

2021 IEEE/ACM International Symposium on Nanoscale Architectures (NANOARCH 2021)

**Alberta, Canada
8 – 10 November 2021**



**IEEE Catalog Number: CFP21DTD-POD
ISBN: 978-1-6654-0960-5**

**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:	CFP21DTD-POD
ISBN (Print-On-Demand):	978-1-6654-0960-5
ISBN (Online):	978-1-6654-0959-9
ISSN:	2327-8218

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

CURRAN ASSOCIATES INC.
proceedings
.com

TABLE OF CONTENTS

COMMUTATIVE APPROXIMATE ADDERS: ANALYSIS AND EVALUATION	1
<i>Junqi Huang; T. Nandha Kumar; Haider A. F. Almurib; Fabrizio Lombardi</i>	
OPTIMIZING ADIABATIC QUANTUM-FLUX-PARAMETRON (AQFP) CIRCUITS USING AN EXACT DATABASE	7
<i>Dewmini Sudara Marakkalage; Heinz Riemer; Giovanni De Micheli</i>	
HDCOG: A LIGHTWEIGHT HYPERDIMENSIONAL COMPUTING FRAMEWORK WITH FEATURE EXTRACTION	13
<i>Shijin Duan; Xiaolin Xu</i>	
ERROR RESILIENCE AND RECOVERY OF PROCESS INDUCED STUCK-AT FAULTS IN MLP NEURAL NETWORKS USING EMERGING TECHNOLOGY	19
<i>An Qi Zhang; Amr M. S. Tosson; Lan Wei</i>	
CRYOGENIC IN-MRAM COMPUTING	25
<i>Yaoru Hou; We Ge; Yanan Guo; Lirida Naviner; You Wang; Bo Liu; Jun Yang; Hao Cai</i>	
RRAM-BASED ANALOG IN-MEMORY COMPUTING (INVITED PAPER)	31
<i>Xiaoming Chen; Tao Song; Yinhe Han</i>	
ROBUST IN-MEMORY COMPUTING WITH HYPERDIMENSIONAL STOCHASTIC REPRESENTATION	37
<i>Prathyush Poduval; Mariam Issa; Farhad Imani; Cheng Zhuo; Xunzhao Yin; Hassan Najafi; Mohsen Imani</i>	
FEFET-BASED PROCESS-IN-MEMORY ARCHITECTURE FOR LOW-POWER DNN TRAINING	43
<i>Farzaneh Zokaei; Bing Li; Fan Chen</i>	
A NOVEL PROGRAMMABLE VARIATION-TOLERANT RRAM-BASED DELAY ELEMENT CIRCUIT	49
<i>Kangqiang Pan; Amr M. S. Tosson; Norman Y. Zhou; Lan Wei</i>	
A COMPUTING-IN-MEMORY SCHEME WITH SERIES BIT-CELL IN STT-MRAM FOR EFFICIENT MULTI-BIT ANALOG MULTIPLICATION	51
<i>Zuolei Hao; Yue Zhang; Jinkai Wang; Hongyu Wang; Yining Bai; Guanda Wang; Weisheng Zhao</i>	
HYBRID MTJ-CMOS INTEGRATION FOR SIGMA-DELTA ADC	57
<i>Yu-Ang Wu; Lirida Naviner; Hao Cai</i>	
RECONFIGURABLE APPROXIMATE MULTIPLICATION ARCHITECTURE FOR CNN-BASED SPEECH RECOGNITION USING WALLACE TREE TENSOR MULTIPLIER UNIT	62
<i>Junyi Qian; Yuanyuan Jiang; Zilong Zhang; Renyuan Zhang; Ziyu Wang; Bo Liu</i>	
A SEXTUPLE CROSS-COUPLED DUAL-INTERLOCKED-STORAGE-CELL BASED MULTIPLE-NODE-UPSET SELF-RECOVERABLE LATCH	68
<i>Aibin Yan; Kuikui Qian; Jie Cui; Ningning Cui; Tianming Ni; Zhengfeng Huang; Xiaoqing Wen</i>	
ABSOLUTE SUBTRACTION AND DIVISION CIRCUITS USING UNCORRELATED RANDOM BITSTREAMS IN STOCHASTIC COMPUTING	74
<i>Yuancheng Zhou; Guangjun Xie; Jie Han; Yongqiang Zhang</i>	
A REVIEW OF DETERMINISTIC APPROACHES TO STOCHASTIC COMPUTING	80
<i>Zhendong Lin; Guangjun Xie; Shaowei Wang; Jie Han; Yongqiang Zhang</i>	
DYNAMICALLY CONFIGURABLE PHYSICAL UNCLONABLE FUNCTION BASED ON RRAM CROSSBAR	86
<i>Jiang Li; Yijun Cui; Chongyan Gu; Chenghua Wang; Weiqiang Liu</i>	
EXPERIMENTAL VERIFICATION OF EMPA FAULT MECHANISM	92
<i>Maoshen Zhang; Qiang Liu</i>	
DEEP NEURAL NETWORK SECURITY FROM A HARDWARE PERSPECTIVE	98
<i>Tong Zhou; Yuheng Zhang; Shijin Duan; Yukui Luo; Xiaolin Xu</i>	
FUZZING HARDWARE: FAITH OR REALITY? (INVITED PAPER)	104
<i>Weimin Fu; Orlando Arias; Yier Jin; Xiaolong Guo</i>	
ERROR ANALYSIS OF THE VARIATIONAL QUANTUM EIGENSOLVER ALGORITHM	110
<i>Sebastian Brandhofer; Simon Devitt; Ilia Polian</i>	
Author Index	