

# **2021 IEEE Third International Conference on Cognitive Machine Intelligence (CogMI 2021)**

**Virtual Conference  
13 – 15 December 2021**



**IEEE Catalog Number: CFP21V07-POD  
ISBN: 978-1-6654-1622-1**

**Copyright © 2021 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:    | CFP21V07-POD      |
| ISBN (Print-On-Demand): | 978-1-6654-1622-1 |
| ISBN (Online):          | 978-1-6654-1621-4 |

**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](mailto:curran@proceedings.com)  
Web: [www.proceedings.com](http://www.proceedings.com)

CURRAN ASSOCIATES INC.  
**proceedings**  
.com

# 2021 IEEE Third International Conference on Cognitive Machine Intelligence (CogMI) **CogMI 2021**

## Table of Contents

|   |      |
|---|------|
| Message from the General Chairs and PC Chairs ..... | x    |
| Organizing Committee .....                          | xii  |
| Technical Program Committee .....                   | xiii |
| Steering Committee .....                            | xiv  |
| Keynotes .....                                      | xv   |

### CogMI Research Session 1

|  |    |
|--|----|
| FireWarn: Fire Hazards Detection Using Deep Learning Models .....  | 1  |
| <i>Isaac Hogan (Queen's University, Canada), Donghao Qiao (Queen's University, Canada), Ruikang Luo (Queen's University, Canada), Mojtaba Moattari (Queen's University, Canada), Austin Carthy (Queen's University, Canada), Farhana Zulkernine (Queen's University, Canada), François Rivest (Royal Military College of Canada, Canada), and Mélanie Breton (Defence Research and Development Canada, Canada)</i> |    |
| Classification and Authentication of Mineral Water Samples using Electronic Tongue and Deep Neural Networks .....  | 11 |
| <i>Seshu Kumar Damarla (University of Alberta, Canada), Xiuli Zhu (Donghua University, China), and Madhusree Kundu (National Institute of Technology Rourkela, India)</i>  |    |
| ATARAXIS: A Deep Learning Approach for Hardwareless In-Vehicle Presence Detection .....  | 17 |
| <i>Magnus Oplenskedal (Norwegian University of Science and Technology, Norway), Amir Taherkordi (University of Oslo, Norway), and Peter Herrmann (Norwegian University of Science and Technology, Norway)</i>  |    |
| Impact Patterns of Combining Model Pruning and Continual Learning on Model Performance .....   | 27 |
| <i>Xueyang Zhang (McGill University, Canada), Hang Li (McGill University, Canada), Xi Chen (McGill University, Canada), and Xue Liu (McGill University, Canada)</i>  |    |

### CogMI Research Session 2

|  |    |
|--|----|
| FairShades: Fairness Auditing via Explainability in Abusive Language Detection Systems .....                 | 34 |
| <i>Marta Marchiori Manerba (University of Pisa, Italy) and Riccardo Guidotti (University of Pisa, Italy)</i> |    |

|  |    |
|--|----|
| TriplEx: Triple Extraction for Explanation .....   | 44 |
| <i>Mattia Setzu (University of Pisa, Italy), Anna Monreale (University of Pisa, Italy), and Pasquale Minervini (University College London, United Kingdom)</i>   |    |
| Boosting Synthetic Data Generation with Effective Nonlinear Causal Discovery .....   | 54 |
| <i>Martina Cinquini (University of Pisa, Italy), Fosca Giannotti (ISTI-CNR, Italy), and Riccardo Guidotti (University of Pisa, Italy)</i>  |    |
| Artificial Intelligence Trends and Future Scenarios: Relations Between Statistics and Opinions .....   | 64 |
| <i>Gissel Velarde (Independent)</i>  |    |
| Classification of Human Emotions using Ensemble Classifier by Analysing EEG Signals. ....  | 71 |
| <i>Lakindu Induwara Mampitiya (Sri Lanka Institute Information Technology, Sri Lanka), Rizma Nalmi (Sri Lanka Institute Information Technology, Sri Lanka), and Namal Rathnayake (Kochi University of Technology, Japan)</i> |    |

### **CogMI Research Session 3**

|   |     |
|---|-----|
| An Empathetic AI Coach for Self-Attachment Therapy .....  | 78  |
| <i>Lisa Alazraki (Imperial College London, United Kingdom), Ali Ghachem (Imperial College London, United Kingdom), Neophytos Polydorou (Imperial College London, United Kingdom), Foaad Khosmood (California Polytechnic State University, USA), and Abbas Edalat (Imperial College London, United Kingdom)</i> |     |
| Cross-Domain Sentiment Classification with Attention-Assisted GAN .....   | 88  |
| <i>Yi-fan Li (The University of Texas at Dallas), Yu Lin (The University of Texas at Dallas), Yang Gao (The University of Texas at Dallas), and Latifur Khan (The University of Texas at Dallas)</i>  |     |
| Valence/Arousal Estimation of Occluded Faces from VR Headsets .....   | 96  |
| <i>Tom Gotsman (Imperial College London, UK), Neophytos Polydorou (Imperial College London, UK), and Abbas Edalat (Imperial College London, UK)</i>   |     |
| A Modular Approach to Building Solar Energetic Particle Event Forecasting Systems .....   | 106 |
| <i>Anli Ji (Georgia State University), Akhil Arya (Georgia State University), Dustin Kempton (Georgia State University), Rafal Angryk (Georgia State University), Manolis K. Georgoulis (Georgia State University), and Berkay Aydin (Georgia State University)</i>   |     |

## CogMI Vision Session 1

|   |     |
|---|-----|
| Towards a Trustworthy, Secure and Reliable Enclave for Machine Learning in a Hospital<br>Setting: The Essen Medical Computing Platform (EMCP) .....   | 116 |
| <i>Hendrik F.R. Schmidt (University Hospital Essen, Germany), Jörg Schlötterer (University Hospital Essen, Germany; University of Duisburg-Essen, Germany; Cancer Research Center Cologne Essen, Germany), Marcel Bargull (University Hospital Essen, Germany), Enrico Nasca (University Hospital Essen, Germany; Cancer Research Center Cologne Essen, Germany), Ryan Aydelott (University Hospital Essen, Germany), Christin Seifert (University Hospital Essen, Germany; University of Duisburg-Essen, Germany; Cancer Research Center Cologne Essen, Germany), and Folker Meyer (University Hospital Essen, Germany; University of Duisburg-Essen, Germany)</i> |     |
| On the Design of Medical Data Ecosystem for Improving Healthcare Research and Commercial<br>Incentive .....   | 124 |
| <i>Zon-Yin Shae (Asia University, Taiwan) and Jeffrey J.P. Tsai (Asia University, Taiwan)</i>   |     |
| A Novel Application of a Semi-Supervised Learning Approach to Identify Choroidal Tumors in<br>Fundus Photographs .....  | 132 |
| <i>Luay Abdeljaber (University of Texas at Dallas), Latifur Khan (University of Texas at Dallas), Mahmoud Zamani (University of Texas at Dallas), Musa Abdelaziz (Retina Center of Texas), Bertil Damato (University of California at San Francisco), and Armin Afshar (University of California at San Francisco)</i>  |     |
| Pre-Training Graph Neural Network for Cross Domain Recommendation .....   | 140 |
| <i>Chen Wang (University of Illinois at Chicago, USA), Yueqing Liang (University of Sydney, AU), Zhiwei Liu (University of Illinois at Chicago, USA), Tao Zhang (University of Illinois at Chicago, USA), and Philip S. Yu (University of Illinois at Chicago, USA)</i>   |     |

## CogMI Vision Session 2

|  |     |
|--|-----|
| PerfML: Smart Management of Complex Performance Data and Analytics .....   | 146 |
| <i>Joshua Kimball (Georgia Institute of Technology, USA), Rodrigo Alves Lima (Georgia Institute of Technology, USA), Abhijit Suprem (Georgia Institute of Technology, USA), Qingyang Wang (Louisiana State University, USA), Yasuhiko Kanemasa (Fujitsu Limited, Japan), and Calton Pu (Georgia Institute of Technology, USA)</i>                  |     |
| Diagnosis, Prevention, and Cure for Misinformation .....   | 156 |
| <i>Ritwik Banerjee (Stony Brook University, USA) and Indrakshi Ray (Colorado State University)</i>   |     |
| Research Challenges for Combined Autonomy, AI, and Real-Time Assurance .....   | 163 |
| <i>Tarek Abdelzaher (University of Illinois, USA), Sanjoy Baruah (Washington University in St. Louis, USA), Chris Gill (Washington University in St. Louis, USA), Eugene Vorobeychik (Washington University in St. Louis, USA), Ning Zhang (Washington University in St. Louis, USA), and Xuan Zhang (Washington University in St. Louis, USA)</i> |     |
| Modeling Misinformation Diffusion in Social Media: Beyond Network Properties .....   | 168 |
| <i>Francesca Spezzano (Boise State University, USA)</i>  |     |

|   |     |
|---|-----|
| An Easy-to-Classify Approach for the Bot-IoT Dataset .....  | 172 |
| <i>Joffrey L. Leevy (Florida Atlantic University), John Hancock (Florida Atlantic University), Taghi M. Khoshgoftaar (Florida Atlantic University), and Jared M. Peterson (Florida Atlantic University)</i> |     |

### **CogMI Vision Session 3**

|  |     |
|--|-----|
| Towards a New Paradigm for Managing Computing Continuum Applications .....   | 180 |
| <i>Victor Casamayor Pujol (TU Wien, Austria), Philipp Raith (TU Wien, Austria), and Schahram Dustdar (TU Wien, Austria)</i>  |     |
| Addressing the Limitations of AI/ML in Creating Cognitive Solutions .....  | 189 |
| <i>Dinesh C Verma (IBM T.J. Watson Research Center, USA), Archit Verma (IBM Consulting, USA), and Utpal Mangla (IBM Consulting, Canada)</i>  |     |
| Artificial Reasoning Toward Goal- Oriented Adaptive Arrays of Sensors .....  | 197 |
| <i>Adrienne Raglin (Army Research Laboratory), Henry Hoffman (University of Chicago), Mark Mittrick (US DEVCOM ARL), Heather Zheng (University of Chicago), and Justine Caylor (US DEVCOM ARL)</i> |     |
| Parallel Detection for Efficient Video Analytics at the Edge .....   | 204 |
| <i>Yanzhao Wu (Georgia Institute of Technology), Ling Liu (Georgia Institute of Technology), and Ramana Kompella (Cisco Systems, Inc.)</i>   |     |

### **CogMI Special Session - Intelligent Cyber-Physical Systems**

|  |     |
|--|-----|
| Boosting Sparse Point Cloud Object Detection via Image Fusion .....  | 214 |
| <i>Weijing Shi (Carnegie Mellon University) and Ragunathan Raj Rajkumar (Carnegie Mellon University)</i>   |     |
| A Hybrid Deep Learning Model for UAVs Detection in Day and Night Dual Visions .....  | 221 |
| <i>Alam Noor (CISTER Research Centre, Portugal), Kai Li (CISTER Research Centre, Portugal), Adel Ammar (Prince Sultan University, Saudi Arabia), Anis Koubaa (Prince Sultan University, Saudi Arabia; CISTER Research Center, Portugal), Bilel Benjdira (Prince Sultan University, Saudi Arabia), and Eduardo Tovar (CISTER Research Centre, Portugal)</i> |     |
| Challenges and Directions for Ambient Intelligence: A Cyber Physical Systems Perspective .....   | 232 |
| <i>John A. Stankovic (University of Virginia, USA), Meiyi Ma (Vanderbilt University, USA), Sarah Masud Preum (Dartmouth College, USA), and Homa Alemzadeh (University of Virginia, USA)</i>  |     |
| AI-Powered IoT System at the Edge .....  | 242 |
| <i>Yiran Chen (Duke University), Ang Li (Duke University), Huanrui Yang (Duke University), Tunhou Zhang (Duke University), Yuewei Yang (Duke University), Hai Li (Duke University), Suman Banerjee (University of Wisconsin-Madison), and Miroslav Pajic (Duke University)</i>   |     |
| Challenges and Opportunities in Approximate Bayesian Deep Learning for Intelligent IoT Systems .....   | 252 |
| <i>Meet P. Vadera (University of Massachusetts Amherst, USA) and Benjamin M. Marlin (University of Massachusetts Amherst, USA)</i>   |     |

|  |            |
|--|------------|
| Enabling Hyperparameter Tuning of Machine Learning Classifiers in Production .....   | 262        |
| <i>Sandeep Singh Sandha (University of California), Mohit Aggarwal (Arm Research, Austin), Swapnil Sayan Saha (University of California), and Mani Srivastava (University of California)</i>   |            |
| Hierarchical Deep Reinforcement Learning for Multi-Robot Cooperation in Partially Observable Environment .....   | 272        |
| <i>Zhixuan Liang (The Hong Kong Polytechnic University, China), Jiannong Cao (The Hong Kong Polytechnic University, China), Wanyu Lin (The Hong Kong Polytechnic University, China), Jinlin Chen (The Hong Kong Polytechnic University, China), and Huafeng Xu (The Hong Kong Polytechnic University, China)</i> |            |
| On Detection of Out of Distribution Inputs in Deep Neural Networks .....   | 282        |
| <i>Susmit Jha (SRI International, USA) and Anirban Roy (SRI International, USA)</i>  |            |
| <b>Author Index .....</b>  | <b>289</b> |