## 2018 IEEE 17th International Conference on Cognitive Informatics & Cognitive Computing (ICCI\*CC 2018)

Berkeley, California, USA 16 – 18 July 2018



**IEEE Catalog Number: ISBN:** 

og Number: CFP18312-POD 978-1-5386-3361-8

## Copyright © 2018 by the Institute of Electrical and Electronics Engineers, Inc. All Rights Reserved

Copyright and Reprint Permissions: Abstracting is permitted with credit to the source. Libraries are permitted to photocopy beyond the limit of U.S. copyright law for private use of patrons those articles in this volume that carry a code at the bottom of the first page, provided the per-copy fee indicated in the code is paid through Copyright Clearance Center, 222 Rosewood Drive, Danvers, MA 01923.

For other copying, reprint or republication permission, write to IEEE Copyrights Manager, IEEE Service Center, 445 Hoes Lane, Piscataway, NJ 08854. All rights reserved.

\*\*\* This is a print representation of what appears in the IEEE Digital Library. Some format issues inherent in the e-media version may also appear in this print version.

 IEEE Catalog Number:
 CFP18312-POD

 ISBN (Print-On-Demand):
 978-1-5386-3361-8

 ISBN (Online):
 978-1-5386-3360-1

## **Additional Copies of This Publication Are Available From:**

Curran Associates, Inc 57 Morehouse Lane Red Hook, NY 12571 USA Phone: (845) 758-0400

Fax: (845) 758-2633

E-mail: curran@proceedings.com Web: www.proceedings.com



## Table of Contents

Preface	iii
Conference Organization	iv
Table of Contents	vi
Keynotes Is the Mind Still a Mystery? Prof. Jerome Feldman, UC Berkeley, USA	1
Nature's Learning Rule: the Hebbian-LMS Algorithm Prof. Bernard Widrow, Stanford University, USA	2
The Future of the Human Brain Prof. Newton Howard, University of Oxford, UK	3
An Integrated Decision Support System Based on the Human OODA Loop  Prof. Henry Leung, Univ. of Calgary, Canada	4
Cognitive Foundations of Knowledge Science and Deep Knowledge Learning by Cognitive Robots <i>Prof. Yingxu Wang</i> , Univ. of Calgary, Canada	5
Session A1 - Cognitive Informatics	6
A Survey and Formal Analyses on Sequence Learning Methodologies and Deep Neural Networks Yingxu Wang, Henry Leung, Marina L. Gavrilova, Omar Zatarain, Daniel Graves, Jianhua Lu, Newton Howard, Sam Kwong, Phillip Sheu, and Shushma Patel	6
Style Memory: Making a Classifier Network Generative Rey Wiyatno and Jeff Orchard	16
Multiscale Analysis of Skewness for Feature Extraction in Real-Time  Jesus D.T. Gonzalez and Witold Kinsner	22
SmartCalendar: Improving Scheduling through Overcoming Temporal Inconsistencies Jiahua Tang and Du Zhang	30
Session A2 - Cognitive Computing	38
Sentence Comprehensions and Semantic Syntheses by Cognitive Machine Learning Mehrdad Valipour and Yingxu Wang	38
Score and Rank-Level Fusion for Emotion Recognition using Genetic Algorithm Ferdous Ahmed, Brandon Sieu, and Marina L. Gavrilova	46
Cognitive Computing to Optimize IT Services  Abbas R. Ali	54
Can Computers overcome Humans? Consciousness Interaction and its implications Camilo M. Signorelli	61
Session A3 – Cognitive Machine Learning	70
Design and Implementation of a Knowledge Base for Machine Knowledge Learning  Yingxu Wang and Omar Zatarain	70
Article Citation Sentiment Analysis using Deep Learning Kumar Ravi, Vadlamani Ravi, Srirangraj Setlur, and Venu Govindaraju	78
Hierarchical Fusion Evolving Spiking Neural Network for Adaptive Learning	86

Cognitive Training Modulates Cognitive Processes of the Brain: the Response Inhibition Improved by Attention Training <i>Yang Wang, Yi Wang, and Xuebing Li</i>	92
Simulation of Student Skills: The Novel Technique Based on Quantization of Cognitive Skills Sadique Ahmad, Kan Li, Adnan Amin, and Muhammad Y. Faheem	97
Session A4 – Cognitive Robots	103
Hybrid Force-Position Robot Control: An Artificial Neural Network Backstepping Approach Sam Doctolero, Emily Veenstra, Chris Macnab, and Peter Goldsmith	103
Controlling a Robot Arm for Target Reaching without Planning using Spiking Neurons <i>J.C.V. Tieck, Lea Steffen, Jacques Kaiser, Arne Roennau, and Rudiger Dillmann</i>	111
Towards a Methodology for RTPA-MATLAB Code Generation based on Machine Learning Rules Yifan Xu and Yingxu Wang	117
A Cognitive Stochastic Machine based on Bayesian Inference: a Behavioral Analysis Raphael Frisch, Marvin Faix, Emmanuel Mazer, Laurent Fesquet, and Augustin Lux	124
Face Pattern Recognition using Convolutional Macropixel Approach Yunke Li, Hongyuan Shi, Liang Chen, and and Fan Jiang	132
Session A5 – Cognitive Neural Networks	138
Extracting Features from Both the Input and the Output of a Convolutional Neural Network to Detect Distributed Denial of Service Attacks  Maryam Ghanbari and Witold Kinsner	138
Improving the Efficacy of Artificial Neural Network Training by Optimizing Training Data for the Simulation and Prediction of Electroencephalogram Chaotic Patterns  Lei Zhang	145
Convolutional Neural Networks: Estimating Relations in the Ising Model on Overfitting Andrei Gavrilov, Alex Jordache, Maya Vasdani, and Jack Deng	154
Emergent Patterns and Spontaneous Activity in Spiking Neural Networks with Dual Complex Network Structure  Sou Nobukawa, Haruhiko Nishimura, and Teruya Yamanishi	159
Flow of Information in Feed-Forward Denoising Neural Networks  Pejman Khadivi, Ravi Tandon, and Naren Ramakrishnan	166
Session A6 – Cognitive Data Science and Big Data Mining	174
Cognitive Natural Language Search using Calibrated Quantum Mesh Rucha Kulkarni, Harshad Kulkarni, Kalpesh Balar, and Praful Krishna	174
Combining Dual Word Embeddings with Open Directory Project based Text Classification Dinara Aliyeva, Kang-Min Kim, Byung-Ju Choi, and Sangkeun Lee	179
Sentiment Classification using Paragraph Vector and Cognitive Big Data Semantics on Apache Spark Kumar Ravi, Vadlamani Ravi, and Boora Shivakrishna	187
Quantile Regression Random Forest Hybrids based Data Imputation  Manish Yadav and Vadlamani Ravi	195
Production Data Analysis and Pressure Prediction of Shale Gas Well in Fuling Jiaoshiba Area <i>Xuemei Chen, Junren Bai, Jun Yi, Jun Peng, and Zhiming Dong</i>	202
Session A7 – Brain Informatics and Consciousness	208
The Roots of Cognition	208

Artificial Neural Network based Chaotic System Design for the Simulation of EEG Time Series Lei Zhang	217
Data Encoding Visualization based Cognitive Emotion Recognition with AC-GAN Applied for Denoising <i>Jielin Qiu and Weiye Zhao</i>	222
Neurological Foundations of the Brain in the Automatic Emotion Regulation of Anger and Fear <i>Zhen-Hao Wang, Yi Wang, Bing-Qian Liu, Dong-Ni Pan, and Xuebing Li</i>	228
Visual Cognitive Attention based Bag-of-words Image Representation for Object Discovery <i>Zhong Ma and Zhuping Wang</i>	234
Session A8 – Cognitive Linguistics and Semantics	240
The Arrangement of Sentiment Lexica in the Space of Distributed Word Representations  Elena Razova and Evgeny Kotelnikov	240
Improving Open Directory Project-based Text Classification with Hierarchical Category Embedding <i>Ji-Min Lee, Kang-Min Kim, Yeachan Kim, and Sangkeun Lee</i>	246
Irony Detection using Neural Network Language Model, Psycholinguistic Features and Text Mining Kumar Ravi and Vadlamani Ravi	254
A Hybrid Approach using Topic Modeling and Class-association Rule Mining for Text Classification: The Case of Malware Detection  B. Shravankumar and Vadlamani Ravi	261
Ontology Faults Diagnosis Model for the Hazardous Chemical Storage Device Lixiao Feng, Guorong Chen, Chengyuan Chen, Liukui Chen, and Jun Peng	269
A Novel Feature Selection based Classification Algorithm for Real-time Medical Disease Prediction Satuluri Naganjaneyulu and Buraga S. Rao	275
Session A9 – Cognitive Systems (I)	283
Trust and Interaction-type Considerations in Multi-objective Team Compositions for Human-computation Mirela Riveni and Schahram Dustdar	283
Sentiment Classification of E-commerce Product Quality Reviews by FL-SVM Approaches <i>Yi Liu, Jiahuan Lu, and Sabina Shahbazzade</i>	292
An Agent-Based Cooperative Work Technology for Distributed Web Meeting Scheduling Hongbo Wang, Guangping Zeng, and Xuyan Tu	299
Session B1 – Brain-Inspired Systems	306
The Logic of Cognitive Genetic Structures  Rodolfo A. Fiorini	306
On the Nature of Natural Intelligence — A Revision of Laozi Wen-Ran Zhang	316
Study on Classification of Left-Right Hands Motor Imagery EEG Signals Based on CNN Geliang Tian and Yue Liu	324
A Unified Approach to Word Sense Representation and Disambiguation Do-Myoung Lee, Yeachan Kim, Ji-Min Lee, and Sangkeun Lee	330
Session B2 – Fuzzy Cognitive Methodologies	337
Fuzzy-Adaptive Control with Gain and Phase Margins Rachael L'Orsa and Chris Macnab	337
Some New q-Rung Orthopair Fuzzy Point-Choquet Integral Aggregation Operators and Their Application to Supplier Selection	343

Yuping Xing, Runtong Zhang, and Yanjun Sun	
Hierarchical Bidirectional Fuzzy Rule Interpolation Shangzhu Jin, Yanling Jiang, Jun Peng, and Qiang Shen	35′
Cognitive Fuzzy Rank Aggregation for Non-Transitive Rankings: An Institute Recommendation System Case Study <i>Md M. Hussain, Sheikh A. Rahman, M.M.S. Beg, and Rashid Ali</i>	358
Session B3 – Cognitive Vehicles and Self-Driving Study of Car Driver's Judgment Affordance on a Narrow Crossing Road	<b>360</b> 366

Session B3 – Cognitive Vehicles and Self-Driving	366
Study of Car Driver's Judgment Affordance on a Narrow Crossing Road Fumio Mizoguchi, Akira Yoshizawa, and Hirotoshi Iwasaki	366
Scene-based Qualitative Analysis and Modeling Tool for Situated Cognition Hironori Hiraishi	373
Estimation of Drivers' Awareness of Pedestrians  Nobubiro Mizuno, Akira Yoshizawa, Akibiro Hayashi, and Takeshi Kawashima	381

Evaluating the Influence of Ambient State of a Car on the Cognitive Distracted State of the Driver	387
Hiroaki Koma, Taku Harada, Akira Yoshizawa, and Hirotoshi Iwasakiwa	

Influence of a Driver's Mindset on Understanding Driver-Assist Systems	393
Akira Yoshizawa and Hirotoshi Iwasaki	

Session B4 – Cognitive Image Processing	401
Hyper Parameters Selection for Image Classification in Convolutional Neural Networks	401
Sajid Nazir, Shushma Patel, and Dilip Patel	

Learning Resolution-independent Image Representations	408
Jon Hammer and Michael Gashler	

A Deep Reconstruction CNN for Illumination-robust Face Image Recovery and Recognition	417
Liping Yang, Bin Yang, and Xiaohua Gu	

Multi-images Restoration Method with a Mixed-Regularization Approach for Cognitive Informatics	423
Xuanguang Ren, Han Pan, Zhongliang Jing, and Lei Gao	

Influence of Relative Power in Multi-trial Speech Imagery	431
C. Sandhya, B. Divya, A. Kavitha, and T. Christy Bobby	

Session B5 – Computational Intelligence and Applications	440
Application of Improved Intelligent PID Algorithm in High Precision Thermostatic Control in	440
Trace Water Analyzer	
Yudeng Qiao, Jun Peng, Wen Ye, Qingling Li, Yonglong Yang, Xiaoyuan Sun, and Dedong Tang	

Multi-feature-based Intrusion Detection for Optical Fiber Perimeter Security System: A Case Study	448
Xiaohua Gu, Tian Wang, Song Hou, Jun Peng, Hongjin Wang, and Oinfeng Xia	

A Generative Model based on Bootstrapping and Artificial Neural Nets for Transmission Gears Safety	454
Jie Li, Jun Peng, Guorong Chen, Qian Xiong, Jianwei Luo, and Xiaoxia Du	

Research on the Human Simulated Intelligent PID Control Method for Servo Feed Driver System	460
Dong Xie, Guorong Chen, Jie Li, Jianqu Zhu, Li Zhengzhong, and Feng Wang	

Design of Intelligent Street Lamp Control System Based on Wireless Network	465
Chenguang Wu, Yiping Deng, Leilei Yin, Bo Yang, Yi Xiang, Junjie Bai, Xiaohua Gu, Jinliang Shi, Rusen Yang,	

and Ying Wu	
Session B6 – Cognitive Systems (II)	471
Recognition of Daily Activity Patterns with Associative Memory and Recall Model	471

An Intelligent Analysis for Rural Settlement Distribution Based on Gaussian Mixture Models: a Case	478
Study of Kengzi Village	

Xi Yang, Fuan Pu, and Guiming Luo

Peter K. Mungai and Runhe Huang

Meta-modeling Process of Pedagogical Strategies in Intelligent Tutoring Systems <i>Adan Gomez and Manuel Caro</i>	485
A Method of Estimating Transmission Line Parameters Using Cloud Computing Based on Distributed Intelligence Yuefeng Sun, Zhengnan Gao, Shubo Hu, Hui Sun, Anlong Su, Shunjiang Wang, Kai Gao, and Weichun Ge	495
Support Recovery for MWC Based on Random Reduction and Null Space Jianxin Gai, Haochen Do, and Qi Liu	501
Session B7 – Computational Intelligence & Data Engineering Hybrid Air Mass Collision Based Optimization Algorithm for Data Cluster Problems Ravi K. Saidala, Nagaraju Devarakonda, and Raviteja Kamarajugadda	<b>507</b>
Natural Language Interfaces to Domain Specific Knowledge Bases: An Illustration for Querying Elements of the Periodic Table  Mukesh K. Rohil, Divyesakshi Rohil, Rohan K. Rohil, and Anurag Runthala	517
An Intelligent Real-Time Occupancy Monitoring System With Enhanced Encryption and Privacy Jawad Ahmad, Hadi Larijani, Rohinton Emmanuel, Mike Mannion, Abbas Javedand, and Ali Ahmadinia	524
Introduction to the CARINA Metacognitive Architecture  Manuel Caro, Darsana P. Josyula, Adan Gomez and Catriona M. Kennedy	530
Northern Bald Ibis Optimization Algorithm: Theory and Application Ravi K. Saidala and Nagaraju Devarakonda	541
Session B8 – Cognitive Systems (III)  Detecting and Resolving Inconsistencies in Snort  Xibin Sun, Du Zhang, Mingzhe Liu, Zhuoxin He, Haijie Li, and Jiwei Li	<b>552</b> 552
Peri-saccadic Remapping Accounts for Visual Stability Xiao Wang, Ningsha Zhang, and Si Wu	561
Cooperative Encoding Strategy for Gate Array Placement on Integrated Circuits Hongbo Wang, Qingdong Su, Guangping Zeng, and Xuyan Tu	567
Hypernym is to Hypernym as Image is to Spatial-taxon. Using Cognitive Informatics Fuzzy Constraints to Enhance Image Annotation <i>Lauren Barghout</i>	575
Cognitive Modeling Processes in Metacognitive Architecture CARINA  Adriana Olier, Adan Gomez and Manuel Caro	579
An Equipment Classification Method of Gathering and Transferring Station Based on Convolutional Neural Network  Jianwei Luo, Guorong Chen, Xiaoxia Du, Jie Li, Kai Zhuang, and Juli Deng	586
Session B9 – Cognitive Systems (IV) Long-Term Portfolio Management using Attribute Selection and Combinatorial Fusion Jason Irukulapati, D. Frank Hsu, and Christina Schweikert	<b>593</b> 593
Neighbouring Proximity – An Key Impact Factor of Deep Machine Learning Hongyuan Shi, Yunke Li, Liang Chen, and Fan Jiang	600
Significance of Bottom-up Attributes in Video Saliency Detection Without Cognitive Bias Jila Hosseinkhani and Chris Joslin	606

Additional Papers	614
Formal Specification of Cognitive Models in CARINA A. J. Jeronimo, M. F. Caro, and A. A. Gomez	614
Formal Representation of Introspective Reasoning Trace of a Cognitive Function in CARINA M. A. Florez, A. A. Gomez, M. F. Caro	620
Mono-,Multi-, and Poly-Scale Analyses and Fractional Operators for Cognitive Systems <i>W. Kinsner</i>	629
Author Index	