

# **2021 IEEE High Performance Extreme Computing Conference (HPEC 2021)**

**Virtual Conference  
20 – 24 September 2021**



**IEEE Catalog Number: CFP21HPE-POD  
ISBN: 978-1-6654-2370-0**

**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:	CFP21HPE-POD
ISBN (Print-On-Demand):	978-1-6654-2370-0
ISBN (Online):	978-1-6654-2369-4
ISSN:	2377-6943

**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

# TABLE OF CONTENTS

<b>EXPLORING THE TRADEOFF BETWEEN RELIABILITY AND PERFORMANCE IN HPC SYSTEMS.....</b>	<b>1</b>
<i>Craig Walker; Braeden Slade; Gavin Bailey; Nicklaus Przybylski; Nathan Debardeleben; William M. Jones</i>	
<b>STREAMING DETECTION AND CLASSIFICATION PERFORMANCE OF A POWER9 EDGE SUPERCOMPUTER.....</b>	<b>8</b>
<i>Wesley Brewer; Chris Geyer; Dardo Kleiner; Connor Horne</i>	
<b>BENCHMARKING THE PROCESSING OF AIRCRAFT TRACKS WITH TRIPLES MODE AND SELF-SCHEDULING.....</b>	<b>15</b>
<i>Andrew Weinert; Marc Brittain; Ngairé Underhill; Christine Serres</i>	
<b>INTERROGATING THE PERFORMANCE OF QUANTUM ANNEALING FOR THE SOLUTION OF STEADY-STATE SUBSURFACE FLOW.....</b>	<b>23</b>
<i>Jessie M. Henderson; Daniel O'Malley; Hari S. Viswanathan</i>	
<b>EMBEDDED COMPUTE MATRIX PROCESSING AND FFTS USING FLOATING POINT FPGAS.....</b>	<b>29</b>
<i>Michael Parker</i>	
<b>A NOVEL APPROACH TO CYBER SITUATIONAL AWARENESS IN EMBEDDED SYSTEMS.....</b>	<b>34</b>
<i>Kyle Denney; Robert Lychev; Donato Kava; Alice Lee; Michael Vai; Nick Evancich; Richard Clark; David Lide; K. Kwak; Jason Li; Michael Lynch; Kyle Tillotson; Walt Tirenin; Doug Schafer</i>	
<b>SERVING MACHINE LEARNING INFERENCE USING HETEROGENEOUS HARDWARE.....</b>	<b>39</b>
<i>Baolin Li; Vijay Gadepally; Siddharth Samsi; Mark Veillette; Devesh Tiwari</i>	
<b>DISTRIBUTED AND HETEROGENEOUS SAR BACKPROJECTION WITH HALIDE.....</b>	<b>47</b>
<i>Connor Imes; Tzu-Mao Li; Mark Glines; Rishi Khan; John Paul Walters</i>	
<b>A SURVEY AND TAXONOMY OF BLOCKCHAIN-BASED PAYMENT CHANNEL NETWORKS.....</b>	<b>56</b>
<i>Haleh Khojasteh; Hiran Tabatabaei</i>	
<b>HLS PORTABILITY FROM INTEL TO XILINX: A CASE STUDY.....</b>	<b>64</b>
<i>Zhili Xiao; Roger D. Chamberlain; Anthony M. Cabrera</i>	
<b>PERFORMANCE EVALUATION OF MIXED-PRECISION RUNGE-KUTTA METHODS.....</b>	<b>72</b>
<i>Ben Burnett; Sigal Gottlieb; Zachary J. Grant; Alfa Heryudono</i>	
<b>PERFORMANCE PORTABILITY OF AN SPMV KERNEL ACROSS SCIENTIFIC COMPUTING AND DATA SCIENCE APPLICATIONS.....</b>	<b>78</b>
<i>Stephen L. Olivier; Nathan D. Ellingwood; Jonathan Berry; Daniel M. Dunlavy</i>	
<b>INVERSE-DELETION BFS - REVISITING STATIC GRAPH BFS TRAVERSALS WITH DYNAMIC GRAPH OPERATIONS.....</b>	<b>86</b>
<i>Oded Green</i>	
<b>THE K-CORE DECOMPOSITION ALGORITHM UNDER THE FRAMEWORK OF GRAPHBLAS.....</b>	<b>93</b>
<i>Longlong Li; Hu Chen; Ping Li; Jie Han; Guanghui Wang; Gong Zhang</i>	
<b>ENABLING EXPLORATORY LARGE SCALE GRAPH ANALYTICS THROUGH ARKOUDA.....</b>	<b>100</b>
<i>Zhihui Du; Oliver Alvarado Rodriguez; David A. Bader</i>	
<b>A GRAPHBLAS IMPLEMENTATION OF TRIANGLE CENTRALITY.....</b>	<b>107</b>
<i>Fuhuan Li; David A. Bader</i>	
<b>A SURVEY: HANDLING IRREGULARITIES IN NEURAL NETWORK ACCELERATION WITH FPGAS.....</b>	<b>109</b>
<i>Tong Geng; Chunshu Wu; Cheng Tan; Chenhao Xie; Anqi Guo; Pouya Haghi; Sarah Yuan He; Jiajia Li; Martin Herbordt; Ang Li</i>	
<b>EVEN FASTER SNN SIMULATION WITH LAZY+EVENT-DRIVEN PLASTICITY AND SHARED ATOMICS.....</b>	<b>117</b>
<i>Dennis Bautembach; Iason Oikonomidis; Antonis Argyros</i>	
<b>USING COMPUTATION EFFECTIVELY FOR SCALABLE POISSON TENSOR FACTORIZATION: COMPARING METHODS BEYOND COMPUTATIONAL EFFICIENCY.....</b>	<b>125</b>
<i>Jeremy M. Myers; Daniel M. Dunlavy</i>	
<b>FAST SPARSE DEEP NEURAL NETWORK INFERENCE WITH FLEXIBLE SPMM OPTIMIZATION SPACE EXPLORATION.....</b>	<b>132</b>
<i>Jie Xin; Xianqi Ye; Long Zheng; Qinggang Wang; Yu Huang; Pengcheng Yao; Linchen Yu; Xiaofei Liao; Hai Jin</i>	
<b>EFFICIENT NEIGHBOR-SAMPLING-BASED GNN TRAINING ON CPU-FPGA HETEROGENEOUS PLATFORM.....</b>	<b>139</b>
<i>Bingyi Zhang; Sanmukh R. Kuppamagari; Rajgopal Kannan; Viktor Prasanna</i>	

<b>TOWARDS COMBINING ERROR-BOUNDED LOSSY COMPRESSION AND CRYPTOGRAPHY FOR SCIENTIFIC DATA .....</b>	<b>146</b>
<i>Ruiwen Shan; Sheng Di; Jon C. Calhoun; Franck Cappello</i>	
<b>SURVEY AND FUTURE TRENDS FOR FPGA CLOUD ARCHITECTURES .....</b>	<b>153</b>
<i>Hafsah Shahzad; Ahmed Sanaullah; Martin Herbordt</i>	
<b>MANEUVER IDENTIFICATION CHALLENGE.....</b>	<b>163</b>
<i>Kaira Samuel; Vijay Gadepally; David Jacobs; Michael Jones; Kyle McAlpin; Kyle Palko; Ben Paulk; Sid Samsi; Ho Chit Siu; Charles Yee; Jeremy Kepner</i>	
<b>THE MIT SUPERCLOUD DATASET .....</b>	<b>170</b>
<i>Siddharth Samsi; Matthew L. Weiss; David Bestor; Baolin Li; Michael Jones; Albert Reuther; Daniel Edelman; William Arcand; Chansup Byun; John Holodnack; Matthew Hubbell; Jeremy Kepner; Anna Klein; Joseph McDonald; Adam Michaleas; Peter Michaleas; Lauren Milechin; Julia Mullen; Charles Yee; Benjamin Price; Andrew Prout; Antonio Rosa; Allan Vanterpool; Lindsey McEvoy; Anson Chengy; Devesh Tiwariz; Vijay Gadepally</i>	
<b>IRIS: A PORTABLE RUNTIME SYSTEM EXPLOITING MULTIPLE HETEROGENEOUS PROGRAMMING SYSTEMS.....</b>	<b>178</b>
<i>Jungwon Kim; Seyong Lee; Beau Johnston; Jeffrey S. Vetter</i>	
<b>RECONFIGURABLE LOW-LATENCY MEMORY SYSTEM FOR SPARSE MATRICIZED TENSOR TIMES KHATRI-RAO PRODUCT ON FPGA.....</b>	<b>186</b>
<i>Sasindu Wijeratne; Rajgopal Kannan; Viktor Prasanna</i>	
<b>SOLVING SPARSE LINEAR SYSTEMS WITH APPROXIMATE INVERSE PRECONDITIONERS ON ANALOG DEVICES .....</b>	<b>193</b>
<i>Vasileios Kalantzis; Anshul Gupta; Lior Horesh; Tomasz Nowicki; Mark S. Squillante; Chai Wah Wu; Tayfun Gokmen; Haim Avron</i>	
<b>GRAPH EMBEDDING AND FIELD BASED DETECTION OF NON-LOCAL WEBS IN LARGE SCALE FREE NETWORKS .....</b>	<b>200</b>
<i>Michael E. Franusich; Franz Franchetti</i>	
<b>OPTIMIZED QUANTUM CIRCUIT GENERATION WITH SPIRAL .....</b>	<b>207</b>
<i>Scott Mionis; Franz Franchetti; Jason Larkin</i>	
<b>THE GRAPHBLAS IN JULIA AND PYTHON: THE PAGERANK AND TRIANGLE CENTRALITIES .....</b>	<b>214</b>
<i>Michel Pelletier; Will Kimmerer; Timothy A. Davis; Timothy G. Mattson</i>	
<b>PERFORMANCE OF A GPU-BASED RADAR PROCESSOR .....</b>	<b>221</b>
<i>Mark Bolding; Saul Crumpton; David Ediger; George Samo</i>	
<b>MACHINE LEARNING FAIRNESS IS COMPUTATIONALLY DIFFICULT AND ALGORITHMICALLY UNSATISFACTORILY SOLVED .....</b>	<b>226</b>
<i>Mike H. M. Teodorescu; Xinyu Yao</i>	
<b>INSTANCE SEGMENTATION OF NEURONAL NUCLEI LEVERAGING DOMAIN ADAPTATION .....</b>	<b>234</b>
<i>Kevin Brady; Pooya Khorrami; Lars Gjestebj; Laura Brattain</i>	
<b>TIMING-BASED SIDE-CHANNEL ATTACK AND MITIGATION ON PCIE CONNECTED DISTRIBUTED EMBEDDED SYSTEMS.....</b>	<b>239</b>
<i>Salman Abdul Khaliq; Usman Ali; Omer Khan</i>	
<b>3D REAL-TIME SUPERCOMPUTER MONITORING .....</b>	<b>246</b>
<i>Bill Bergeron; Matthew Hubbell; Dylan Sequeira; Winter Williams; William Arcand; David Bestor; Chansup Byun; Vijay Gadepally; Michael Houle; Michael Jones; Anna Klien; Peter Michaleas; Lauren Milechin; Julie Mullen; Andrew Prout; Albert Reuther; Antonio Rosa; Siddharth Samsi; Charles Yee; Jeremy Kepner</i>	
<b>CLASSIFICATION FRAMEWORKS COMPARISON ON 3D POINT CLOUDS .....</b>	<b>253</b>
<i>F. Patricia Medina; Randy Paffenroth</i>	
<b>PRAGMATIC BENCHMARKING FOR RESEARCH COMPUTING .....</b>	<b>259</b>
<i>Dennis Milechin; Ahmed Aly; Josh Bevan; Charlie Jahnke; Yun Shen; Brian Gregor</i>	
<b>IMPROVED COMPRESSION FOR WORD EMBEDDINGS BY SCALING PRINCIPAL COMPONENTS.....</b>	<b>265</b>
<i>Joseph McDonald; Siddharth Samsi; Daniel Edelman; Chansup Byun; Jeremy Kepner; Vijay Gadepally</i>	
<b>MODELING DATA MOVEMENT PERFORMANCE ON HETEROGENEOUS ARCHITECTURES.....</b>	<b>272</b>
<i>Amanda Bienz; Luke N. Olson; William D. Gropp; Shelby Lockhart</i>	
<b>DMM-GAPBS: ADAPTING THE GAP BENCHMARK SUITE TO A DISTRIBUTED MEMORY MODEL .....</b>	<b>279</b>
<i>Zach Hansen; Brody Williams; John D. Leidel; Xi Wang; Yong Chen</i>	
<b>NODE-BASED JOB SCHEDULING FOR LARGE SCALE SIMULATIONS OF SHORT RUNNING JOBS .....</b>	<b>287</b>
<i>Chansup Byun; William Arcand; David Bestor; Bill Bergeron; Vijay Gadepally; Michael Houle; Matthew Hubbell; Michael Jones; Anna Klein; Peter Michaleas; Lauren Milechin; Julie Mullen; Andrew Prout; Albert Reuther; Antonio Rosa; Siddharth Samsi; Charles Yee; Jeremy Kepner</i>	

<b>NON-VOLATILE MEMORY ACCELERATED GEOMETRIC MULTI-SCALE RESOLUTION ANALYSIS</b> .....	294
<i>Andrew Wood; Moshik Hershcovitch; Daniel Waddington; Sarel Cohen; Meredith Wolf; Hongjun Suh; Weiyu Zong; Peter Chin</i>	
<b>AN EFFICIENT ALGORITHM FOR THE CONSTRUCTION OF DYNAMICALLY UPDATING TRAJECTORY NETWORKS</b> .....	301
<i>Deniz Gurevin; Chris J. Michael; Omer Khan</i>	
<b>TOWARDS DISTRIBUTED SQUARE COUNTING IN LARGE GRAPHS</b> .....	308
<i>Trevor Steil; Geoffrey Sanders; Roger Pearce</i>	
<b>SUPERCOMPUTING ENABLED DEPLOYABLE ANALYTICS FOR DISASTER RESPONSE</b> .....	315
<i>Kaira Samuel; Jeremy Kepner; Michael Jones; Lauren Milechin; Vijay Gadepally; William Arcand; David Bestor; William Bergeron; Chansup Byun; Matthew Hubbell; Michael Houle; Anna Klein; Victor Lopez; Julie Mullen; Andrew Prout; Albert Reuther; Antonio Rosa; Sid Samsi; Charles Yee; Peter Michaleas</i>	
<b>VERTICAL, TEMPORAL, AND HORIZONTAL SCALING OF HIERARCHICAL HYPERSPARSE GRAPHBLAS MATRICES</b> .....	320
<i>Jeremy Kepner; Tim Davis; Chansup Byun; William Arcand; David Bestor; William Bergeron; Vijay Gadepally; Michael Houle; Matthew Hubbell; Michael Jones; Anna Klein; Lauren Milechin; Julie Mullen; Andrew Prout; Albert Reuther; Antonio Rosa; Siddharth Samsi; Charles Yee; Peter Michaleas</i>	
<b>SPATIAL TEMPORAL ANALYSIS OF 40,000,000,000 INTERNET DARKSPACE PACKETS</b> .....	326
<i>Jeremy Kepner; Michael Jones; Daniel Andersen; Aydin Bluç; Chansup Byun; K. Claffy; Timothy Davis; William Arcand; Jonathan Bernays; David Bestor; William Bergeron; Vijay Gadepally; Micheal Houle; Matthew Hubbell; Anna Klein; Chad Meiners; Lauren Milechin; Julie Mullen; Sandeep Pisharody; Andrew Prout; Albert Reuther; Antonio Rosa; Siddharth Samsi; Doug Stetson; Adam Tse; Charles Yee; Peter Michaleas</i>	
<b>A MORE PORTABLE HEFFTE: IMPLEMENTING A FALLBACK ALGORITHM FOR SCALABLE FOURIER TRANSFORMS</b> .....	334
<i>Daniel Sharp; Miroslav Stoyanov; Stanimire Tomov; Jack Dongarra</i>	
<b>DELAYED ASYNCHRONOUS ITERATIVE GRAPH ALGORITHMS</b> .....	339
<i>Mark P. Blanco; Scott McMillan; Tze Meng Low</i>	
<b>SPARSE DEEP NEURAL NETWORK ACCELERATION ON HBM-ENABLED FPGA PLATFORM</b> .....	346
<i>Abhishek Kumar Jain; Sharan Kumar; Aashish Tripathi; Dinesh Gaitonde</i>	
<b>TOWARD HDL EXTENSIONS FOR RAPID AI/ML ACCELERATOR GENERATION</b> .....	353
<i>Ryan Kabrick; John Leidel; David Donofrio</i>	
<b>WORKLOAD IMBALANCE IN HPC APPLICATIONS: EFFECT ON PERFORMANCE OF IN-NETWORK PROCESSING</b> .....	359
<i>Pouya Haghi; Anqi Guo; Tong Geng; Anthony Skjellum; Martin C. Herbordt</i>	
<b>HYKERNEL: A HYBRID SELECTION OF ONE/TWO-PHASE KERNELS FOR TRIANGLE COUNTING ON GPUS</b> .....	367
<i>Mohammad Almasri; Neo Vasudeva; Rakesh Nagi; Jinjun Xiong; Wen-Mei Hwu</i>	
<b>AI ACCELERATOR SURVEY AND TRENDS</b> .....	374
<i>Albert Reuther; Peter Michaleas; Michael Jones; Vijay Gadepally; Siddharth Samsi; Jeremy Kepner</i>	
<b>AN INTERFACE FOR MULTIDIMENSIONAL ARRAYS IN ARKOUDA</b> .....	383
<i>Mitesh Kothari; Richard W. Vuduc</i>	
<b>LARGE SCALE STRING ANALYTICS IN ARKOUDA</b> .....	385
<i>Zhihui Du; Oliver Alvarado Rodriguez; David A. Bader</i>	
<b>PRODUCTIVE HIGH-PERFORMANCE K-TRUSS DECOMPOSITION ON GPU USING LINEAR ALGEBRA</b> .....	392
<i>Runze Wang; Linchen Yu; Qinggang Wang; Jie Xin; Long Zheng</i>	
<b>FUSING NON ELEMENT-WISE LAYERS IN DNNs</b> .....	399
<i>Upasana Sridhar; Tze Meng Low; Martin D. Schatz</i>	
<b>EFFICIENTLY BUILDING A LARGE SCALE DATASET FOR PROGRAM INDUCTION</b> .....	401
<i>Lauren Milechin; Javier Lopez-Contreras; Ferran Alet</i>	
<b>DELUGE: ACHIEVING SUPERIOR EFFICIENCY, THROUGHPUT, AND SCALABILITY WITH ACTOR BASED STREAMING ON MIGRATING THREADS</b> .....	408
<i>Brian A. Page; Peter M. Kogge</i>	
<b>RECONFIGURABLE HARDWARE ROOT-OF-TRUST FOR SECURE EDGE PROCESSING</b> .....	414
<i>Alan Ehret; Eliakin Del Rosario; Carsten Schwicking; Karen Gettings; Michel A. Kinsy</i>	
<b>PERFORMANCE STUDY OF GPU APPLICATIONS USING SYCL AND CUDA ON TESLA V100 GPU</b> .....	421
<i>Goutham Kalikrishna Reddy Kuncham; Rahul Vaidya; Mahesh Barve</i>	
<b>SYSTEM-LEVEL MODELING OF GPU/FPGA CLUSTERS FOR MOLECULAR DYNAMICS SIMULATIONS</b> .....	428
<i>Chunshu Wu; Sahan Bandara; Tong Geng; Vipin Sachdeva; Woody Sherman; Martin Herbordt</i>	

<b>GCN INFERENCE ACCELERATION USING HIGH-LEVEL SYNTHESIS</b> .....	436
<i>Yi Chien Lin; Bingyi Zhang; Viktor Prasanna</i>	
<b>FASTER STOCHASTIC BLOCK PARTITION USING AGGRESSIVE INITIAL MERGING, COMPRESSED REPRESENTATION, AND PARALLELISM CONTROL</b> .....	442
<i>Ahsen J. Uppal; Jaeseok Choi; Thomas B. Rolinger; H. Howie Huang</i>	
<b>HYPC-MAP: A HYBRID PARALLEL COMMUNITY DETECTION ALGORITHM USING INFORMATION-THEORETIC APPROACH</b> .....	449
<i>M. Abdul M. Faysal; Shaikh Arifuzzaman; Cy Chan; Maximilian Bremer; Doru Popovici; John Shalf</i>	
<b>PRIVATEER: MULTI-VERSIONED MEMORY-MAPPED DATA STORES FOR HIGH-PERFORMANCE DATA SCIENCE</b> .....	457
<i>Karim Youssef; Keita Iwabuchi; Wu-Chun Feng; Roger Pearce</i>	
<b>AN ALL-AT-ONCE CP DECOMPOSITION METHOD FOR COUNT TENSORS</b> .....	464
<i>Teresa M. Ranadive; Muthu M. Baskaran</i>	
<b>MODEL QUANTIZATION AND SYNTHETIC APERTURE DATA ANALYSES INCREASING THROUGHPUT AND ENERGY EFFICIENCY</b> .....	472
<i>Mark Barnell; Courtney Raymond; Anthony Salmin; Dan Brown; Darrek Isereau</i>	
<b>IMPLICATIONS OF REDUCED COMMUNICATION PRECISION IN A COLLOCATED DISCONTINUOUS GALERKIN FINITE ELEMENT FRAMEWORK</b> .....	477
<i>Marcin Rogowski; Lisandro Dalcin; Matteo Parsani; David E. Keyes</i>	
<b>DPGS GRAPH SUMMARIZATION PRESERVES COMMUNITY STRUCTURE</b> .....	484
<i>L. Durbeck; Peter Athanas</i>	
<b>SCALING OF EVOLUTIONARY SEARCH OF ALGORITHM SPACE TO SPEED-UP SCIENTIFIC IMAGE UNDERSTANDING WORKFLOWS</b> .....	493
<i>Nicholas Grabill; Kai Pinckard; Dirk Colbry</i>	
<b>DIGRAPH CLUSTERING BY THE BLUERED METHOD</b> .....	499
<i>Tiancheng Liu; Dimitris Floros; Nikos Pitsianis; Xiaobai Sun</i>	
<b>BOUNDARY INTEGRAL SOLVER APPROACHES FOR PARTICLE ACCELERATOR SIMULATION PROBLEMS AND DEPLOYMENT ON NERSC HARDWARE</b> .....	506
<i>Julia Wei; M. Harper Langston; Pierre-David Letourneau; Matthew J. Morse; Larry Weintraub; Aimee Nogoy; Noah Amsel; Richard Lethin</i>	
<b>A HIGH-PERFORMANCE HETEROGENEOUS CRITICAL PATH ANALYSIS FRAMEWORK</b> .....	512
<i>Yasin Zamani; Tsung-Wei Huang</i>	
<b>USING MONITORING DATA TO IMPROVE HPC PERFORMANCE VIA NETWORK-DATA-DRIVEN ALLOCATION</b> .....	519
<i>Yijia Zhang; Burak Aksar; Omar Aaziz; Benjamin Schwaller; Jim Brandt; Vitus Leung; Manuel Egele; Ayse K. Coskun</i>	
<b>RAPID CONFIGURATION OF ASYNCHRONOUS RECURRENT NEURAL NETWORKS FOR ASIC IMPLEMENTATIONS</b> .....	526
<i>Spencer Nelson; Wassim Khalil; Sangyun Kim; Jia Di; Zhe Zhou; Zhihang Yuan; Guangyu Sun</i>	
<b>DESIGN OF ASYNCHRONOUS POLYMORPHIC LOGIC GATES FOR HARDWARE SECURITY</b> .....	532
<i>Chandler Bernard; William Bryant; Richard Becker; Jia Di</i>	
<b>EFFICIENT SCHEDULING OF DEPENDENT TASKS IN MANY-CORE REAL-TIME SYSTEM USING A HARDWARE SCHEDULER</b> .....	537
<i>Amin Norollah; Zahra Kazemi; Niloufar Sayadi; Hakem Beitollahi; Mahdi Fazeli; David Hely</i>	
<b>HARDROID: TRANSPARENT INTEGRATION OF CRYPTO ACCELERATORS IN ANDROID</b> .....	544
<i>Luca Piccolboni; Giuseppe Di Guglielmo; Simha Sethumadhavan; Luca P. Carloni</i>	
<b>WASP: A WEARABLE SUPER-COMPUTING PLATFORM FOR DISTRIBUTED INTELLIGENCE IN MULTI-AGENT SYSTEMS</b> .....	552
<i>Chinmaya Patnayak; James E. McClure; Ryan K. Williams</i>	
<b>SPECTRAL GRAPH PARTITIONING USING GEODESIC DISTANCE-BASED PROJECTION</b> .....	559
<i>Yasunori Futamura; Ryota Wakaki; Tetsuya Sakurai</i>	
<b>DETECTION OF MULTIPLE CROP DISEASES USING IMAGE PROCESSING TECHNIQUES</b> .....	566
<i>Akanksha Soni; Jeetendra Kumar Soni; Surabhi Hota</i>	
<b>LOW-COMMUNICATION ASYNCHRONOUS DISTRIBUTED GENERALIZED CANONICAL POLYADIC TENSOR DECOMPOSITION</b> .....	572
<i>Cannada Lewis; Eric Phipps</i>	
<b>ARE VAN EMDE BOAS TREES VIABLE ON THE GPU?</b> .....	577
<i>Benedikt Mayr; Alexander Weinrauch; Mathias Parger; Markus Steinberger</i>	
<b>FILTERED TENSOR CONSTRUCTION AND DECOMPOSITION FOR DRUG REPOSITIONING</b> .....	584
<i>Dimitri Leggas; Muthu Baskaran; James Ezick; Brendan Von Hofe</i>	

<b>SOFTWARE-HARDWARE CO-OPTIMIZATION ON PARTIAL-SUM PROBLEM FOR PIM-BASED NEURAL NETWORK ACCELERATOR .....</b>	<b>591</b>
<i>Qizhe Wu; Linfeng Tao; Huawei Liang; Wei Yuan; Teng Tian; Shuang Xue; Xi Jin</i>	
<b>KNOWLEDGE-GUIDED TENSOR DECOMPOSITION FOR BASELINING AND ANOMALY DETECTION .....</b>	<b>598</b>
<i>Dimitri Leggas; Christopher Coley; Teresa Ranadive</i>	
<b>A COMPARISON OF AUTOMATIC DIFFERENTIATION AND CONTINUOUS SENSITIVITY ANALYSIS FOR DERIVATIVES OF DIFFERENTIAL EQUATION SOLUTIONS.....</b>	<b>605</b>
<i>Yingbo Ma; Vaibhav Dixit; Michael J. Innes; Xingjian Guo; Chris Rackauckas</i>	
<b>TOWARD PERFORMANCE PORTABLE PROGRAMMING FOR HETEROGENEOUS SYSTEMS ON A CHIP: A CASE STUDY WITH QUALCOMM SNAPDRAGON SOC .....</b>	<b>614</b>
<i>Anthony Cabrera; Seth Hitefield; Jungwon Kim; Seyong Lee; Narasinga Rao Miniskar; Jeffrey S. Vetter</i>	
<b>REALIZING FORWARD DEFENSE IN THE CYBER DOMAIN .....</b>	<b>621</b>
<i>Sandeep Pisharody; Jonathan Bernays; Vijay Gadepally; Michael Jones; Jeremy Kepner; Chad Meiners; Peter Michaleas; Adam Tse; Doug Stetson</i>	
<b>LESSONS FROM NATURE FOR COMPUTING: LOOKING BEYOND MOORE’S LAW WITH SPECIAL PURPOSE COMPUTING AND CO-DESIGN.....</b>	<b>628</b>
<i>Sadasivan Sadas Shankar</i>	
<b>Author Index</b>	