Opening Session, Monday Oct. 17, 8:00 – 10:00 am

8:00 Opening Ceremony – Speaker TBD

8:15 Opening Address – *Historical Impact of Government Investment in High Performance Computing*, Robert Leland (Sandia),

8:40 Keynote Talk – Title TBD, Neil Gershenfeld (MIT)

9:15 Keynote Talk – Title TBD, Leon Chua (UC Berkeley)

Coffee Break, 10:00 – 10:15 am

Approximate and Stochastic Computing, Monday Oct. 17, 10:15 – 12:15 pm

10:15 *Approximate Computing: Challenges and Opportunities*, Jungwook Choi (IBM)

10:45 *Bayesian Sensor Fusion with Fast and Low Power Stochastic Circuits*, Alexandre Coninx (CNRS / Univ. Pierre et Marie Curie)

11:15 *Computing architecture to perform approximated simulated annealing for Ising models*, Takuya Okuyama (Hitachi)

11:45 *Reducing Data Movement with Approximate Computing Techniques*, Stephen Crago (USC/ISI),

Neuromorphic Computing I, Monday Oct. 17, 10:15 – 12:15 pm

10:15 *Hyperdimensional Biosignal Processing: A Case Study for EMG-based Hand Gesture Recognition*, Abbas Rahmi (UC Berkeley)

10:45 *Conversion of Artificial Recurrent Neural Networks to Spiking Neural Networks for Low-power Neuromorphic Hardware*, Emre Neftci (UC Irvine)

11:15 *Spiking Network Algorithms for Scientific Computing*, William Severa (Sandia)

11:45 *Digital Neuromorphic Design of a Liquid State Machine for Real-Time Processing*, Anvesh Polepalli (Rochester Institute of Technology)

Adiabatic and Reversible Computation, Monday Oct. 17, 1:15-3:15

1:15 *A Path Toward Ultra-Low-Energy Computing*, Erik DeBenedictis (Sandia)

* Note: An open IARPA Workshop on related topics will occur on site Wednesday afternoon, Oct. 19. A related IRDS Workshop will also occur on site Sunday, Oct. 16.
1:45 Energy Efficiency Limits of Logic and Memory, Sapan Agarwal (Sandia)

2:15 A Novel Operational Paradigm for Thermodynamically Reversible Logic, Michael Frank (Sandia)

2:45 A Mini-MIPS Microprocessor for Adiabatic Computing, Gregory Snyder (U. Notre Dame)


1:15 Accelerating Discrete Fourier Transforms with Dot-product engine, Miao Hu (HP)

1:45 Accelerating Machine Learning with Non-Volatile Memory: exploring device and circuit tradeoffs, Geoffrey Burr (IBM)

2:15 Neural Processor Design Enabled by Memristor Technology, Chenchen Liu (U. Pittsburgh)

2:45 Recurrent Crossbar of Memristive Nanodevices Implements Online Novelty Detection, Christopher Bennett (U. Paris Sud)

Coffee Break, 3:15-3:30pm

Extending CMOS and In-Memory Processing, Monday Oct. 17, 3:30 – 5:30 pm

3:30 Rethinking Operating Systems for New Types of Computing, Dejan Milojicic (HP)

4:00 Challenges for optical interconnect for beyond Moore’s law computing, Anthony Lentine (Sandia)

4:30 Processor-in-Memory Support for Artificial Neural Networks, Joshua Schabel (NC State U.)

5:00 DRC²: Dynamically Reconfigurable Computing Circuit based on Memory Architecture, Jean Philippe Noel (CEA)

Cellular Neural/Nonlinear Networks and Nonlinear Dynamical Systems, Monday Oct. 17, 3:30 – 5:30 pm

3:30 Molecular Cellular Networks: A Non von Neumann Architecture for Molecular Electronics, Craig Lent (U. Notre Dame)

4:00 Towards Logic-in-Memory circuits using 3D-integrated Nanomagnetic Logic, Fabrizio Riente (TU Munich)

4:30 Computing with Dynamical Systems, Fred Rothganger (Sandia)

Poster Session, Monday Oct. 17, 7:00 – 10:00 pm

A simple highly parallel interconnect scheme for ultra-large computing systems to reduce communication power by over a factor of 1000, Zhe Wan (UCLA)

A study on double-gate spin MOSFETs, Kazuhiko Endo (AIST)
An Electronic Synapse Based on Self-Heating-Enhanced Charge-Trapping in High-k Gate Dielectrics, Xuefeng Gu (UCLA)

Estimating the Energy Crossover for Quantum Computing, Keith Britt (U. Tenn and ORNL)

Flux–Charge Analysis of Memristor Circuits, Fernando Corinto (Politecnico di Torino)

Fundamental Limits on Energy Dissipation for Neural Network Implementations, Natesh Ganesh (U. Mass)

Growth and characterization of niobium oxide memristors, Noraica Davila (HP)

Josephson junction neurons for neuromorphic computing, Kenneth Segall (Colgate U.)

Low-Power Image Recognition Challenge, Yung-Hsiang Lu (Purdue U.)

Metrics for Emerging Digital Computing Technologies, Scott Holmes (Booz Allen)

Natural Machine Logic Improves Safety Outside the Box of Computation, Charles Moeller (Reactive Logic Systems)

New insights into the dynamics of tantalum oxide memristors, Alon Ascoli (TU Dresden)

Non-spiking implementations of spiking neurons and networks, Angel Yanquas-Gil (Argonne)

Nonequilibrium neuromorphic computation in multimode cavity QED, Benjamin Lev (Stanford)

Nonlinear Dynamical Circuit Analysis of a Ferromagnetic Inductor, Suhas Kumar (HP)

Optical computing for multimode fiber demultiplexing, dispersion compensation, and routing using spatial-spectral holography, Kevin Wagner (U. Colorado)

Proposed Experiments to Test the Foundations of Quantum Computing, Alan Kadin

The Optical Turing Machine, Joe Touch (USC/ISI)

Using Resistive Shunts to Reduce Power Consumption in Digital Electronics Based on Superconducting Nanowires, Emily Toomey (MIT)

Keynote Session, Tuesday Oct. 18, 8:30 am

8:30, Keynote Talk – Title TBD, Hideo Mabuchi (Stanford)

9:15 Keynote Talk – Title TBD, David DiVincenzo (Aachen Univ.)

Coffee Break, 10:00 am

Optical and Quantum Computing, Tuesday Oct. 18, 10:15 am

10:45 **Functional Architecture for Scalable Quantum Computing**, Eyob Sete (Rigetti Comp)

11:15 **Information processing with large-scale optical integrated circuits**, Dave Kielpinski (HP)

11:45 **All-Optical Neuromorphic Computing in Optical Networks of Semiconductor Lasers**, Daniel Brunner (Univ. Franche-Comte)

**Novel Devices and Physical Computing, Tuesday Oct. 18, 10:15 am**

10:15 **FinSAL: A Novel FinFET Based Secure Adiabatic Logic for Energy-Efficient and DPA Resistant IoT Devices**, Himanshu Thapliyal (University of Kentucky)

10:45 **Erasing Logic-Memory Boundaries in Superconductor Electronics**, Vasili Semenov (Stony Brook Univ.)


11:45 **Double Barrier Memristive Devices for Neuromorphic Computing**, Martin Ziegler (Christian-Albrechts Universität zu Kiel)

**Optical and Quantum Computing II, Tuesday Oct. 18, 1:15 pm**

1:15 **Brain Inspired Photonic Motif Networks**, Faraz Monifi (UC San Diego)

1:45 **Optically-Inspired Computing Based on Spin Waves**, Wolfgang Porod (U. Notre Dame)

2:15 **Parallel Data Processing With Magnonic Holographic Co-Processor**, Aleksander Khitun (UC Riverside)

2:45 **High Density Multilayer Optical Circuit Board for Unprecedented Connectivity at Board Scales**, Andrew Michaels (UC Berkeley)

**Neuromorphic Computing III, Tuesday Oct. 18, 1:15 pm**

1:15 **Technology considerations for neuromorphic computing**, David Mountain (U. Maryland)

1:45 **High Throughput Neural Network based Embedded Streaming Multicore Processors**, Raqibul Hasan (U. Dayton)

2:15 **Designing Reconfigurable Large-Scale Deep Learning Systems Using Stochastic Computing**, Ao Ren (Syracuse Univ.)

2:45 **Neuromorphic computing with integrated photonics and superconductors**, Jeffrey Shainline (NIST)
Coffee Break, 3:15 pm

Error-Tolerant Logic and Circuits, Tuesday Oct. 18, 3:30 pm

3:30 Computationally-Redundant Energy-Efficiency Processing for Y’all (CREEPY), Bobin Deng (Georgia Tech)

4:00 Information-Theoretic Limits of Algorithmic Noise Tolerance, Daewon Seo (U. Illinois)

4:30 XtokaxikoX: A Stochastic Computing-Based Autonomous Cyber-Physical System, Rui Policarpo Duarte (Univ. Técnica de Lisboa)

Neuromorphic Computing IV, Tuesday Oct. 18, 3:30 pm

3:30 Opportunities in Physical Computing driven by Analog Realization, Jennifer Hasler (Georgia Tech)

4:00 Neuromorphic Mixed-Signal Circuitry for Asynchronous Pulse Processing, Peter Petre (HRL Labs)

4:30 Overcoming the Static Learning Bottleneck - the Need for Adaptive Neural Learning, Craig Vineyard (Sandia)

Wild and Crazy Ideas (WACI) Session, Tuesday, Oct. 18, 7 pm

Contributions TBD

Keynote Session, Wednesday Oct. 19, 8:30 am

8:30 Keynote Talk --Title TBD, Luping Shi (Tsinghua Univ.)

9:15 Keynote Talk – Title TBD, Kwabena Boahen (Stanford)

Coffee Break, 10:00 am

Government Agency Session, Wednesday Oct. 19, 10:15 am

10:15 Title TBD, Steve Hillenius, (SRC)

10:45 Title TBD, Robinson Pino (U.S. Department of Energy)

11:15 Title TBD, William Vanderlinde (IARPA)

11:45 Title TBD, Carl Williams (NIST)

ICRC Conclusion, Wednesday Oct. 19, 12:15 pm