep a log of best positions visited as well as any other global variables. In comparison to GA, the factual hyper-dimensional coordinates of each fish directly substitutes the need of a chromosome. As for social reasoning, the barycenter of the whole school can automatically guide expansion and contraction of the school, evocating exploration and exploitation when necessary. Interested practitioner and investigators could grasp the rational of FSS in the introductory book chapter of 2009. Broadly speaking, FSS is composed of operators that can be grouped in the following categories feeding, swimming and breeding. Together these operators afford computational features such as: (i) high-dimensional search abilities, (ii) on-the-‘swim’ selection between exploration and exploitation, and (iii) self-adaptable guidance towards sought solutions (that can be multi-modal)

In the short-course, we will present the basic operators, some variations, and the current website.

Heitor Silvério Lopes

(Universidade Tecnológica Federal do Paraná, Brazil)



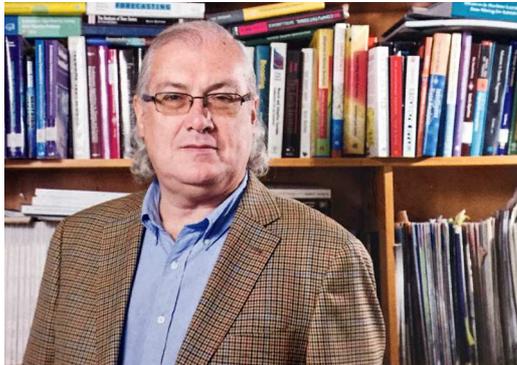
“Genetic Programming: foundations and applications”

Genetic programming (GP) is an evolutionary computation method largely used for real-world problems. Basically, GP evolves a population of programs (usually represented as complex trees), and each element of the population represents a possible solution for an optimization problem. There are many classes of problems where GP can be successfully applied, such as data mining, pattern recognition, game playing, and learning strategies. In this tutorial, the foundations of GP are introduced in a simple way, so that it is adequate for both, undergraduate and graduate students. Along the tutorial, several real-world applications are presented so as to illustrate GP’s applicability.

“Swarm intelligence: new inspirations”

The growing complexity of real-world problems has motivated computer scientists to search for efficient problem-solving methods. Evolutionary computation and swarm intelligence meta-heuristics are outstanding examples that nature has been an unending source of inspiration. The behaviour of ants, bees, bacteria, and many other organisms have inspired computational intelligence researchers to devise new optimization algorithms. This tutorial highlights not only the traditional but, also, the most recent nature-inspired metaphors used in swarm intelligence algorithms. We present the biological behaviours from which a number of meta-heuristics were developed, along with some applications for real-world problems.

Pablo A. Estevez (Department of Electrical Engineering, University of Chile, and Millennium Institute of Astrophysics, Chile)



“An Introduction to Deep Neural Networks”

Deep neural networks have achieved impressive results in data science, in particular in the Imagenet competition since 2012. The main factors of this revolution in computer vision and machine learning are: a) larger training sets with millions of labeled samples, b) powerful GPU implementations, c) faster training algorithms, and d) better regularization strategies. In this talk, I will review the main principles of convolutional neural networks and their network architectures, including regularization techniques such as dropout and batch normalization. In addition, I will review the ongoing work on methods for visualizing and understanding deep neural networks using information theory, deconvolution and layer-wise relevance propagation.

**Prof. Dhiya Al-Jumeily (Faculty of Engineering and Technology,
Liverpool John Moores University, England, UK)**



“Machine Learning and Medical Practice (Inspired by the Past for Motivating the Future)”

The acceleration of technological change, especially the rise of mass computational availability in the late 20 th Century, has led to the emergence of process and task frameworks that leverage and depend upon technological solutions. Subsequently,

the use and acceptance of technology on a wide scale has opened up a new and expanding space of possibilities, allowing us to address many problems that were previously considered intractable, including the redefining the roles of many experts. Meanwhile, the long-standing challenge of human healthcare has become a natural domain of interest for the incorporation of such advances in technology, since successful solutions in health translate into healthier populations and improve the quality of life of individuals. In general, the drive towards such technology rich applications, for the purpose of exploring new solution spaces, has been accompanied by an increasing rise in the need to effectively synthesis and manipulate information problems. The healthcare domain is no exception to this phenomenon.

In response, the emergence of a relatively new field called Data Science has resulted, paralleled by the rise in prominence of the Intelligent Systems paradigm. Additionally, the term 'Big Data' has been introduced in recognition of the extended use and scale of data, which now features prominently as a critical component in many solutions. The Data Science discipline, along with related concepts, aims to address the problem of information processing, providing a capacity for problem analysis that may exceed immediate human cognitive capabilities, while offloading routine tasks to reduce human cognitive labour and its associated limitations. Data can be viewed as the information carrying substrate within this paradigm, a medium upon which the problem domain information is encoded. In effect, computational processes are now being applied to two types of information processing that have remained until recently the exclusive concern of human cognition, namely representing the essential information processing of the human brain via non- biological substrates.

The application of big data solutions, enabled by data science approaches and intelligent system technologies, has already delivered transformative impacts in the health domain. Firstly, the expansion in basic science frameworks towards data intensive processes, using connected and collaborative operational models, has enabled advances in health critical areas including genomics, neuroscience, pharmaceutical development, systems biology, bioinformatics, and others. Prominent related 'Big Data' and 'Big Science'; projects include the Human Brain Project in Europe, the Blue Brain Project in Switzerland, the Brain Activity Map in the US, and the BRAIN initiative that is also based in the US. Such ambitious large-scale projects, which make extensive use of data science approaches, such as data mining, serve to deliver fundamental insights into human biology and brain function, unlocking new therapeutic solutions. Furthermore, big data and intelligent systems approaches have been applied to the growing space of patient medical data to derive new solutions in disease prediction, patient monitoring, diagnosis, prognosis, pre-surgical evaluation, and world disease burden analysis, among other problem domains. Such a space of intelligent solutions opens up new emerging paradigms in healthcare including P4 medicine (Predictive, Personalized, Preventive, and Participatory), enabling an emphasis on wellness as opposed to disease. In this talk, we explore the intersection of data science, big data, and healthcare, providing a background to problem domains, considering the progress so far, assessing the potential of such approaches, and exploring possible future directions.

SSoCIA Program

The program includes the following:

- 8 Plenary Sessions (90 minutes each)
- 1 Demo Sessions (90 minutes)

SSoCIA Schedule					
Time/Date	06-nov	07-nov	08-nov	09-nov	10-nov
09:00 - 09:45	Registration	DEMO	2017 IEEE LA-CCI	2017 IEEE LA-CCI	2017 IEEE LA-CCI
09:45 - 10:00	Opening Ceremony	BREAK			
10:00 - 11:30	Heitor Lopes: Genetic Programming	Pablo Esteves: An Introduction to Deep Neural Networks			
11:30 - 13:00	Omar Florez: Building your neural network from Scratch	Ronaldo Menezes: Human Dynamics Modeling			
13:00 - 15:00	LUNCH				
15:00 - 16:30	Heitor Lopes: Swarm Optimization	Fernando Buarque: FSS (Fish School Search for beginners)			
16:30 - 16:45	BREAK				
16:45 - 18:15	Dhiya Al-Jumeily: Machine Learning and Medical Practice (Inspired By The Past for Motivating The Future)	José Principe: Cognitive Architectures			
18:15 - 19:00	Welcome Reception	Closing Ceremony + Cocktail SSoCIA / LA-CCI			

3 Organizers

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Registration and Accommodation

Registration fee:

IEEE Members	USD 80 (PEN 270.00)
IEEE Nonmembers	USD 90 (PEN 300.00)

The benefits that the registration fee will include:

- ✓ Access to all lectures of this Summer School.
- ✓ Coffee breaks.
- ✓ Kit of participant: bag, notepad, pen, etc.
- ✓ A certificate for participation of the Summer School (2017 IEEE CIS SSoCIA)
- ✓ Access to all plenaries of 2017 IEEE LA-CCI (from 8 to 10 November).

Registration deadline: **30/10/2017**

Payment methods: VISA, wired transfer, cash (in situ).