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**Keynote: Artificial Intelligence in Cloud/Fog/Edge Computing and Internet-of-Things**

**Biography**

Vincenzo Piuri is an Italian scientist. He is an IEEE Fellow and an ACM Distinguished Scientist. He is known for his work in the field of information processing, with specific focus on artificial intelligence, computational intelligence, signal/image processing, biometrics, industrial applications, measurement systems, arithmetic units and fault-tolerant architectures. He received the IEEE Technical Activities Board Hall of Honor (2019), the IEEE Systems Council Outstanding Service Award (2018), the IEEE Instrumentation and Measurement Society Distinguished Service Award (2008), and the IEEE Instrumentation and Measurement Society Technical Award (2002). He is President of the IEEE Systems Council (2020-2021). He served in the IEEE MGA Strategic Direction and Environmental Assessment Committee (2016), the IEEE Publication Services and Products Board (2013), the IEEE PSPB Strategic Planning Committee (2013, 2009-11), and the IEEE TAB/PSPB Products & Services Committee (2013, 2008–09, 2005–06). He has been Chair of the IEEE Awards Board Technical Field Awards Council (2017–18), where he also served as member (2014-2015, 2006-2008).

**Abstract:**

Recent years have seen a growing interest among users in the migration of their applications to the Cloud/Fog/Edge computing and Internet-of-Things environments. However, due to high complexity, Cloud/Fog/Edge-based and Internet-of-Things infrastructures need advanced components for supporting applications and advanced management techniques for increasing the efficiency.

Adaptivity and autonomous learning abilities become extremely useful to support configuration and dynamic adaptation of these infrastructures to the changing needs of the users as well as to create adaptable applications. This self-adaptation ability is increasingly essential especially for non-expert managers as well as for application designers and developers with limited competences in tools for achieving this ability.

Artificial intelligence is a set of techniques which greatly can improve both the creation of applications and the management of these infrastructures.

This talk will discuss the use of artificial intelligence in supporting the creation of applications in cloud/fog/edge and IoT infrastructures as well as their use in the various aspects of infrastructure management.
Keynote: Artificial Immune System as a Function Approximator for Fault Prognostics Applications

Biography

Dr. Jagannathan Sarangapani is at the Missouri University of Science and Technology (former University of Missouri-Rolla) where he is a Professor and Rutledge-Emerson Endowed Chair of Electrical and Computer Engineering. He is currently serving as Interim Director of the Intelligent Systems Center and served as the Site Director for the graduated NSF Industry/University Cooperative Research Center on Intelligent Maintenance Systems. His research interests include machine learning applied to dynamic systems and control, secure networked control systems, prognostics, and autonomous systems/robotics. He has coauthored 180 peer reviewed journal articles, 289 refereed IEEE conference articles, several book chapters, authored/co-dited 6 books, received 21 US patents, one patent defense publication and several pending. He supervised to graduation 30 doctoral and 31 M.S level students, and his total funding is in excess of $17.9 million from various US federal and industrial members with over $9.85 million towards his shared credit. He was the co-editor for the IET book series on control from 2010 through 2013 and now serving on many editorial boards. He received many awards including, 2021 University of Missouri Presidential Award for Research Excellence Sustained Career, 2018 IEEE CSS's Transition to Practice Award, 2007 Boeing Pride Achievement Award, 2001 Caterpillar Excellence Award, 2000 NSF Career Award, and has been on organizing committees of several IEEE Conferences. He is a Fellow many societies- IEEE, National Academy of Inventors, Institute of Measurement and Control (UK), and Institution of Engineering and Technology (IET), UK.

Abstract

Artificial immune systems (AIS) are a group of biological-based techniques of nature inspired computing (NIC) built upon human/animal immune system. Similar to artificial neural networks (ANN), AIS has been traditionally considered as an offline tool for applications such as classification, pattern recognition, robotics, anomaly detection, and cyber security. As a consequence, offline training schemes are proposed to tune the AIS parameters. Major drawbacks of the offline AIS schemes are the need for offline labelled data and the selection of number of antibodies, which is vital for function approximation in engineering applications. In this talk, a comprehensive introduction will be presented on AIS for the purpose of fault diagnostics and prediction.

As for an engineering application, an observer-based fault detection and prediction (FDP) scheme using artificial immune system (AIS) as an online approximator is introduced for a class of nonlinear discrete-time systems by using output measurements alone. The AIS is utilized as an online approximator in discrete-time (OLAD) in the proposed online fault diagnosis scheme while its parameters are tuned online. A nonlinear observer comprising of the AIS and the robust adaptive term is designed and an output residual is determined by comparing the observer and system outputs. A fault is detected if this output residual exceeds a priori chosen threshold. Upon detection, the OLAD is initiated to learn the unknown fault dynamics while the robust adaptive term ensures asymptotic convergence of the residual. Additionally, the parameter update law for the AIS is used to estimate the time-to-failure (TTF), which is considered as a first step for prognostics. The performance of the proposed FDP scheme is demonstrated in simulation and on an axial piston pump hardware test-bed for a couple of failure modes. Finally, AIS will be contrasted with ANN which is another NIC method.
Dr. Komla Agbenyo Folly
Professor, Department of Electrical Engineering,
University of Cape Town, Cape Town, South Africa.

Keynote: Diversity Increasing Methods in PBIL: Application to Power System Controller Design

Biography
Komla Agbenyo Folly received his BSc and MSc Degrees in Electrical Engineering from Tsinghua University, Beijing, China, in 1989 and 1993, respectively. He received his PhD in Electrical Engineering from Hiroshima University, Japan, in 1997. From 1997 to 2000, he worked at the Central Research Institute of Electric Power Industry (CRIEPI), Tokyo, Japan. He is currently a Professor in the Department of Electrical Engineering at UCT. He was Fulbright Scholar at the Missouri University of Science and Technology, Missouri, USA in 2009. His research interests include power system stability, control and optimisation, HVDC modelling, grid integration of renewable energy, application of computational intelligence to power systems, grid resilience and smart grid. He is member of the Institute of Electrical Engineers of Japan (IEEJ), a Senior member of both the IEEE and South African Institute of Electrical Engineers (SAIEE).

Abstract:
Population-based Incremental Learning (PBIL) is a meta-heuristic algorithm that combines simple genetic algorithm (GA) with competitive learning derived from Artificial Neural Networks (ANNs). It has recently received increasing attention due its effectiveness, robustness, and easy implementation. Despite these strengths, PBIL may suffer from issues of loss of diversity in the population, resulting in premature convergence. In this talk, I will present some diversity maintaining methods that can be used to increase the diversity in PBIL. I will then discuss how these methods can be applied to controller design in power systems to improve the small signal stability.
Keynote: Machine Learning Applications in Medical Image Analysis

Biography

Dr. G. Saravana Kumar working as a professor at Department of Engineering Design, IIT Madras. His research aims to the development of representational and computational tools for virtual and physical prototyping applied to arrive at solutions to design problems. Some of his specific research areas include CAD, Design Optimization, Design for Additive Manufacturing, Orthopedic Bio-mechanics and Biomedical Image Processing. He has published more than 40 international journal and 85 conference papers. He has published 5 patents and he got Best Researcher Award from IEEE Madras Section, 2021.

Abstract

This lecture shall introduce medical image analysis in general and in specific some of challenging tasks associated with it and how in recent times, machine learning techniques are able to address some of these challenges. Computations and learning models associated with some popular machine learning techniques shall be discussed. The talk shall also include examples from application including CT and MRI based image processing, segmentation for computer aided diagnosis and anatomical modeling with focus applying the methods to orthopedics domain. A sample example problem shall be attempted for hands on exposure and demonstration.
Dr. Narasimman Sundararajan
IEEE Fellow, Professor (retd.),
School of Electrical & Electronic Engg.
Nanyang Technological University, Singapore

Keynote: Meta-cognitive Neural Networks

Biography

Narasimhan Sundararajan received the B.E in Electrical Engineering with First Class Honors from the Alagappa Chettiar College of Engg. &Tech., Karaikudi, University of Madras in 1966, M.Tech from the Indian Institute of Technology, Madras in 1968 and Ph.D. in Electrical Engineering from the University of Illinois, Urbana-Champaign in 1971.

He worked in the Indian Space Research Organization, Trivandrum, India starting as a Control System Designer to Director, Launch Vehicle Design Group contributing to the design and development of the Indian satellite launch vehicles SLV3, ASLV, PSLV and GSLV. He worked as the Project Engineer (Mission) for the first Indian Satellite Launch Vehicle project SLV3 team working directly under Dr. Kalam. He was also an NRC Research Associate at NASA. He is a Life Fellow of IEEE, an Associate Fellow of AIAA and also a Fellow of the Institution of Engineers, Singapore. His research interests are in the areas of aerospace control, machine learning, neural networks and applications and computational intelligence and have more than 250 papers and also fivebooks in the area of neural networks.

Abstract

This talk will focus on the recently developed neural network learning algorithms inspired from the models of human metacognition. Meta-cognition is defined as knowledge about knowledge. The model of human metacognition developed by Nelson and Narens is the simplest model of meta-cognition available in the area of psychology of learning. We present the recently developed Meta-cognitive Radial Basis Function (McRBF) neural network that uses the concepts from the Nelson and Narens model of metacognition.

McRBF also has a cognitive and a meta-cognitive component. An RBF neural network that is able to represent knowledge is the cognitive component, and a self-regulatory learning mechanism is its meta-cognitive component. For every sample instance in the training set, the self-regulatory learning mechanism compares the knowledge represented by the cognitive component with that of the sample instance. Based on its judgment, it chooses suitable learning strategies, and decides what-to-learn, when-to-learn and how-to-learn in a meta-cognitive environment. We present the architecture and learning algorithm of McRBF. As the McRBF self-regulates its own learning process, it has better generalization abilities. The decision making abilities of McRBF are demonstrated using standard benchmark classification problems and also with some real applications in the areas of medical informatics in detecting neural disorders like Alzheimer disease and Autism detection problems.
Keynote: Hybrid WIPSO-GSA Algorithm Based Optimal DG and Capacitor Planning Considering Different Load Types and Load Levels

Biography

Dr. N. Kumarappan received the Graduate degree from Madurai Kamaraj University, Tamil Nadu, India in 1982, the Post-Graduate degree from Annamalai University, Annamalai Nagar, India in 1989 and the Ph.D. degree from CEG Anna University, Tamil Nadu, India in 2004 under QIP fellowship AICTE, India. He is the former head of the department and currently a Professor with the Department of Electrical Engineering, Faculty of Engineering and Technology, Annamalai University. He is having 33 years of experience to his credit as an educator and researcher. He has published more than 130 international journal and conference papers. According to Google scholar his citation is 1185, H index 17. He was the outstanding reviewer for the Elsevier international journal of electric power and energy system 2015. He is an IEEE Madras Section Chairman, IEEE CIS Madras Chapter Chair and a Coordinator for more than 100 IEEE Madras Section organized FDP, Workshop, tech meet and TISP programs etc.. He was the recipient of the IEEE-NNS Outstanding Paper Travel Grant Award, Australia 2002, IEEE-WCCI Outstanding Paper Travel Grant Award, Canada 2016, the IEEE PES Student Program Award, USA 2003 and IEEE CIS Madras Chapter Best Chapter Award 2017. He was also a recipient of best researcher award, Annamalai University, 2018. His interview appeared in Electrical India magazine in February 2021 issue. He has acted as a guest editor in the special issue of Complexity journal, published by Wiley - Hindawi. He is the General Chair for the international conference MASCON 2021 organised by IEEE Madras Section. His current research interests include power system operation and control, electricity price forecasting, EHV transmission fault diagnosis, FACTS devices, power system reliability, artificial intelligence techniques, micro grid, distributed generation and smart grid. Dr.Kumarappan is a Life Fellow of the Institution of Engineer's (India) and a Life Member of the Indian Society of Technical Education. He was the recipient of the IEEE Madras Section Motivation Award in 2010 and the Certificate of Appreciation in 2012, third rank in the chapter activities 2015. He was the organizer of a special session in IEEE WCCI 2010 Spain, IEEE WCCI 2016 Canada and IEEE WCCI 2018 Brazil. He is a Speaker, Reviewer and Session Chair for IEEE/IET-U.K. international conferences and other international journals.

Abstract

In this study a hybrid configuration of weight improved particle swarm optimization (WIPSO) algorithm and gravitational search algorithm (GSA) termed hybrid WIPSO-GSA algorithm is proposed for separate and simultaneous planning of distributed generation (DG) and capacitor in the distribution network. The optimal DG and capacitor planning problem is examined from local distribution company's viewpoint considering minimization of total active power loss ($P_{loss_{total}}$) as main objective function. In addition, apart from constant power load modeling, the voltage dependent realistic mixed customer load modeling is also considered at different load levels such as light, medium and peak. Moreover, the total cost benefit achieved through DG and capacitor planning is established by considering necessary economic factors for the total planning period. The proposed methodology is tested on standard 33-bus radial distribution system. The superiority of the proposed technique is also illustrated by comparing the results with other optimization techniques.
Dr. Cesare Alippi
IEEE Fellow, AdCom Member CIS,
Professor of Information Processing Systems, Department of Electronics,
Polytechnic University of Milan, Italy

Keynote: Neural Graph Processing: an embedding-based approach

Biography
Dr. CESARE ALIPPI is a Professor with the Politecnico di Milano, Italy and Università della Svizzera italiana, Lugano, Switzerland. He is a visiting professor at the University of Guangzhou, China and a Consultant Professor at the Northwestern Polytechnic in Xi’an, China. He has been a visiting researcher/professor at UCL (UK), MIT (USA), ESPCI (F), CASIA (RC), A*STAR (SIN), U. Kobe(Japan). In 2018 he received IEEE CIS Outstanding Computational Intelligence Magazine Award, the 2016 Gabor award from the International Neural Networks Society and the IEEE Computational Intelligence Society Outstanding Transactions on Neural Networks and Learning Systems Paper Award; in 2013 the IBM Faculty award; in 2004 the IEEE Instrumentation and Measurement Society Young Engineer Award. Current research activity addresses adaptation and learning in non-stationary environments, graph learning and Intelligence for embedded, IoT and cyber-physical systems. He holds 8 patents, has published one monograph book, 7 edited books and about 200 papers in international journals and conference proceedings.

Abstract
Many fields, like physics, neuroscience, chemistry, and sociology, investigate phenomena by processing multivariate measurements advantageously represented as a sequence of attributed graphs. Graphs come in different forms, with variable attributes, topology, and ordering, making it difficult to perform a mathematical analysis in the graph space. Within this framework, we are interested in processing graph data streams to solve applications e.g., detect structural changes in the graph sequence, a situation associated with time variance, faults, anomalies or events of interest as well as design sophisticated processing like those requested by predictors.

On the change detection front, theoretic results show that, under mild hypotheses, the confidence level of an event detected in the graph domain can be associated with another confidence level in an embedding space; this enables the identification of events in the graph domain by investigating embedded data. The opposite holds. However, evaluation of distances between graphs and identification of an appropriate embedding for the problem at hand are far from being trivial tasks with deep adversarial learning approaches and constant curvature manifold transformation showing to be appropriate transformations able to solve the problem. Deep autoregressive predictive models can then be designed to operate directly on graphs, hence providing the building blocks for other future sophisticated neural processing.
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