Conquering Complexity:
Challenges and Opportunities

Philadelphia, PA
November 3 - 5, 2014

Conference Program

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Welcome to the Complex Adaptive Systems Conference

Cihan H. Dagli, Ph.D.
Conference Chair
Professor
Engineering Management
and Systems Engineering
Director of S&T's Systems
Engineering Graduate Program
INCOSE and IIE Fellow
International Journal
of General Systems
Intelligent Systems Area Editor
dagli@mst.edu

Welcome to this year's Complex Adaptive Systems Conference. Over the next three days, we will share our ideas, tools, methodologies and research results in the domains of System Modeling and Design, System of Systems, Computational Complexity, Business and Financial Analytics, Data Science and Analytics, Cyber Physical Systems, Socio-Technical Systems, Health Care Analytics, and Adaptive Systems. Contributions to this conference, in the form of paper presentations and plenary sessions, will cultivate new ideas and advance all of our understanding of the complex systems of today.

We are pleased to announce that we have authors from 22 countries presenting 90 papers. On behalf of the organizing committee, I wish to thank all our authors for their contributions to the proceedings and to this conference.

A special recognition goes to our distinguished plenary speakers for presenting their current research and speaking to future research needs.

Further, I want to mention our conference sponsors, whose financial contributions and support allow us to continue to offer this annual conference. Their involvement enhances the collaboration between industry and academia.

In closing, I wish to express my gratitude to the conference organizing committee and paper referees. Your comments, suggestions and diligence in creating each track ensures a successful conference.

Opening Welcome

Speaker: Lockheed Martin's Garry Roedler

Garry Roedler is a Fellow and the Engineering Outreach Program Manager for Lockheed Martin. His systems engineering experience spans the full life cycle and includes technical leadership roles in both programs and systems engineering business functions. Garry holds degrees in mathematics education and mechanical engineering from Temple University and the Expert Systems Engineering Professional (ESEP) certification from INCOSE. Garry is an INCOSE Fellow, author of numerous publications and presentations, and the recipient of many awards, including the INCOSE Founders Award, Best SE Journal Article, IEEE Golden Core, Lockheed Martin Technical Leadership Award and Lockheed Martin NOVA Award. His leadership roles across many technical organizations include chair of the INCOSE Corporate Advisory Board, steering group member for the National Defense Industrial Association Systems Engineering Division, working group chair for the IEEE Joint Working Group for DoD Systems Engineering Standardization, editor of ISO/IEC/IEEE 15288, Systems Life Cycle Processes and several other standards, and key roles in the development of the Systems Engineering Body of Knowledge (SEBoK) and the INCOSE Systems Engineering Handbook. This unique set of roles has enabled Garry to influence the technical co-evolution and consistency of these key resources.

Conference Schedule at a Glance

Full Schedule starts on pg. 5

Monday, Nov. 3, 2014

8:00 a.m. – 5:00 p.m.
Registration *(Pre-function Foyer)*

8:00 a.m. – 9:00 a.m.
Continental Breakfast *(Pre-function Foyer)*

9:00 a.m. – 10:00 a.m.
Opening Session & Welcome *(Adams)*
Speaker: Garry Roedler
Plenary – Fundamental Research in Systems Engineering
Speaker: *Chris Paredis*

10:00 a.m. – 10:30 a.m.
Break *(Pre-function Foyer)*

10:30 a.m. – 12:00 p.m.
Concurrent Technical Sessions
System of Systems I *(Adams)*
Data Science & Analytics I *(Hamilton)*
Cyber Physical Systems: Energy Infrastructure *(Jefferson A)*

12:00 p.m. – 1:30 p.m.
Luncheon & Afternoon Plenary *(Franklin)*
Plenary – Leveraging Technology to Address the Challenges of Complex Adaptive Systems
Speaker: *Robie Samanta-Roy*

1:30 p.m. – 3:00 p.m.
Concurrent Technical Sessions
System of Systems II *(Adams)*
Data Science & Analytics II *(Hamilton)*
Intelligent & Adaptive Systems I *(Jefferson A)*

3:00 p.m. – 3:30 p.m.
Break *(Pre-function Foyer)*

3:30 p.m. – 5:00 p.m.
Concurrent Technical Sessions
System of Systems III *(Adams)*
Data Science & Analytics III *(Hamilton)*
Intelligent & Adaptive Systems II *(Jefferson A)*

Tuesday, Nov. 4, 2014

8:00 a.m. – 5:00 p.m.
Registration *(Pre-function Foyer)*

8:00 a.m. – 9:00 a.m.
Continental Breakfast *(Pre-function Foyer)*

9:00 a.m. – 10:00 a.m.
Announcements & Session Convenes *(Adams)*
Plenary – A Cognitive Architecture for Object Recognition in Video
Speaker: *Jose C. Principe*

10:00 a.m. – 10:30 a.m.
Break *(Pre-function Foyer)*

10:30 a.m. – 12:00 p.m.
Concurrent Technical Sessions
System of Systems IV *(Adams)*
Business & Financial Analytics I *(Hamilton)*
Intelligent & Adaptive Systems III *(Jefferson A)*

12:00 p.m. – 1:30 p.m.
Luncheon & Afternoon Plenary *(Franklin)*
Plenary – Clustering Innovations in Data Science
Speaker: *Mika Sato-Ilic*

1:30 p.m. – 3:00 p.m.
Concurrent Technical Sessions
System of Systems V *(Adams)*
Emerging Technologies & Complexity *(Hamilton)*
Intelligent & Adaptive Systems IV *(Jefferson A)*

3:00 p.m. – 3:30 p.m.
Break *(Pre-function Foyer)*

3:30 p.m. – 5:00 p.m.
Concurrent Technical Sessions
System of Systems VI *(Adams)*
Data Science & Analytics IV *(Hamilton)*
Intelligent & Adaptive Systems V *(Jefferson A)*

6:30 p.m. – 7:00 p.m.
Cash Bar *(Pre-function Foyer)*

7:00 p.m. – 9:30 p.m.
Banquet & Awards *(Franklin)*
Banquet Plenary – Embracing Complexity and Advancing the Craft of Engineering
Speaker: *Cheryl McIntyre*

Wednesday, Nov. 5, 2014

8:00 a.m. – 5:00 p.m.
Registration *(Pre-function Foyer)*

8:00 a.m. – 9:00 a.m.
Continental Breakfast *(Pre-function Foyer)*

9:00 a.m. – 10:00 a.m.
Announcements & Session Convenes *(Adams)*
Plenary – Conquering Complexity in the New World of Smart Cities and Internet of Things
Speaker: *Dave Welsh*

10:00 a.m. – 10:30 a.m.
Break *(Pre-function Foyer)*

10:30 a.m. – 12:00 p.m.
Concurrent Technical Sessions
System of Systems VII *(Adams)*
Intelligent & Adaptive Systems VI *(Hamilton)*
Biomimicry & Cognitive Agents *(Jefferson A)*

12:00 p.m. – 1:30 p.m.
Luncheon & Afternoon Plenary *(Franklin)*
Plenary – The Emerging "Big Dimensionality"
Speaker: *Yew-Soon Ong*

1:30 p.m. – 3:00 p.m.
Concurrent Technical Sessions
System of Systems VIII *(Adams)*
Business & Financial Analytics II *(Hamilton)*

3:00 p.m.
Conference Adjourns

Thank you sponsors

On behalf of the Complex Adaptive Systems Conference Organizing Committee, we would like to express our appreciation to this year's esteemed sponsors.

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Conference Morning Plenary Speaker

Monday, November 3, 2014 | 9:00 a.m. – 10:00 a.m. | Adams Room

Chris Paredis, PhD
Program Director, CMMI/ESD&SYS
National Science Foundation, USA

Fundamental Research in Systems Engineering

Abstract: Systems Engineering as a discipline has evolved over the years from best practices and lessons learned while developing increasingly complex systems primarily in the aerospace and defense domains. As we continue to strive towards improving systems engineering methods and towards applying systems engineering principles in an ever-broadening array of application domains, it is important to take a step back and look at the theoretical foundations of systems engineering. Only by rigorously identifying and expanding these theoretical foundations can we hope to keep pace with the rate of innovation in the systems we engineer and the rate of change in the global context in which they operate. Given that our goal is to "improve" systems engineering, a fundamental question in this respect is: What is our criterion for "goodness"? In his presentation, Dr. Paredis will argue why "value" should be this criterion. After defining what is meant by "value," several simple value-driven models will be proposed to explain current practices in systems engineering and design. A theory of systems engineering could evolve by further expanding and refining a suite of explanatory models, from which testable hypotheses can be derived, and for which in turn empirical evidence can be collected to confirm or falsify the models and corresponding hypotheses. This, unfortunately, is not yet common practice in our research community. The presentation will end with a short introduction of two NSF programs that provide research funding in this area: the Systems Science program and the Engineering and Systems Design program.

Biography:

Chris Paredis is Program Director for the Engineering and Systems Design (ESD) and Systems Science (SYS) programs at the National Science Foundation. He is also Professor of Mechanical Engineering in the G.W. Woodruff School of Mechanical Engineering, and in the H.M. Stewart School of Industrial and Systems Engineering at Georgia Tech, Atlanta, USA. He holds graduate degrees in Mechanical Engineering from the Catholic University of Leuven (Belgium) and in Electrical and Computer Engineering from Carnegie Mellon University. Dr. Paredis' research focuses on Model-Based Systems Engineering, combining aspects of decision theory, information technology, simulation, and systems theory to support the design of complex mechatronic systems. He received the 2007 CETL/BP Junior Faculty Teaching Excellence Award, the 2007 SAE Ralph R. Teetor Educational Award, and the 2011 ASME CIE Excellence in Research Award.

Conference Schedule

Monday, November 3, 2014 *Presentations are noted by corresponding page number in proceedings.*

Registration Desk Open
8:00 a.m. – 5:00 p.m.
Pre-function Foyer

Continental Breakfast
8:00 a.m. – 9:00 a.m.
Pre-function Foyer

Opening Session
9:00 a.m. – 10:00 a.m.
Adams Room

Morning Plenary

Speaker: Chris Paredis, PhD

Fundamental Research in Systems Engineering

Chris Paredis, PhD
Program Director CMMI/ESD & SYS
National Science Foundation, USA

Break
10:00 a.m. – 10:30 a.m.
Pre-function Foyer

Concurrent Sessions
10:30 a.m. – 12:00 p.m
(See schedule at right)

Concurrent Sessions 10:30 a.m. – 12:00 p.m.

System of Systems: System Behavior Modeling
Adams Room

Session Chair: Charles O. Adler
Missouri S&T, USA

65 - On the Flexibility of Systems in System of Systems Architecting
Dincer Konur | Hadi Farhangi | Cihan H. Dagli, *Missouri S&T, USA*

57 - A Hybrid Genetic Algorithm and Particle Swarm Optimization with Type-2 Fuzzy Sets for Generating Systems of Systems Architectures
Siddhartha Agarwal | Louis E. Pape | Cihan H. Dagli, *Missouri S&T, USA*

49 - Study of the Use of a Genetic Algorithm to Improve Networked System-of-Systems Resilience
Charles O. Adler | Cihan H. Dagli, *Missouri S&T, USA*

41 - Quantitative SoS Architecture Modeling
Joseph W. Marvin | Robert K. Garrett Jr., *Prime Solutions Group, Inc., USA*

Data Science and Analytics: Clustering
Hamilton Room

Session Chair: Mika Sato-Ilic
University of Tsukuba, Japan

278 - On a Multidimensional Cluster Scaling
Mika Sato-Ilic, *University of Tsukuba, Japan;* Peter Ilic, *University of Toyo, Japan*

409 - Applying Moving Average Filtering for Non-Interactive Differential Privacy Settings
Kato Mivule | Claude Turner, *Bowie State University, USA*

285 - Adaptive Learning Model for Predicting Negotiation Behaviors Through Hybrid K-means Clustering, Linear Vector Quantization and 2-Tuple Fuzzy Linguistic Model
Siddhartha Agarwal | Hamid R. Safarpour | Cihan H. Dagli, *Missouri S&T, USA*

293 - Cluster Analysis of North Atlantic Tropical Cyclones
Irenea L. Corporal-Lodangco | Peter J. Lamb, *Cooperative Institute for Mesoscale Meteorological Studies, USA;* Michael B. Richman | Lance M. Leslie, *University of Oklahoma, USA*

Cyber Physical Systems: Energy Infrastructure
Jefferson A Room

Session Chair: Stephen H. Anderson
University of Missouri, USA

649 - Tomography-Measured Macropore Parameters to Estimate Hydraulic Properties of Porous Media
S. H. Anderson, *University of Missouri, USA*

655 - Organizing Patterns and Evolution of Indian Movie Industry
Srinivasan Radhakrishnan | Rohit Jacob, *Symbiosis Institute of Management Studies, India;* Sagar Kamarthi, *Northeastern University, USA;* Arjun Duvvuru, *JDA Software Inc., India*

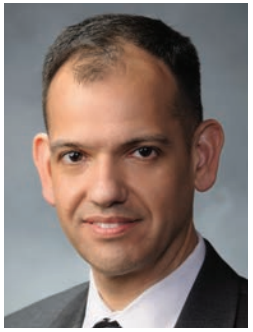
643 - Computed Tomography-Estimated Transport Velocity and Chemical Dispersivity in Undisturbed Geomedia
S. H. Anderson | R. L. Peyton, *University of Missouri, USA*; D. J. Heinze, *Environ, USA*

124 - Data Infrastructures for Asset Management Viewed as Complex Adaptive Systems
Paul Brous | Irene Overtoom | Paulien Herder | Marijn Janssen, *Delft University of Technology, The Netherlands;* Arie Versluis, *Rijkswaterstaat, The Netherlands*

Conference Afternoon Plenary Speaker

Monday, November 3, 2014 | 12:00 p.m. – 1:30 p.m. | Franklin Room

Robie Samanta-Roy, PhD
Vice President for Technology
Lockheed Martin, USA



Leveraging Technology to Address the Challenges of Complex Adaptive Systems

Abstract: TBA.

Biography:

Robie Samanta-Roy is Vice President, Technology and Innovation at Lockheed Martin. His responsibilities include leading Lockheed Martin's enterprise-level technology innovation strategy to ensure the corporation's continuing ability to develop and leverage new technologies to help solve its customers' most challenging problems. In this role, he works with the corporation's Engineering and Technology Council and Enterprise Operations leaders to develop and actively manage an enterprise technology roadmap aligned with business area needs, focusing on innovation. He also works with Lockheed Martin's university program with the goal of fostering and transitioning research from leading U.S. research universities, as well as liaison with U.S. government organizations critical to the formation of technical policy and the execution of research.

Conference Schedule

Monday, November 3, 2014 *Presentations are noted by corresponding page number in proceedings.*

Luncheon & Afternoon Plenary

Speaker:
Robie Samanta-Roy, PhD
12:00 p.m. – 1:30 p.m.
Franklin Room

Leveraging Technology to Address the Challenges of Complex Adaptive Systems

Robie Samanta-Roy, PhD
Vice President for Technology
Lockheed Martin, USA

Concurrent Sessions

1:30 p.m. – 3:00 p.m.
(See schedule at right)

Concurrent Sessions 1:30 p.m. – 3:00 p.m.

System of Systems: System Modeling and Design

Adams Room

Session Chair: Nil Ergin
Penn State University, USA

13 - Improving Collaboration in Search and Rescue System of Systems
Nil Kilicay-Ergin, *Penn State University, USA*

21 - Context-Aware Systems: A More Appropriate Response System to Hurricanes and Other Natural Disasters
R. Millham, *Durban University of Technology, South Africa*

27 - Assessing Water Sustainability Related to Hospitals Using System Dynamics Modeling
Misagh Faezipour | Susan Ferreira, *The University of Texas at Arlington, USA*

33 - Designing Future Processing, Exploitation, and Dissemination Support Systems Using Simulation
Corey Lofdahl | Martin Voshell | Samuel Mahoney, *Charles River Analytics, USA*

Data Science and Analytics: Knowledge Extraction

Hamilton Room

Session Chair: Iveta Mrázová
Charles University, Czech Republic

308 - Mining the Czech Insolvency Proceedings Data
Iveta Mrázová | Peter Zvirinský, *Charles University, Czech Republic*

328 - AHP Based Classification Algorithm Selection for Clinical Decision Support System Development
Sina Khanmohammadi | Mandana Rezaeiahari, *Binghamton University, USA*

564 - Computer Assisted System to Help in Developing Capacitive Touch Sensing Applications
Mohamed M. El Rayes, *Fayoum University, Egypt;* Tamer M. Nassef, *Misr University for Science and Technology, Egypt*

322 - A Novel Text Analysis Platform for Pharmacovigilance of Clinical Drugs
Anutosh Maitra | Shubhashis Sengupta | K. M. Annervaz | Tom Geo Jain | Madhura Shivaram, *Accenture Technology Labs, India*

Intelligent and Adaptive Systems: Computational Learning

Jefferson A Room

Session Chair: Natacha Gueorguieva
City University of New York, USA

535 - Evolving Vacation Packages: Genetic Algorithms for Entertainment
Iren Valova | Andrew Embry | MacKinley Trudeau, *University of Massachusetts Dartmouth, USA*; George Georgiev, *University of Wisconsin, USA*

529 - Optimizations of the Gravitationally Organized Related Mapping ANN Through Genetic Algorithms
Iren Valova | Chris Gorman, *University of Massachusetts Dartmouth, USA*

523 - Harnessing Mother Nature: Optimizing Genetic Algorithms for Adaptive Systems
Justin Lovinger | Iren Valova | MacKenzie Rogers | Ryan Nadeau, *University of Massachusetts Dartmouth, USA;* Natacha Gueorguieva, *City University of New York, USA*

541 - Simulated Annealing Approach to Solve Nonogram Puzzles with Multiple Solutions
Wen Li Wang, *Penn State University, USA;* Mei-Huei Tang, *Gannon University USA*

Winner 2014 Stevens Doctoral Award

INCOSE FOUNDATION™

INCOSE Foundation/Stevens Doctoral Award for promising research in Systems Engineering and Integration.

Siddhartha Agarwal

Ph.D. candidate | **Systems Engineering**
Missouri University of Science and Technology

Research:

Formulation of a domain independent framework for generating meta-architectures for System of Systems.

In addition, Agarwal is devising a methodology for implementation of a related meta-architecture though a behavior dependent adaptive strategy for negotiating effectively with participating systems. The model involves computational intelligence and deep learning techniques.

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MISSOURI S&T University of Science & Technology

Conference Schedule

Monday, November 3, 2014 *Presentations are noted by corresponding page number in proceedings.*

Break
3:00 p.m. – 3:30 p.m.
Pre-function Foyer

Concurrent Sessions
3:30 p.m. – 5:00 p.m.
(See schedule at right)

Concurrent Sessions 3:30 p.m. – 5:00 p.m.

System of Systems: Computational Complexity
Adams Room

Session Chair: David Curry
Missouri S&T, USA

192 - Complexity Analysis of Multilayer Perceptron Neural Network Embedded Into a Wireless Sensor Network
Gursel Serpen | Zhenning Gao, *University of Toledo, USA*

185 - Computational Complexity Measures for Many-Objective Optimization Problems
David M. Curry | Cihan H. Dagli, *Missouri S&T, USA*

210 - Approach to Manage Complexity in Internet of Things
Angel Hernandez-Bravo, *IBM, Spain;* Jesus Carretero, *Universidad Carlos III de Madrid, Spain*

401 - Network Traffic Anomalies, Natural Language Processing, and Random Matrix Theory
Pedro N. Safier, *S & J Solutions, LLC, USA;* Ira S. Moskowitz, *Naval Research Laboratory, USA*

Data Science and Analytics: Knowledge Discovery
Hamilton Room

Session Chair: Phillip H. Griffin
Griffin Information Security Consulting, USA

314 - Towards an Ontology-Based Persona-Driven Requirements and Knowledge Engineering
Wee Wee Sim | Peggy Brouse, *George Mason University, USA*

335 - The Role of Search Engine Optimization on Keeping the User on the Site
Gokhan Egri, *Istanbul Kultur University, Turkey;* Coskun Bayrak, *University of Arkansas at Little Rock, USA*

393 - Telebiometric Authentication Objects
Phillip H. Griffin, *Griffin Information Security Consulting, USA*

Intelligent and Adaptive Systems: Biologically Inspired Models
Jefferson A Room

Session Chair: Issam Abu-Mahfouz
Penn State University, USA

464 - Simulating Influence of Channel Kinetics and Temperature on Hodgkin-Huxley Threshold Dynamics
George Georgiev, *University of Wisconsin, USA;* Iren Valova, *University of Massachusetts Dartmouth, USA;* Natacha Gueorguieva | David Brady, *City University of New York, USA*

490 - Assessment of Disc Damage Likelihood Scale(DDLS) for Automated Glaucoma Diagnosis
Rana Uday Singh | Shruti Gujral, *Chandigarh University, India*

556 - Drill Wear Feature Identification Under Varying Cutting Conditions Using Vibration and Cutting Force Signals and Data Mining Techniques
Issam Abu Mahfouz | Amit Banerjee, *Penn State University, USA*

220 - Application of Gaussian Process to Locational Marginal Pricing Forecasting
Hiroyuki Mori | Kaoru Nakano, *Meiji University, Japan*

Conference Morning Plenary Speaker

Tuesday, November 4, 2014 | 9:00 a.m. – 10:00 a.m. | Adams Room

Jose C. Principe, PhD
Distinguished Professor ECE,
BellSouth Professor and Director
Computational NeuroEngineering Lab
University of Florida, USA

A Cognitive Architecture for Object Recognition in Video

Abstract: This talk describes our efforts to abstract from the animal visual system the computational principles to explain images in video. We develop a hierarchical, distributed architecture of dynamical systems that self-organizes to explain the input imagery using an empirical Bayes criterion with sparseness constraints and dual state estimation. The interpretation of the images is mediated through causes that flow top down and change the priors for the bottom up processing. We will present preliminary results in several data sets.

Biography:

Jose C. Principe (M'83-SM'90-F'00) is a Distinguished Professor of Electrical and Computer Engineering and Biomedical Engineering at the University of Florida where he teaches advanced signal processing, machine learning and artificial neural networks (ANNs) modeling. He is BellSouth Professor and the Founder and Director of the University of Florida Computational NeuroEngineering Laboratory (CNEL) www.cnel.ufl.edu. His primary area of interest is processing of time varying signals with adaptive neural models. The CNEL Lab has been studying signal and pattern recognition principles based on information theoretic criteria (entropy and mutual information).
Dr. Principe is an IEEE Fellow. He was the past chair of the Technical Committee on Neural Networks of the IEEE Signal Processing Society, past-president of the International Neural Network Society, and past-editor in chief of the IEEE Transactions on Biomedical Engineering. He is a member of the Advisory Board of the University of Florida Brain Institute. Dr. Principe has more than 600 publications. He directed 81 Ph.D. dissertations and 65 Master theses. He wrote in 2000 an interactive electronic book entitled "Neural and Adaptive Systems" published by John Wiley and Sons, and more recently co-authored "Brain Machine Interface Engineering," Morgan and Claypool, "Information Theoretic Learning," Springer, and "Kernel Adaptive Filtering," Wiley.

Conference Schedule

Tuesday, November 4, 2014 *Presentations are noted by corresponding page number in proceedings.*

Registration Desk Open
8:00 a.m. – 5:00 p.m.
Pre-function Foyer

Continental Breakfast
8:00 a.m. – 9:00 a.m.
Pre-function Foyer

Session Convenes
9:00 a.m. – 10:00 a.m.
Adams Room

Announcements

Morning Plenary

Speaker: Jose C. Principe, PhD

A Cognitive Architecture for Object Recognition in Video

Jose C. Principe, PhD
Distinguished Professor ECE,
Bellsouth Professor Computational NeuroEngineering Lab,
University of Florida, USA

Break
10:00 a.m. – 10:30 a.m.
Pre-function Foyer

Concurrent Sessions
10:30 a.m. – 12:00 p.m.
(See schedule at right)

Concurrent Sessions 10:30 a.m. – 12:00 p.m.

System of Systems: Socio-Technical Systems

Adams Room

Session Chair: Douglas A. Bodner
Georgia Institute of Technology, USA

425 - Enterprise Modeling Framework for Counterfeit Parts in Defense Systems
Douglas A. Bodner, *Georgia Institute of Technology, USA*

418 - Location Intelligence Application in Digital Data Activity Dimensioning in Smart Cities
Michael Jensen | Jose Gutierrez | Jens Pedersen, *Aalborg University, Denmark*

440 - Holistic Study of Liquefied Natural Gas Carrier Systems
M. R. Zoolfakar | W. M. Dahalan | M. K. Puteri Zarina, *Universiti Kuala Lumpur, Malaysia;* R. Norman | E. Mesbahi, *Newcastle University, UK*

432 - Achieving a Decision Paradigm for Distributed Warfare Resource Management
Bonnie W. Young | John M. Green, *Naval Postgraduate School, USA*

Business and Financial Analytics: Financial Analytics

Hamilton Room

Session Chair: David Enke
Missouri S&T, USA

234 - Nonlinear Modeling Using Neural Networks for Trading the Soybean Complex
David Enke | Phoebe S. Wiles, *Missouri S&T, USA*

254 - A Hybrid Neuro-Fuzzy Model to Forecast Inflation
David Enke | Nijat Mehdiyev, *Missouri S&T, USA*

240 - TN-RSI: Trend Normalized RSI Indicator for Stock Trading Systems with Evolutionary Computation
Ugur Sahin | A. Murat Ozbayoglu, *TOBB University of Economics and Technology, Turkey*

246 - Volatility Forecasting Using a Hybrid GJR-GARCH Neural Network Model
David Enke | Soheil Almasi Monfared, *Missouri S&T, USA*

Intelligent and Adaptive Systems: Reinforcement Learning as Adaptive Control

Jefferson A Room

Session Chair: Abhijit Gosavi
Missouri S&T, USA

500 - How to Rein in the Volatile Actor: A New Bounded Perspective
Abhijit Gosavi, *Missouri S&T, USA*

549 - Direct Adaptive Control for Infinite-Dimensional Symmetric Hyperbolic Systems
Mark J. Balas, *Embry-Riddle Aeronautical University , USA;* Susan A. Frost, *NASA Ames Research Center, USA*

470 - A Latent Space Support Vector Machine (LSSVM) Model for Cancer Prognosis
William Ford | Walker Land, *Binghamton University, USA*

484 - Interictal Epileptic Activity Rate in Relation with Seizure Occurrence and Sleep Stages: A Stereo-EEG Study
Mamadou L. Ndiaye | Idy Diop | Abdoul K. Mbodji , *Polytechnic High Institute (ESP), Sénégal*

Conference Afternoon Plenary Speaker

Tuesday, November 4, 2014 | 12:00 p.m. – 1:30 p.m. | Franklin Room

Mika Sato-Ilic, PhD
Professor of Engineering,
Information Systems
University of Tsukuba, Japan

Clustering Innovations in Data Science

Abstract: There is an increasing necessity to analyze today's vast and complex societal data. However, conventional data analysis that is dependent on statistical methods cannot deal with the often complex data types that form this data. Clustering is one type of data analysis that allows us to detect and characterize the latent structure of data by classifying objects based on similarities among the objects. This clustering analysis has gained interest as an adaptive approach to large and complex data. This presentation outlines clustering analysis and introduces innovative techniques of clustering-based models for adapting large and complex data by using the obtained cluster as a scale.

Biography:

Mika Sato-Ilic currently holds the position of professor in the Faculty of Engineering, Information and Systems, at the University of Tsukuba, Japan. She is the founding editor-in-chief of the *International Journal of Knowledge Engineering and Soft Data Paradigms*, associate editor of *Neurocomputing*, associate editor of *Information Sciences*, regional editor of *International Journal on Intelligent Decision Technologies* and associate editor of the *International Journal of Innovative Computing, Information and Control Express Letters*, as well as serving on the editorial board of several other journals. In addition, she was a council of the International Association for Statistical Computing (a Section of the International Statistical Institute), a senior member of the IEEE where she holds several positions including the vice-chair of the Fuzzy Systems Technical Committee of the IEEE Computational Intelligence Society. In addition, she has served on several IEEE committees including the administration committee, program co-chair, and special sessions co-chair. Her academic output includes 4 books, 9 book chapters and over 100 journal and conference papers. Her research interests include the development of methods for data mining, multi-dimensional data analysis, multi-mode multi-way data theory, pattern classification, and computational intelligence techniques for which she has received several academic awards.

Conference Schedule

Tuesday, November 4, 2014 *Presentations are noted by corresponding page number in proceedings.*

Luncheon & Afternoon Plenary

Speaker: Mika Sato-Ilic, PhD

12:00 p.m. – 1:30 p.m.

Franklin Room

Clustering Innovations in Data Science

Mika Sato-Ilic, PhD
Professor of Engineering, Information Systems
University of Tsukuba, Japan

Concurrent Sessions

1:30 p.m. – 3:00 p.m.

(See schedule at right)

Break

3:00 p.m. – 3:30 p.m.

Pre-function Foyer

Concurrent Sessions 1:30 p.m. – 3:00 p.m.

Systems of Systems: Multi-Scale Modeling

Adams Room

Session Chair: Mike Mekkanen
University of Vaasa, Finland

93 - Modeling of Intelligent System Thinking in Complex Adaptive Systems
Ben Khayut | Lina Fabri | Maya Avikhana, *Intelligence Decisions Technologies Systems, Israel*

87 - Executable Architecture Based on System Dynamics: An Integrated Methodology Composed by Standard System Dynamics Modeling and DoDAF Operational View Models
Andrés Bueno | Luz Torres Carreño | Dario J. Delgado | Ricardo Llamosa-Villalba, *Universidad Industrial de Santander, Colombia*

72 - Using OPNET to Model and Evaluate the MU Performance Based on IEC61850-9-2LE
Mike Mekkanen | Reino Virrankoski | Mohammed Elmusrati | Erkki Antila, *University of Vaasa, Finland*

80 - Develop an Executable Architecture for a System of Systems: A Teaching Management Model
Darío J. Delgado | Ricardo Llamosa-Villalba | Rodrigo Torres-Sáez, *Universidad Industrial de Santander, Colombia*

Emerging Technologies and Complexity

Hamilton Room

Session Chair: Corey B. Hart
Lockheed Martin IS&GS, USA

177 - Synchronicity Among Biological and Computational Levels of an Organism: Quantum Biology and Complexity
Carlos E. Maldonado | Nelson A. Gómez-Cruz, *Universidad del Rosario, Colombia*

381 - A Trusted Third-Party (TTP) Based Encryption Scheme for Ensuring Data Confidentiality in Cloud Environment
Syed Rizvi | Katie Cover | Christopher Gates, *Penn State University, USA*

515 - An Associative Memorization Architecture of Extracted Musical Features From Audio Signals by Deep Learning Architecture
Tadaaki Niwa | Ryosuke Ooe | Masahiro Kinoshita | Tamotsu Mitamura | Takashi Kawakami, *Hokkaido University of Science, Japan;* Keitaro Naruse, *University of Aizu, Japan*

387 - Towards a Compiler for a Polychronous Wavefront Computer: Programming by Optimization
Corey B. Hart, *Lockheed Martin IS&GS, USA*

Intelligent and Adaptive Systems: Decision Making Analytics

Jefferson A Room

Session Chair: Mitsuo Gen
Fuzzy Logic Systems Institute, Japan

587 - Hybrid Multiobjective Evolutionary Algorithm for Assembly Line Balancing Problem with Stochastic Processing Time
Wenqiang Zhang | Weitao Xu, *Henan University of Technology, China;* Mitsuo Gen, *Fuzzy Logic Systems Institute, Japan*

579 - Utilization of Robust Video Processing Techniques to Aid Efficient Object Detection and Tracking
Anand Balasubramanian | Shreyamsh Kamate | Nuri Yilmazer, *Texas A&M University-Kingsville, USA*

571 - An Effective Multi-Objective EDA for Robust Resource Constrained Project Scheduling with Uncertain Durations
Xinchang Hao, *Waseda University, Japan;* Lin Lin, *Dalian University of Technology, China;* Mitsuo Gen, *Fuzzy Logic Systems Institute, Japan*

446 - An Efficient Multi-Objective Meta-Heuristic Method for Probabilistic Transmission Network Planning
Kakuta Hiroki | Hiroyuki Mori, *Meiji University, Japan*

Conference Banquet Plenary Speaker

Tuesday, November 4, 2014 | 7:00 p.m. – 9:30 p.m. | Franklin Room

Cheryl McIntyre

Director of Complex Systems

Lockheed Martin, USA

Embracing Complexity and Advancing the Craft of Engineering

Abstract: TBA.

Biography:

Cheryl McIntyre is Lockheed Martin's Corporate Director of Complex Systems. In this position, Ms. McIntyre is responsible for advancing the engineering enterprise by maturing innovative engineering practices that embrace complex systems development. In her 29 years with Lockheed Martin, she has held key leadership roles managing the design, development, and fielding of complex large-scale systems and various engineering organizations. Ms. McIntyre graduated from State University of New York College at Plattsburgh with a bachelor's degree in Computer Science, and is recognized as a Distinguished Alumna. She is a member of the Foundation Board of Directors for the Museum of Science & Technology (MOST), the Institute of Electrical and Electronics Engineers (IEEE) Computer Society Industry Advisory Board, and the National Defense Industry Association (NDIA) Software Experts Panel and Software Committee.

Conference Schedule

Tuesday, November 4, 2014 *Presentations are noted by corresponding page number in proceedings.*

Concurrent Session
3:30 p.m. – 5:00 p.m.
(See schedule at right)

Cash Bar
6:30 p.m. – 7:00 p.m.
Pre-function Foyer

Banquet & Awards

Plenary Speaker:
Cheryl McIntyre
7:00 p.m. – 9:30 p.m.
Franklin Room

Embracing Complexity and Advancing the Craft of Engineering

Cheryl McIntyre
Director of Complex Systems, Lockheed Martin, USA

Concurrent Sessions 3:30 p.m. – 5:00 p.m.

System of Systems: Distributed Systems
Adams Room

Session Chair: Bilal Khan
City University of New York, USA

345 - A Study of the Effect of Basic Network Characteristics on System-of-System Failure Propagation
Charles O. Adler | Cihan H. Dagli, *Missouri S&T, USA*

476 - Towards a Formal Understanding of Bateson's Rule: Chromatic Symmetry in Cyclic Boolean Networks and its Relationship to Organism Growth and Cell Differentiation
Yuri Cantor | Bilal Khan, *City University of New York, USA;* Kirk Dombrowski, *University of Nebraska-Lincoln, USA*

353 - Empirical Model Development for Message Delay and Drop in Wireless Sensor Networks
Gursel Serpen | Zhenning Gao, *University of Toledo, USA*

359 - Cloud Computing as a Debug Tool
Chandru Mirchandani, *George Washington Universtiy, USA*

Data Science and Analytics: Prediction
Hamilton Room

Session Chair: David M. Curry
Missouri S&T, USA

637 - The Assessment of Machine Learning Model Performance for Predicting Alluvial Deposits Distribution
Adamu M. Ibrahim | Brandon Bennett, *University of Leeds, UK*

629 - An Algorithm for Clustering Animals by Species Based Upon Daily Movement
David M. Curry, *Missouri S&T, USA*

623 - Predicting Solar Irradiance Using Time Series Neural Networks
A. Alzahrani | J. W. Kimball | C. Dagli, *Missouri S&T, USA*

618 - Assessing the Auto Associative Network Approach for Prediction in Civil Engineering Databases
Hakan Yasarer | Yacoub Najjar, *University of Mississippi, USA*

Intelligent and Adaptive Systems: Social Media Analytics
Jefferson A Room

Session Chair: Babak Heydari
Stevens Institute of Technology, USA

145 - The Scalpel or the Shotgun? A Study of Strategies for Boosting New Technology Adoption in Social Network Environments
Peter Ludlow | Babak Heydari, *Stevens Institute of Technology, USA*

168 - Enhancing a Rule-Based Event Coder with Semantic Vectors
Jinhong K. Guo | David Van Brackle | Martin O. Hofmann, *Lockheed Martin Advanced Technology Laboratories, USA*

152 - Measuring the Influence of Mass Media on Opinion Segregation Through Twitter
Omar ElTayeby | Peter Molnar | Roy George, *Clark Atlanta University, USA*

160 - Controversial Topic Discovery on Members of Congress with Twitter
Aleksey Panasyuk | Edmund Szu-Li Yu | Kishan G. Mehrotra, *Syracuse University, USA*

Conference Morning Plenary Speaker

Wednesday, November 5, 2014 | 9:00 a.m. – 10:00 a.m. | Adams Room

David Welsh
Senior Standards Manager
Microsoft Corporation, USA

Conquering Complexity in the New World of Smart Cities and Internet of Things

Abstract: Cities have grown into complex "systems of systems" of ageing infrastructures and ever increasing operating costs. The new demands on private personal data, and the growing socio-economic problems are only compounded with an urgent global ecological agenda. Natural disasters like Hurricane Sandy continue to hit home the need for cities to develop a strong resiliency agenda. As of 2008, most of the world's population now belongs to cities. In the next decades cities will grow at an even more alarming rate while new technologies unlock massive streams of data about city infrastructures through platforms like the Internet of Things (IoT). As these forces collide, every city is becoming its own unique civic laboratory-a place where technology and policy is adapted in novel ways to meet very practical local needs. How we built cities so far doesn't scale for the future, and it is well recognized by agencies like the World Bank that something transformative has to change. We live in a complex and ever adaptive world, but what is the new science of a Smart City? This presentation will look at the latest transformative Smart City thinking from a number of different viewpoints, from the city architect and urban designers perspective, to the city administration and citizens new governance perspective, to the role Information and Communications Technologies is having in in bringing us out of the industrial age to the information age and hopefully to an age of innovation.

Biography:

Dave Welsh has been at Microsoft Corporation for more than 12 years, and works in Microsoft's Corporate Standards Group. Dave covers Microsoft's global policy on a variety of different standards agendas, these days largely focused on Smart Cities and also IoT. In his job Dave works with the Microsoft development teams (including Windows and Office) on their new Cloud services, as well as Microsoft's field operations globally.

Educated at Concordia University Center for Building Studies (Montreal) and the Technical University of Eindhoven, Department of Architecture (The Netherlands), Dave specialized in Computer Aided Architectural and Building Design back in the 1970s.

Dave has been both an engineer and manager in different countries across a variety of industry domains from buildings and construction, to transportation, to international trade logistics, to manufacturing to online retail as one of the early Amazon.com employees back in the 1990s.

Going back to the '80s, Dave has been active with a number of different international, US and EU standards organizations on a wide range of topics. He has co-authored different ISO standards, chaired different technical committees, was the United Nations Standards Rapporteur within the UN's Center for Trade Facilitation, a past member of the International Chamber of Shipping (London) and their Liaison to World Customs Council (Brussels). More recently he was US Head of Delegation to several US national committees to ISO. He is currently chair of the US national committee to ISO/IEC on Systems and Software Engineering standards, and he is also very involved with a number of Consortia on Smart Cities and also Consortia on the Internet of Things (IoT).

Conference Schedule

Wednesday, November 5, 2014

Presentations are noted by corresponding page number in proceedings.

Registration Desk Open
8:00 a.m. – 5:00 p.m.
Pre-function Foyer

Continental Breakfast
8:00 a.m. – 9:00 a.m.
Pre-function Foyer

Session Convenes
9:00 a.m. – 10:00 a.m.
Adams Room

Announcements

Morning Plenary

Speaker: Dave Welsh

Conquering Complexity in the New World of Smart Cities and Internet of Things

Dave Welsh
Senior Standards Manager
Microsoft Corporation, USA

Break
10:00 a.m. – 10:30 a.m.
Pre-function Foyer

Concurrent Sessions
10:30 a.m. – 12:00 p.m.
(See schedule at right)

Concurrent Sessions 10:30 a.m. – 12:00 p.m.

System of Systems: Complex Analytics
Adams Room

Session Chair: Fred Highland
Lockheed Martin, USA

110 - SoS Benefiting from Complex Systems Research
Vernon Ireland, *The University of Adelaide, Australia*

198 - Modeling Complexity in Multi-Modal Adaptive Survey Systems
Fred Highland, *Lockheed Martin, USA*

131 - Challenges of Governance in Complex Adaptive Systems: A Case Study of U.S. Public Education
Sibel McGee | Robert Edson, *Analytic Services Inc., USA*

140 - Applying Advanced 21st Century Systems Engineering and Integration (SEI) Methods to Address and Manage Risks within a CAS Environment
Gennaro J. Avvento, *Lockheed Martin, USA*

Intelligent and Adaptive Systems: Machine Learning
Hamilton Room

Session Chair: Michael B. Richman
University of Oklahoma, USA

593 - A New Scheme for Daily Peak Wind Gust Prediction Using Machine Learning
Andrew Mercer | Jamie Dyer, *Mississippi State University, USA*

599 - A Machine Learning Framework for Predicting Purchase by Online Customers Based on Dynamic Pricing
Rajan Gupta, *University of Delhi, India;* Chaitanya Pathak, *Ask-me-Bazaar Online Marketplace, India*

606 - A Fuzzy-Neuro Based Weather Prediction System for Bangladesh
Tamjid Rahman | Abul L. Haque, *North South University, Bangladesh*

612 - Attribution and Prediction of Maximum Temperature Extremes in SE Australia
Michael B. Richman | Lance M. Leslie, *University of Oklahoma, USA*

Biomimicry and Cognitive Agents
Jefferson A Room

Session Chair: Ahmet Ozbayoglu
TOBB University of Economics and Technology, Turkey

367 - A Multi-Agent System Model for Partner Selection Process in Virtual Enterprise
B. Lotfi Sadigh, *Middle East Technical University, Turkey;* F. Arikan | A. M. Ozbayoglu | H. O. Unver, *TOBB University of Economics and Technology, Turkey;* S. E. Kilic, *Atilim University, Turkey*

373 - Self-Managed Networks with Fault Management Hierarchy
Mehmet Toy, *Comcast Cable, LLC, USA*

301 - Data Mining Based Hybridization of Meta-RaPS
Fatemah Al-Duoli | Ghaith Rabadi, *Old Dominion University, USA*

508 - Biomimicry Based Learning Outcomes of Simple Cognitive Agents
Anna T. Lawniczak | Jason B. Ernst, *University of Guelph, Canada;* Bruno N. Di Stefano, *Nuptek Systems Ltd, Canada*

Conference Afternoon Plenary Speaker

Wednesday, November 5, 2014 | 12:00 p.m. – 1:30 p.m. | Franklin Room

Yew-Soon Ong, PhD

Director, Centre for Computational Intelligence;
Director, SIMTECH-NTU Joint Lab on Complex Systems;
Program Principal Investigator, Rolls-Royce@NTU Corporate Lab;
Nanyang Technological University, Singapore

The Emerging "Big Dimensionality"

Abstract: The world continues to generate quintillion bytes of data daily, leading to the pressing needs for new efforts in dealing with the grand challenges brought by Big Data. Today, there is a growing consensus among the computational intelligence communities that data volume presents an immediate challenge pertaining to the scalability issue. However, when addressing volume in Big Data analytics, researchers in the data analytics community have largely taken a one-sided study of volume, which is the "Big Instance Size" factor of the data. The flip side of volume which is the dimensionality factor of Big Data, on the other hand, has received much lesser attention.

In this talk, special focus is placed on the relatively under-explored topic of "Big Dimensionality," wherein the explosion of features (variables) brings about new challenges to computational intelligence. We begin with an analysis on the origins of Big Dimensionality. The evolution of feature dimensionality in the last two decades is then discussed using popular data repositories considered in the data analytics and computational intelligence research communities. Subsequently, some of the state-of-the-art feature selection schemes reported in the field of computational intelligence are reviewed to reveal the inadequacies of existing approaches in keeping pace with the emerging phenomenon of Big Dimensionality.

Biography:

Yew-Soon Ong is currently an associate professor and director of the Center for Computational Intelligence, director of the A*Star SIMTECH-NTU Joint Lab on Complex Systems at the School of Computer Engineering Nanyang Technological University, Singapore and program principal investigator of the Rolls-Royce@NTU Corporate Lab. He received a PhD degree on Artificial Intelligence in Complex Design from the Computational Engineering and Design Center, University of Southampton, United Kingdom in 2003. His current research interest in computational intelligence spans across memetic computing, evolutionary computation, machine learning and agent-based systems. He is the founding technical editor-in-chief of *Memetic Computing Journal*, founding chief editor of the Springer book series on studies in adaptation, learning, and optimization, associate editor of the *IEEE Transactions on Evolutionary Computation*, the *IEEE Transactions on Neural Networks & Learning Systems, IEEE Computational Intelligence Magazine, IEEE Transactions on Cybernetics, Soft Computing, International Journal of System Sciences* and others. He has co-authored over 120 refereed publications and his research grants in the last five years amounts to a total of more than 25 million Singapore dollars. Presently, he chairs the IEEE Computational Intelligence Society Intelligent Systems and Applications Technical Committee. His research work on Memetic Algorithm was featured by Thomson Scientific's Essential Science Indicators as one of the most cited emerging areas of research in August 2007. Recently, he also received the 2014 IEEE Computational Intelligence Magazine Outstanding Paper Award and the 2012 IEEE Transactions on Evolutionary Computation Outstanding Paper Award for his work pertaining to Memetic Computing. In teaching, he has also received teaching awards including the Nanyang Excellence Award for Teaching in 2008, Most Popular Lecturer Award 2009, and recently invited as Fellow of Renaissance Engineering Programme at Nanyang Technological University.

Conference Schedule

Wednesday, November 5, 2014

Presentations are noted by corresponding page number in proceedings.

Luncheon & Afternoon Plenary

Speaker: Yew-Soon Ong, PhD

12:00 p.m. – 1:30 p.m.

Franklin Room

The Emerging "Big Dimensionality"

Yew-Soon Ong, PhD
Director, Centre for Computational Intelligence; Director, SIMTECH-NTU Joint Lab on Complex Systems; Program Principal Investigator, Rolls-Royce@ NTU Corporate Lab; Nanyang Technological University, Singapore

Concurrent Sessions

1:30 p.m. – 3:00 p.m.

(See schedule at right)

Concurrent Sessions

1:30 p.m. – 3:00 p.m.

System of Systems: Emergent System Behavior

Adams Room

Session Chair: TBA
TBA

104 - Systems Thinking: An Analysis of Key Factors and Relationships
Divya Vohra Behl | Susan Ferreira, *The University of Texas at Arlington, USA*

118 - Verification Points for Self-Adaptive Systems
Brian Phillips | Mark Blackburn, *Stevens Institute of Technology, USA*

204 - Controlling Design Complexity with the Monterey Phoenix Approach
Kristin Giammarco | Mikhail Auguston | Monica Farah-Stapleton, *Naval Postgraduate School, USA;* W. Clifton Baldwin | Ji'on Crump, *Stevens Institute of Technology, USA*

454 - Operation Optimal Dynamics of a Hybrid Electrical System: Multi-Agent Approach
Abdoul K. Mbodji | Mamadou L. Ndiaye | Papa A. Ndiaye, *University Cheikh Anta DIOP, Senegal;* Mounirou Ndiaye, *University THIES, Senegal*

Business and Financial Analytics: Business Analytics

Hamilton Room

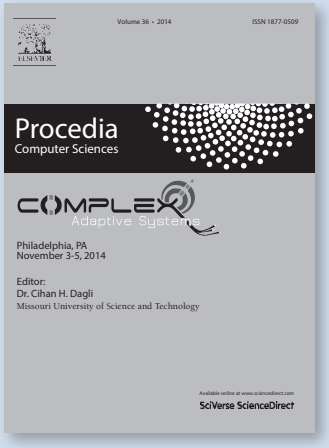
Session Chair: Anthony Joseph
Pace University, USA

227 - The Treasury Bill Rate, the Great Recession, and Neural Networks Estimates of Real Business Sales
Anthony Joseph | Maurice Larrain, *Pace University, USA;* Claude Turner, *Bowie State University, USA;*

261 - Demand Forecasting Based on Pairwise Item Associations
Ayhan Demiriz, *Sakarya University, Turkey*

269 - Neural Network Modeling, Simulation and Prediction of Innovation Growth in United Arab Emirates (UAE)
Harish Sanjeev, *Siemens Building Technologies, UAE;* Anand Kumar, *Birla Institute of Technology and Science, UAE;* Osman Ahmed, *Siemens Building Technologies, USA*

Proceedings



Papers presented at the 2014 Complex Adaptive Systems Conference are published in the *Procedia Computer Sciences*, which is an online publication hosted by SciVerse Science Direct. Content is freely available worldwide in perpetuity.

In addition, papers are submitted for indexing to **Scopus** at **www.scopus.com** and **Engineering Village (Ei)** at **www.engineeringvillage.com**

Hotel Floor Plan

Registration – *Pre-function Foyer*
Continental Breakfast – *Pre-function Foyer*
Welcome/Morning Plenary – *Adams*
Concurrent Sessions – *Adams, Hamilton & Jefferson A*
Breaks – *Pre-function Foyer*
Luncheon Plenary – *Franklin*
Cash Bar – *Pre-function Foyer*
Banquet (Tuesday Evening) – *Franklin*

Questions? Contact Us

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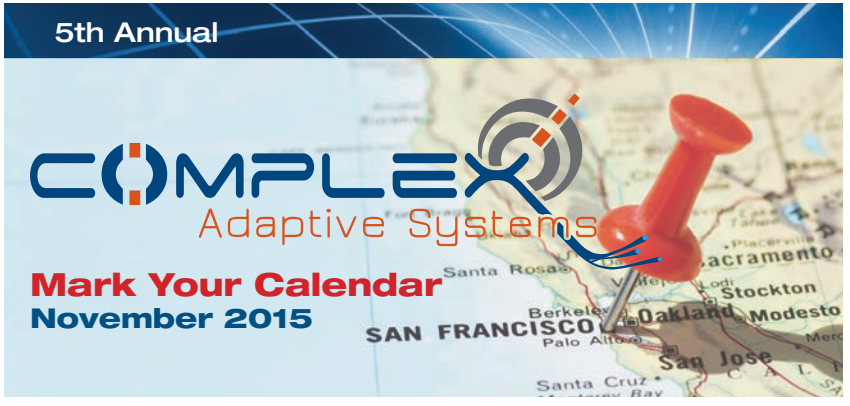

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