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The International Conference on Advanced Machine Learning Technologies and Applications (AMLTA2019)

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*To the scientific Research Group in Egypt
members and my wife Nazaha Hassan El
Saman*

Preface

This volume constitutes the refereed proceedings of the fourth International Conference on Advanced Machine Learning Technologies and Applications, AMLTA2019, will be held in Cairo, Egypt, in March 28–30, 2019. In response to the call for papers for AMLTA2019, 199 papers were submitted for presentation and inclusion in the proceedings of the conference. After a careful blind refereeing process, 93 papers were selected for inclusion in the conference proceedings. The papers were evaluated and ranked on the basis of their significance, novelty, and technical quality by at least two reviewers per paper. The papers cover current research in machine learning, data sciences, bioinformatics, complex network, renewable energy, swarm intelligence, biomedical engineering, complex control systems, cyber security, data mining, and deep learning. Also, five special sessions and one workshop will be organized: Special Session (1) Recent Trends in Data Science and Analytics by Prof Mrinal Kanti Ghose, and Prof Roheet Bhatnagar, India; Special Session (2) Advances and Applications of Modern Control Systems by Professor Ahmad Taher Azar, IEEE Senior Member; Special Session (3) Soft Computing Applications in Environmental and Earth Sciences by Prof. Richa N. K. Sharma and Prof. Shamama Anwar; Special Session (4) Machine Learning in Bioinformatics: Current Trends and Challenges by Dr. Mohamed Hamed and Dr. Mohamed Taha; Special Session (5) Image Processing: Classical and Modern Techniques by Dr. Mohamed Wagieh and Dr. Fayed Al Fayed. The workshop titled Machine Learning for Control and Power Energy will be organized by Professor Ashraf Darwish, Egypt.

In addition to these papers, the program will include two keynote talks: the first talk by Professor Swagatam Das (Indian Institute of Technology) titled Multi-modal and Uncertain Optimization with Differential Evolution - Some Recent Approaches and Future Challenges, and the second talk by Professor Ivan Zelinka (Department of Computer Science, Faculty of Electrical Engineering and Computer Science, VŠB-TUO, 17. listopadu 15, 708 33 Ostrava-Poruba, Czech Republic) titled Modern Algorithms in Control and Design of Complex Systems. In addition, one tutorial will be given by Professor Ibrahim A. Hameed (Norwegian University of Science and Technology, Noway) titled Hands-on to TensorFlow. We express our

sincere thanks to the plenary and tutorial speakers, workshop/special session chairs, and international program committee members for helping us to formulate a rich technical program. We would like to extend our sincere appreciation for the outstanding work contributed over many months by the Organizing Committee: Local Organization Chair, and Publicity Chair. We also wish to express our appreciation to the SRGE members for their assistance. We would like to emphasize that the success of AMLTA2019 would not have been possible without the support of many committed volunteers who generously contributed their time, expertise, and resources toward making the conference an unqualified success. Finally, thanks to Springer team for their support in all stages of the production of the proceedings. We hope that you will enjoy the conference program.

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Keynote Speakers and Tutorial

Multi-modal and Uncertain Optimization with Differential Evolution - Some Recent Approaches and Future Challenges

Swagatam Das

Indian Institute of Technology

<https://www.isical.ac.in/~swagatam.das/>

Abstract. Differential Evolution (DE) is arguably one of the most powerful stochastic real-parameter optimization algorithms of current interest. DE operates through similar computational steps as employed by a standard Evolutionary Algorithm (EA). However, unlike traditional EAs, the DE variants perturb the current-generation population members with the scaled differences of distinct population members. Therefore, no separate probability distribution has to be used for generating the offspring. Since its inception in 1995, DE has drawn the attention of many researchers all over the world resulting in a lot of variants of the basic algorithm with improved performance. This talk will begin with a brief but comprehensive overview of the basic concepts related to DE, its algorithmic components and control parameters. It will subsequently discuss some of the significant algorithmic variants of DE for bound-constrained single-objective optimization for high-dimensional search spaces. The talk will then focus on some interesting DE variants with additional mechanisms like a distance-based selection, a clustering procedure and aging mechanisms for optimization of objective functions corrupted with additive noise from various sources (with various probability distributions) and also optimization over dynamic/noisy fitness landscapes where the optima can shift with time. The talk will finally discuss a few interesting applications of DE and highlight a few open research problems.



Bio: Swagatam Das is currently serving as an associate professor at the Electronics and Communication Sciences Unit of the Indian Statistical Institute, Kolkata, India. His research interests include evolutionary computing, pattern recognition, multi-agent systems, and wireless communication. Dr. Das has published one research monograph, one edited volume, and more than 200 research articles in peer-reviewed journals and international conferences. He is the founding co-editor-in-chief of *Swarm and Evolutionary Computation*, an international journal from Elsevier.

He has also served as or is serving as the associate editors of Pattern Recognition (Elsevier), IEEE Trans. on Systems, Man, and Cybernetics: Systems, IEEE Computational Intelligence Magazine, IEEE Access, Neurocomputing (Elsevier), Engineering Applications of Artificial Intelligence (Elsevier), and Information Sciences (Elsevier). He is an editorial board member of Progress in Artificial Intelligence (Springer), PeerJ Computer Science, International Journal of Artificial Intelligence and Soft Computing, and International Journal of Adaptive and Autonomous Communication Systems. Dr. Das has 14000+ Google Scholar citations and an H-index of 56 till date. He has been associated with the international program committees and organizing committees of several regular international conferences including IEEE CEC, IEEE SSCI, SEAL, GECCO, and SEMCCO. He has acted as guest editors for special issues in journals like IEEE Transactions on Evolutionary Computation and IEEE Transactions on SMC, Part C. He is the recipient of the 2012 Young Engineer Award from the Indian National Academy of Engineering (INAE). He is also the recipient of the 2015 Thomson Reuters Research Excellence India Citation Award as the highest cited researcher from India in Engineering and Computer Science category between 2010 to 2014.

Modern Algorithms in Control and Design of Complex Systems

Ivan Zelinka

Department of Computer Science, Faculty of Electrical Engineering
and Computer Science VŠB-TUO, 17. listopadu 15, 708 33 Ostrava-Poruba,
Czech Republic
ivan.zelinka@vsb.cz
www.ivanzelinka.eu

Abstract. This keynote discusses the mutual intersection of exciting fields of research: bio-inspired algorithms, deterministic chaos and complex systems. The first one will discuss main principles of bio-inspired methods, its historical background and its use on various examples including real-world ones. Examples include plasma reactor control, optimal signal routing in the network of portable meteorological stations, complex system design as antenna design, nonlinear system and controllers design and more. Also, its use in deterministic chaos control with focusing on simple chaotic systems (logistic, Hennon,...), as well as CML systems exhibiting spatiotemporal chaos, will be mentioned and explained. The second part will discuss the use of deterministic chaos instead of pseudo-random number generators inside evolutionary algorithms with the application on well known evolutionary algorithms (differential evolution, PSO, SOMA, genetic algorithms,...) and test functions. A mutual comparison will be presented, based on our research. Also will be discussed the question whether evolutionary dynamics need pseudo-random numbers or no. At the end will be mentioned a novel approach joining evolutionary dynamics, complex networks and CML systems exhibiting chaotic behaviour. Reported methodology and results are based on the actual state of the art (that is a part of this keynote) as well as on our research. The keynote is designed as an introduction; no advanced or expert knowledge from complex networks, chaos and control is expected.



Bio: Ivan Zelinka is currently working at the Technical University of Ostrava (VSB-TU), Faculty of Electrical Engineering and Computer Science. He graduated consequently at Technical University in Brno (1995 – MSc.), UTB in Zlín (2001 – PhD) and again at Technical University in Brno (2004 – assoc. prof.) and VSB-TU (2010 - professor). Before academic career, he was an employed like TELECOM technician, computer specialist (HW+SW) and Commercial Bank (computer and LAN supervisor). During his career at UTB, he

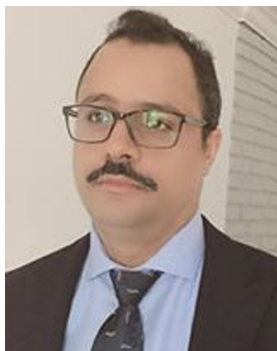
proposed and opened 7 different lectures. He also has been invited for lectures at numerous universities in different EU countries plus the role of the *keynote speaker* at the Global Conference on Power, Control and Optimization in Bali, Indonesia (2009), Interdisciplinary Symposium on Complex Systems (2011), Halkidiki, Greece and IWCFTA 2012, Dalian China. The field of his expertise is mainly on unconventional algorithms and cybersecurity. He is and was responsible supervisor of 3 grant of fundamental research of Czech grant agency GAČR, co-supervisor of grant FRVŠ - Laboratory of parallel computing. He was also working on numerous grants and two EU project like a member of the team (FP5 - RESTORM) and supervisor (FP7 - PROMOEVO) of the Czech team and supervisor of international research (founded by TACR agency) focused on the security of mobile devices (Czech - Vietnam). Currently, he is a professor at the Department of Computer Science and in total, he has been the supervisor of more than 40 MSc. and 25 Bc. diploma thesis. Ivan Zelinka is also supervisor of doctoral students including students from the abroad. He was awarded by Siemens Award for his PhD thesis, as well as by journal Software news for his book about artificial intelligence. Ivan Zelinka is a member of British Computer Society, Editor in chief of Springer book series: Emergence, Complexity and Computation (<http://www.springer.com/series/10624>), Editorial board of Saint Petersburg State University Studies in Mathematics, a few international program committees of various conferences and international journals. He is the author of journal articles as well as of books in Czech and English language and one of three founders of TC IEEE on big data <http://ieeesmc.org/about-smcs/history/2014-archives/44-about-smcs/history/2014/technical-committees/204-big-data-computing/>. He is also head of research group NAVY <http://navy.cs.vsb.cz>.

Hands-on to TensorFlow (Tutorial on)

Ibrahim A. Hameed

Norwegian University of Science and Technology, Norway

Abstract. TensorFlow is an open source software library for numerical computation using data and flow graphs. In this tutorial, you will be introduced to TensorFlow and how to use for training deep learning models using CPU and GPU. You will learn how to use colab notebooks with real-world examples.



Speaker: Ibrahim A. Hameed has a Ph.D. in artificial intelligence from South Korea. A Ph.D. in field robotics from Denmark. He is working as an Associate Professor at the department of ICT at the Norwegian University of Science and Technology, Norway. He is a deputy head of research and innovation. He is the head of the international master program in Simulation and Innovation.

Contents

Deep Learning Applications	
A Deep Learning Approach for Tongue Diagnosis	3
Meng Xiao, Guozheng Liu, Yu Xia, and Hao Xu	
Reduced 3-D Deep Learning Framework for Hyperspectral Image Classification	13
Noureldin Laban, Bassam Abdellatif, Hala M. Ebeid, Howida A. Shedeed, and Mohamed F. Tolba	
An Efficient Deep Convolutional Neural Network for Visual Image Classification	23
Basma Abd El-Rahiem, Muhammad Atta Othman Ahmed, Omar Reyad, Hani Abd El-Rahaman, Mohamed Amin, and Fathi Abd El-Samie	
Deep Learning for Predictive Analytics in Healthcare	32
Anandhavalli Muniasamy, Sehrish Tabassam, Mohammad A. Hussain, Habeeba Sultana, Vasanthi Muniasamy, and Roheet Bhatnagar	
Deep Layer CNN Architecture for Breast Cancer Histopathology Image Detection	43
Zanariah Zainudin, Siti Mariyam Shamsuddin, and Shafaatunnur Hasan	
Regression Task on Big Data with Convolutional Neural Network	52
Chang Liu, Ziheng Wang, Su Wu, Shaozhi Wu, and Kai Xiao	
The Regression of MNIST Dataset Based on Convolutional Neural Network	59
Ziheng Wang, Su Wu, Chang Liu, Shaozhi Wu, and Kai Xiao	

Swarm Intelligence and Applications

Intelligent Hybrid Approach for Feature Selection 71
Ahmed M. Anter, Ahmad Taher Azar, and Khaled M. Fouad

Parameter Estimation for Chaotic Systems Using the Fruit Fly Optimization Algorithm 80
Saad M. Darwish, Amr Elmasry, and Asmaa H. Ibrahim

Optimal Shortest Path in Mobile Ad-Hoc Network Based on Fruit Fly Optimization Algorithm 91
Saad M. Darwish, Amr Elmasry, and Shaymaa H. Ibrahim

Swarm Optimization for Solving Load Balancing in Cloud Computing 102
Aya A. Salah Farrag, Safia Abbas Mohamad, and El Sayed M. El-Horbaty

The Influence of New Energy Access on Load Peaks and Troughs Based on Optimization Techniques 114
Weibao Zhang, Hong Gang, Baozhong Gan, and Qianhui Gang

Multi-objective Solution of Traveling Salesman Problem with Time . . . 121
Ibrahim A. Hameed

Game Theory Based Solver for Dynamic Vehicle Routing Problem 133
Saad M. Darwish and Bassem E. Abdel-Samee

A Hybridization of Sine Cosine Algorithm with Steady State Genetic Algorithm for Engineering Design Problems 143
M. A. El-Shorbagy, M. A. Farag, A. A. Mousa, and I. M. El-Desoky

Machine Learning in Biomedical

MolecRank: A Specificity-Based Network Analysis Algorithm 159
Ahmed Abdeen Hamed, Agata Leszczynska, and Mark Schreiber

Detecting Epileptic Seizures Using Abe Entropy, Line Length and SVM Classifier 169
Aya Naser, Manal Tantawi, Howida Shedeed, and Mohamed F. Tolba

Analyzing Electrooculography (EOG) for Eye Movement Detection . . . 179
Radwa Reda, Manal Tantawi, Howida shedeed, and Mohamed F. Tolba

Analysis of Classification Methods for Gene Expression Data 190
Lamiaa Zakaria, Hala M. Ebeid, Sayed Dahshan, and Mohamed F. Tolba

Using Eye Movement to Assess Auditory Attention 200
Alaa Bakry, Radwa Al-khatib, Randa Negm, Eslam Sabra, Mohamed Maher, Zainab Mohamed, Doaa Shawky, and Ashraf Badawi

Facilitating Classroom Orchestration Using EEG to Detect the Cognitive States of Learners 209
 Zainab Mohamed, Mohamed El Halaby, Tamer Said, Doaa Shawky, and Ashraf Badawi

A New Nano-robots Control Strategy for Killing Cancer Cells Using Quorum Sensing Technique and Directed Particle Swarm Optimization Algorithm 218
 Doaa Ezzat, Safaa Amin, Howida A. Shedeed, and Mohamed F. Tolba

Data Mining: Technology and Applications

Mining Student Information System Records to Predict Students' Academic Performance 229
 Amjad Abu Saa, Mostafa Al-Emran, and Khaled Shaalan

Bayesian Classification of Personal Histories - An application to the Obesity Epidemic 240
 Christopher R. Stephens, José Antonio Borrás Gutiérrez, and Hugo Flores

Poverty and Its Relation to Crime and the Environment: Applying Spatial Data Mining to Enhance Evidence-Based Policy 250
 Christopher R. Stephens, Oliver López-Corona, Ricardo David Ruíz, and Walter Martínez Santana

Identifying Different Types of Biclustering Patterns Using a Correlation-Based Dilated Biclusters Algorithm 261
 Mahmoud Mounir, Mohamed Hamdy, and Mohamed Essam Khalifa

Reduction of Variations Using Chemometric Model Transfer: A Case Study Using FT-NIR Miniaturized Sensors 272
 Mohamed Hossam, Amr Wassal, and M. Watheq El-Kharashi

Predicting Drug Target Interaction by Integrating Drug Fingerprint and Drug Side Effect Using Machine Learning 281
 Abdelrahman Saad, Fahima A. Maghraby, and Yasser M. Omar

Statistical Insights and Association Mining for Terrorist Attacks in Egypt 291
 Nour Eldeen M. Khalifa, Mohamed Hamed N. Taha, Sarah Hamed N. Taha, and Aboul Ella Hassanien

Regression with Support Vector Machines and VGG Neural Networks 301
 Su Wu, Chang Liu, Ziheng Wang, Shaozhi Wu, and Kai Xiao

A Distributed Multi-source Feature Selection Using Spark 312
 Bochra Zaghdoudi, Waad Bouaguel, and Nadia Essoussi

The Classification of Multiple Power Quality Disturbances Based on Dynamic Event Tree and Support Vector Machine	321
Qiang Gao, Fenghou Pan, Feng Yuan, Jiayu Pan, Jiannan Zhang, and Yunhua Zhang	
Power Cable Fault Diagnosis Based on Wavelet Analysis and Neural Network	330
Minghang Jiao, Yang Gao, Xuemin Leng, Yangqun Ou, and Lin Zhang	
Predictive Control of Superheated Steam Temperature of Molten Salt Heat Storage System	339
Zhi Wang	
Control and Chaotic Systems	
Optimal Proportional Integral Derivative (PID) Controller Design for Smart Irrigation Mobile Robot with Soil Moisture Sensor	349
Ahmad Taher Azar, Hossam Hassan Ammar, Gabriel de Brito Silva, and Mohd Saiful Akmal Bin Razali	
Adaptive Higher Order Sliding Mode Control for Robotic Manipulators with Matched and Mismatched Uncertainties	360
Ahmad Taher Azar, Fernando E. Serrano, Sundarapandian Vaidyanathan, and Hani Albalawi	
Robust Path Tracking of Mobile Robot Using Fractional Order PID Controller	370
Hossam Hassan Ammar and Ahmad Taher Azar	
Synchronization between a Novel Integer-Order Hyperchaotic System and a Fractional-Order Hyperchaotic System Using Tracking Control	382
Ayub Khan, Shikha Singh, and Ahmad Taher Azar	
Design of Air-Cooled Control System for Intelligent Transformer	392
Dantian Zhong, Qiang Gao, Jiayu Pan, Zhannan Guo, and Maojun Wang	
Quoting Model Strategy of Thermal Power Plant Considering Marginal Cost	400
Anlong Su, Mingyang Zhu, Shunjiang Wang, Kai Gao, Jun Yuan, and Zhenjiang Lei	
Combination-Combination Anti-Synchronization of Four Fractional Order Identical Hyperchaotic Systems	406
Ayub Khan, Shikha Singh, and Ahmad Taher Azar	

A New Generalized Synchronization Scheme to Control Fractional Chaotic Systems with Non-identical Dimensions and Different Orders 415
 Adel Ouannas, Giuseppe Grassi, and Ahmad Taher Azar

Design of Reactive Voltage Automatic Control Device Based on Fuzzy Control 425
 Qiang Zhang, Zhengdao Zhou, Yingjun Ju, Jianhan Jianhan, and Yong Liu

Fractional-Order Control Scheme for Q-S Chaos Synchronization 434
 Adel Ouannas, Giuseppe Grassi, and Ahmad Taher Azar

Path Planning Control for 3-Omni Fighting Robot Using PID and Fuzzy Logic Controller 442
 MennaAllah Soliman, Ahmad Taher Azar, Mahmood Abdallah Saleh, and Hossam Hassan Ammar

Agricultural Service Mobile Robot Modeling and Control Using Artificial Fuzzy Logic and Machine Vision 453
 Mohamed Hesham Barakat, Ahmad Taher Azar, and Hossam Hassan Ammar

Performance Evaluation of Research Reactors Under Different Predictive Controllers 466
 Mina S. Andraws, Asmaa A. Abd El-Hamid, Ahmed H. Yousef, Imbaby I. Mahmoud, and Sherief A. Hammad

Enhanced Genetic Algorithm and Chaos Search for Bilevel Programming Problems 478
 Yousria Abo-Elnaga, S. M. Nasr, I. M. El-Desoky, Z. M. Hendawy, and A. A. Mousa

The Design of Power Quality Detecting System Based on ADSP-BF606 488
 Yunhua Zhang, Fenghou Pan, Qiang Gao, Feng Yuan, Jiayu Pan, Zailin Li, and Jicheng Dai

Role of Robotic Process Automation in Pharmaceutical Industries 497
 Nitu Bhatnagar

Text Mining, Summarization and Language Identification Using Related Text Sources to Improve Classification of Transcribed Speech Data 507
 Niraj Shrestha, Elias Moons, and Marie-Francine Moens

A Semantic Text Summarization Model for Arabic Topic-Oriented 518
 Rasha M. Badry and Ibrahim F. Moawad

A Language Identification System Based on Voxforge Speech Corpus	529
Khaled Lounnas, Mourad Abbas, Hocine Teffahi, and Mohamed Lichouri	
A Novel Automated Financial Transaction System Using Natural Language Processing	535
Sachin Agarwal, Prasenjit Mukherjee, Baisakhi Chakraborty, and Debashis Nandi	
Exploring Different Approaches for Parsing Telugu	546
B. Venkata Seshu Kumari, A. Giri Prasaad, M. Susmitha, Vikram Raju R., and Roheet Bhatnagar	
A Proposed Approach for Arabic Semantic Annotation	556
Ghada Khairy, A. A. Ewees, and Mohamed Eisa	
Automated Essay Evaluation Based on Fusion of Fuzzy Ontology and Latent Semantic Analysis	566
Saad M. Darwish and Sherine Kh. Mohamed	
Towards a Portable SLU System Applied to MSA and Low-resourced Algerian Dialects	576
Mohamed Lichouri, Rachida Djeradi, Amar Djeradi, and Mourad Abbas	
Ans2vec: A Scoring System for Short Answers	586
Wael Hassan Gomaa and Aly Aly Fahmy	
Machine Learning in Cyber Security	
Applications of Machine Learning in Cyber Security - A Review and a Conceptual Framework for a University Setup	599
Rishabh Jain and Roheet Bhatnagar	
Applying Cryptographic Techniques for Securing the Client Data Signals on the Egyptian Optical Transport Network	609
Kamel H. Rahoma and Ayman A. Elsayed	
A Blind Fragile Based Medical Image Authentication Using Schur Decomposition	623
Abdallah Soualmi, Adel Alti, Lamri Laouamer, and Morad Benyoucef	
A New Image Watermarking Technique in Spatial Domain Using DC Coefficients and Graph Representation	633
Lamri Laouamer	
Image Encryption Algorithm Methodology Based on Multi-mapping Image Pixel	645
W. M. Abd-Elhafiez, Omar Reyad, M. A. Mofaddel, and Mohamed Fathy	

City Crime Mapping Using Machine Learning Techniques 656
 Nitish Yadav, Ashish Kumar, Roheet Bhatnagar, and Vivek Kumar Verma

Fragile Watermarking Techniques for 3D Model Authentication: Review 669
 Kariman M. Mabrouk, Noura A. Semary, and Hatem Abdul-Kader

Supervised Performance Anomaly Detection in HPC Data Centers 680
 Mohamed Soliman Halawa, Rebeca P. Díaz Redondo, and Ana Fernández Vilas

Online Signature Verification Using Deep Learning and Feature Representation Using Legendre Polynomial Coefficients. 689
 Amr Hefny and Mohamed Moustafa

Machine Learning in Image and Signal Processing

Non-invasive Calibration-Free Blood Pressure Estimation Based on Artificial Neural Network 701
 Nashat Maher, G. A. Elsheikh, Wagdy R. Anis, and Tamer Emara

Data Augmentation and Feature Fusion for Melanoma Detection with Content Based Image Classification 712
 Rik Das, Sourav De, Siddhartha Bhattacharyya, Jan Platos, Vaclav Snasel, and Aboul Ella Hassanien

Dental Age Estimation: A Machine Learning Perspective 722
 Jiang Tao, Jian Wang, Andrew Wang, Zhangqian Xie, Ziheng Wang, Shaozhi Wu, Aboul Ella Hassanien, and Kai Xiao

A Survey on Human Activity Recognition Based on Temporal Signals of Portable Inertial Sensors 734
 Reda Elbasiony and Walid Gomaa

3D Geolocation Approach for Moving RF Emitting Source Using Two Moving RF Sensors 746
 Kamel H. Rahouma and Aya S. A. Mostafa

Optimized Feed Forward Neural Network for Microscopic White Blood Cell Images Classification 758
 Shahd T. Mohamed, Hala M. Ebeid, Aboul Ella Hassanien, and Mohamed F. Tolba

Renewable Energy

Applying Polynomial Learning for Soil Detection Based on Gabor Wavelet and Teager Kaiser Energy Operator 771
 Kamel H. Rahouma and Rabab Hamed M. Aly

Effect of Photo Voltaic Panel on Power Generation by Manual Adjustment with Panel Angle	784
Xingyu Liu	
The Impact of Large Scale Distributed Generation Grid-Connection on Structure of Electric Power Network	792
Aihua Wang, Deming Qi, and Hong Gang	
Wind Power Curtailment Scheme Based on Wind Tower Method	801
Aoran Xu, Yang Gao, Xuemin Leng, Weiqing Wu, and Hongyu Zhong	
Energy Consumption Regulation for Substation Operation in Practice	809
Guangming Wang, Xilan Wang, Yong Pei, Hui Jin, Hongren Yu, Ju Zhang, Hong Gao, and Yan Zhao	
Implementation of Tower Grounding Resistance Measurement Based on Decreasing Overhead Grounding Line's Current Shunt Using High-Frequency Power Supply	817
Yujie Pei, Jinglong Mu, Weijun Li, Jun Dong, Jianguo Xu, Chunmei Guan, Yi Qu, and Hongchuang Ma	
Wind Power Dispatching Method Based on High-Voltage and Large Capacity Electric Heat Storage	826
Weichun Ge, Lingwei Zhao, and Shunjiang Wang	
Calculation of Energy Saving Based on Building Engineering	837
Bin Shao and Xingyu Liu	
Heat Discharge of Molten Salt in Double Energy Storage Tank	845
Kaiyu Pang, Yonghui Chen, Min Zhang, Jianxun Dong, Xingye Zhou, Zhi Wang, and Bo Guo	
Development of Insulation Parameter Monitoring System for Transmission Line Arrester	854
Fang Han, Dantian Zhong, Qiang Gao, Feng Yuan, and Yunhua Zhang	
Complex Networks and Intelligent Systems	
Correlating Thermal Anomaly with Earthquake Occurrences Using Remote Sensing	863
Utpal Kanti Mukhopadhyay, Richa N. K. Sharma, Shamama Anwar, and Atma Deep Dutta	
IOT-Based Conceptual Framework for the Prevention of Acute Air Pollution Episodes for Reducing and Limiting Related Diseases in Egypt	876
Basmah El Haddad and Zainab Elsadi	

Smart and Incremental Model to Build Clustered Trending Topics of Web Documents 888
Mona A. Abou-Of, Hassan M. Saad, and Saad M. Darwish

Combining CMMI Specific Practices with Scrum Model to Address Shortcomings in Process Maturity 898
Sarah K. Amer, Nagwa Badr, and Ahmed Hamad

World Perception of the Latest Events in Egypt Based on Sentiment Analysis of the Guardian’s Related Articles 908
Walid Gomaa and Reda Elbasiony

Parallel Computation for Sparse Network Component Analysis 918
Dina Elsayad, Safwat Hamad, Howida A. Shedeed, and M. F. Tolba

Influence Ranking Model for Social Networks Users 928
Nouran Ayman, Tarek F. Gharib, Mohamed Hamdy, and Yasmine Afify

Turning Caregivers into Informed Agents as a Strategy to Disseminate Scientific Information About Cancer 938
Ali Ruiz Coronel and Fernando Ramirez Alatraste

Comparative Analysis of Unmixing Algorithms Using Synthetic Hyperspectral Data 945
Menna M. Elkholy, Marwa Mostafa, Hala M. Ebeid, and Mohamed F. Tolba

Author Index 957