ISMC 2025

THE 5TH INTERNATIONAL SYMPOSIUM ON EMERGING MEMORY AND COMPUTING

GRAND HOTEL MILLENNIUM
SOFIA, BULGARIA

3–7 JUNE 2025

PROGRAMME

GENERAL INFORMATION

VENUE:	Grand Hotel Millennium Hotel, Sofia, Bulgaria
REGISTRATION:	Conference Lobby, 2nd floor
PLENARY HALLS:	Millennium 1, Millennium 2 and Millennium 3, 2nd floor
EXHIBITION:	Conference Lobby, 2nd floor
WELCOME COCKTAIL:	Tuesday, June 3, 2025 | 19:00, Conference Lobby, 2nd floor
OPENING CEREMONY:	Wednesday, June 4, 2025 | 08:45, Millennium 2 Hall, 2nd floor
COFFEE-BREAKS:	Conference Lobby, 2nd floor
WORKING LUNCHES:	Conference Lobby, 2nd floor
POSTER SESSION:	Wednesday, June 4, 2025 | 18:00–19:00, Einstein Hall, 2nd floor
CONFERENCE BANQUET:	Wednesday, June 4, 2025 | 20:00, Traditional Bulgarian Restaurant "Chevermeto"
CONFERENCE TOUR:	Thursday, June 5, 2025 | Rila Monastery tour | Meeting point: Reception at Grand Hotel Millennium at 11:15
SESSION WITH EDITORS FROM NATURE:	Friday, June 6, 2025 | 09:15–10:05, Millennium 2 Hall, 2nd floor
CLOSING CEREMONY AND POSTER AWARDS:	Friday, June 6, 2025 | Millenium 2 Hall, 2nd floor
OFFICIAL CONFERENCE LANGUAGE:	English
AUDIOVISUAL PRESENTATIONS:	Please hand in your presentations to the technical teamin the hall on an electronic device (CD, DVD, USB) on the day of your presentation duringthe break before the start of the relevant session, at the latest. Please be in the conferencehall 10 minutes before the start of your lecture. The duration of each lecture will becontrolled by the moderator of the respective plenary session.
POSTER SESSION:	The poster session will take place at Einstein Hall, Grand Hotel Millennium Sofia Hotel, 2nd Floor. Thumbtacks for poster mounting are available at the registration desk. The poster committee will evaluate the posters for the poster prizes at the time of the authors' presentations. The authors are expected to be at the poster stands during the official poster session. Please remove your posters at the end of the session.

JUNE 3, 2025

16:00–19:00	REGISTRATION AND ACCOMMODATION
19:00–21:00	WELCOME COCKTAIL

JUNE 4, 2025

MILLENNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
	08:45–09:15	
	OPENING	
	09:15–10:00	
	Avantgarde approach: Can Quantum Biology influence Bioinspired Computing and AI? *Prof. Ekaterina Iordanova* *Chair: Prof. Ilia Valov*	
	10:10–10:45	
Chair: Prof. Ekaterina Iordanova	*Chair: Prof. Huaqiang Wu*	*Chair: Prof. C. Daniel Frisbie*
Optical and Electical Memristive Devices and Their Role in Next Generation Neuronal Networks *Prof. Juerg Leuthold*	**In-Memory Computing for Deep Learning Inference: An Overview and Future Prospects** *Dr. Abu Sebastian*	**A new generation of ionic gated transistors** *Prof. Alberto Morpurgo*
	10:45–11:10	
Low Dimensional Materials and Optoelectronic Devices Enabling Neuromorphic Computing Applications *Prof. Dimitra G. Georgiadou*	**Non-linear Reconfigurable Threshold Logic Gates Based on Nanostructured Metallic films** *Prof. Paolo Milani*	**Electrolyte-gated multifunctional InAs nanowire transistors** *Prof. Francesco Rossella*
	11:10–11:40 Coffee break	
	11:40–12:05	
In-sensor computing for the classification of optical patterns directly irradiated to a reservoir layer made of a solid electrolyte *Prof. Tsuyoshi Hasegawa*	**Cross-stack optimization for pushing the energy boundaries at the edge** *Prof. Melika Payvand*	**In-materio Reservoir Computing Utilizing Iontronic Transistors** *Prof. Takashi Tsuchiya*

MILLENNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
12:05–12:30		
Van der Waals Material Devices for Memory and Computing *Prof. Han Wang*	**Efficient Adaptive Intelligence with Hardware-Software Co-Design** *Prof. Emre Neftci*	**In-memory computing with volatile proton devices** *Prof. Takeaki Yajima*
12:30–12:55		
MoS2-based Flash memory arrays for defect-tolerant soft tree models *Prof. Can Li*	**Operando Nanoscale Investigation of Energy Device Materials Using Light** *Dr. Giuliana Di Martino*	**Reservoir Computing Using Ionic Liquids and Its Dimensional Analysis** *Prof. Kentaro Kinoshita*
12:55–13:55 Lunch		
13:55–14:30		
Chair: Prof. Han Wang	*Chair: Prof. J. Joshua Yang*	*Chair: Prof. Francesco Rossella*
Using Polymers, Protons and Electrons for Brain-Like Computing *Prof. Alberto Salleo*	**Metal-oxides memristors: the link between real and artificial brains** *Prof. Themis Prodromakis*	**Sub-Band Filling and Ion-Carrier Interactions in Organic EGTs** *Prof. C. Daniel Frisbie*
14:30–14:55		
Sensor-Driven memristive Digital Twin of Mycelium *Prof. Georgios Ch. Sirakoulis*	**Tackling Unpredictability in Emerging Memory Devices: the Bayesian Approach** *Prof. Damien Querlioz*	**High-Mobility Electron Gases via Ionic Gating** *Prof. Jianting Ye*
14:55–15:20		
Engineering organic neuromorphic interfaces for biohybrid synaptic communication *Prof. Francesca Santoro*	**Computing-in-Memristor for Energy-Efficient Signal Processing** *Prof. Jianshi Tang*	**Ionic liquid-based functional devices using 2D materials and organic polymers** *Prof. Taishi Takenobu*
15:20–15:45		
On-chip learning with organic neuromorphic and biohybrid systems *Prof. Yoeri van de Burgt*	**Energy-efficient parallel analog computing for edge intelligence** *Prof. Shi-Jun Liang*	**Study of the strange-metal behaviors in high-temperature superconductors** *Prof. Qihong Chen*
15:45–16:15 Coffee break		

MILLENNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
	16:15– 16:40	
AI for 2D Materials and 2D Materials for AI *Prof. Saptarshi Das* *Chair: Prof. Alberto Salleo*	**Vertical and Lateral Filament Growth in Electrochemical Metallization Memory Cells** *Dr. Stephan Menzel* *Chair: Prof. Juerg Leuthold*	**Small changes in a brain-stimulating device could provide big health opportunities for users** *Prof. Ana Proykova* *Chair: Prof. Hongtao Yuan*
	16:40–17:05	
Ionic Nanoarchitectonics for Emerging Electronic Information Devices *Prof. Kazuya Terabe*	**Machine Learning Algorithm Based on Physics Informed Neural Networks with Memory** *Prof. Angela Slavova*	**Development of Reliable Emerging Memory devices and Their Applications** *Prof. Shinhyun Choi*
	17:05–17:30	
Effect of Materials Design on Memristive Switching in Oxides-based Memristors *Dr. Shaochuan Chen*	**Memristor models for analysis of memory crossbars** *Prof. Valeri Mladenov*	**Vanadium Dioxide for Neuromorphic Computing** *Prof. Alexandre Zimmers*
	17:30–17:55	
	A new approach for simulating Battery State of Health (SOH) and State of Charge (SOC) by using RISC Microcontroller architecture *Dimitar Boychev*	**Memristor-Based Neuromorphic Accelerators: Hype, Hope, or Reality?** *Prof. Thirumalai Venkatesan*
17:55–18:55	**POSTER SESSION**	
18:55–19:55	**FREE TIME**	
20:00	**CONFERENCE BANQUET**	

JUNE 5, 2025

MILLENNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
	09:00–09:45	
	Diffusive and drift memristors for neuromorphic and analog computing *Prof. J. Joshua Yang* *Chair: Prof. Anthony Kenyon*	
	09:55–10:30	
Chair: Prof. Huanglong Li	*Chair: Prof. Simon Brown*	*Chair: Prof. Takashi Tsuchiya*
Materials challenges in SiOx ReRAM *Prof. Anthony Kenyon*	**Entropy Production Minimization and Edge of Chaos in Nonmonotonic Dynamical Circuits** *Prof. R. Stanley Williams*	**Electrochemical Protonic Synapses for Energy-Efficient Brain-Inspired Computing** *Prof. Bilge Yildiz*
	10:30–10:55	
Energy-Intelligent Computing Devices Based on 2D Quantum Materials *Prof. Heejun Yang*	**Spintronic foundation cells for large-scale integration** *Prof. Qiming Shao*	**Modulating the electronic performance by solid-state nanoionic mechanisms** *Prof. Ilia Valov*
11:30	**RILA MONASTERY TOUR**	

JUNE 6, 2025

MILLE NNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
	08:30–09:15	
	Chellenges of Iontronics *Prof. Yoshihiro Iwasa* *Chair: Prof. Kazuya Terabe*	
	09:15–10:05	
	EDITORS SESSION	

MILLENNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
	10:15–10:50	
Chair: Prof. Can Li	*Chair: Prof. Yuanyuan Shi*	*Chair: Prof. Shimpei Ono*
Optoelectronic memories for bioinspired in-sensor computing *Prof. Yang Chai*	**Brain-like Computation with Percolating Networks of Nanoparticles** *Prof. Simon Brown*	**Iontronics with organic semiconductor crystals** *Prof. Junichi Takeya*
	10:50–11:15	
Resistive switching in high-Tc YBCO superconductor *Prof. Jordi Suñe Tarruella*	**Self-organizing memristive networks as stochastic dynamical systems for reservoir computing** *Dr. Gianluca Milano*	**Metallic Polymers Mediated by Molecules and Ions; Supramolecular Alchemy** *Prof. Shun Watanabe*
11:15–11:45 Coffee break sponsored by Advanced Electronic Materials (Wiley)		
	11:45–12:10	
Investigation and Utilization of Capacitive Effects in TiOx Memristive Devices *Prof. Itör Köymen*	**Information processing in dopant network processing units** *Prof. Wilfred van der Wiel*	**Electrical Control on Correlated Electronic States in Quantum Materials** *Prof. Hongtao Yuan*
	12:10–12:35	
A new opportunity for the emerging tellurium semiconductor: making neuromorphic devices *Prof. Huanglong Li*	**Physical Reservoir Devices based on Carbon Nanotube Haptic Sensor for Future Autonomous Robotics** *Prof. Hirofumi Tanaka*	**Magneto-ionics: combining ionics with magnetism to design multifunctional synaptic elements** *Prof. Liza Herrera Diez*
	12:35–13:00	
Uniformity, linearity and symmetry enhancement in TiOx/MoS2-xOx based analog RRAM via S-vacancy confined nanofilament *Prof. Yuanyuan Shi*	**Local spatiotemporal dynamics in neuromorphic nanowire networks** *Prof. Carlo Riccardi*	**Tailored ionic structure in oxide heterostructures for ionotronics** *Dr. Felix Gunkel*
	13:00–13:25	
Defect Engineering in Functional Metal Oxides for RRAM Applications: Experimental Studies and Insights *Prof. Devesh Kumar Avasthi*	**Memristive Nanowire Networks: Neuromorphic Learning beyond Artificial Neural Networks** *Prof. Zdenka Kuncic*	**Advanced Functionalities of Ions** *Prof. Shimpei Ono*
13:25–14:25 Lunch		

MILLENNIUM BALLROOM 1	MILLENNIUM BALLROOM 2	MILLENNIUM BALLROOM 3
	14:25–15:00	
Chair: Prof. Valeri Mladenov	*Chair: Prof. Ana Proykova*	*Chair: Prof. Plamen Nikolov*
Towards a quantitative and non-destructive operando analysis of TaOx memristive devices using soft X-ray radiation *Dr. Burkhard Beckhoff*		**Memristive neural dynamics for sensor-processor integration** *Prof. Ronald Tetzlaff*
	15:00–15:25	
Reflection Electron Microscopy: crystal growth and phase transitions on vicinal Si(111) surface *Prof. Bogdan Ranguelov*	**Back-end-of-line integration of emerging memory technologies for neuromorphic edge computing** *Prof. Erika Covi*	**Molecular Neuromorphic Building Blocks for Artificial Intelligence** *Prof. Sreetosh Goswami*
	15:25–15:50	
Advances in Silicon Nitride ReRAM Technology *Dr. Panagiotis Dimitrakis*	**Development of High-Quality Layered PdSe2 CrystalInvited speech 56** *Dr. Dimitre Dimitrov*	**Thin-film growth strategy for solving the sustainability puzzle of neuromorphic-based artificial intelligence (AI) hardware** *Dr. Babak Bakhit*
	15:50–16:15	
Ultraclean contacts for ferroic devices based on two-dimensional materials *Dr. Soumya Sarkar*	**Persistent polarization effects and memory properties in ionic-liquid gated InAs nanowire transistors** *Dr. Valeria Demontis*	**Synaptic Vesicle-Mimetic Polyoxome-talates – Molecular Multilevel Switches with Quantum Memristive Potential** *Dr. Kirill Monakhov*
	16:15–16:40	
Electronic-Photonic Memristors for Neuromorphic Computing *Prof. Alexandros Emboras*	**Ferroelectric synaptic weights: design guidelines using AI Hardware toolkits** *Prof. Laura Bégon-Lours*	**Fabrication modes fro Ge-based quantum devices** *Dr. Nikolay Petkov*
	16:40–17:05	
Exploiting the Local Activity of a Threshold Switch to Reproduce Generation, Evolution, and Extinction of a Neuronal Voltage Spike through a Three-Element Analogue Electrical Cell *Prof. Fernando Corinto*	**Dynamical System Theory Unfolds the Application Potential of Locally-Active. Threshold Switches** *Prof. Alon Ascolli*	
17:05– 17:30	**CLOSING AND AWARDS CEREMONY**	

JUNE 7, 2025, 10:00–17:00 LAB VISITS

POSTER SESSION

N°	Poster title	Authors
S01-P01	Iontronics-Enabled Ambipolarity	***Luca Nappi,*** *Rossella Francesco*
S01-P02	Programmable non-volatile quantum point contact achieved by electrochemical polishing method with Ag/SiO2 based ECM	***Xin Zheng****, Ilia Valov*
S01-P03	SPICE Simulation of Power Dissipation, Energy Consumption and Programming Time of Memristors Using the Dynamic Memdiode Model	***E. Miranda****, E. Piros, F.L. Aguirre, X. Pérez, T. Kim, P. Schreyer, J. Gehrunger, T. Oster, K. Hofmann, J. Suñé, C. Hochberger, L. Alff*
S01-P04	Effect of IrO2 Buffer layer on the switching characteristics of Hf/Ta2O5/Ta device	***Byoung Gun Han****, Ilia Valov*
S01-P05	Possibilities for programming robotic systems in emergency situations with OpenAI artificial intelligence using the Node-Red visual programming system	***Atanas Garbev***
S01-P06	Physical Explanation of Linearity and Symmetry and Thousands of Analog States Using Molecular Kinetics	*Bidyabhusan Kundu and Sreetosh Goswami*
S01-P07	Molecular Memcapacitive Crossbar for energy efficient computing	***Pallavi Gaur****, Pradip Ghosh, Harivignesh S, Sreebrata Goswami and Sreetosh Goswami*
S01-P08	Effect of the SET pulse time on the read value in low resistance state for filamentary valance change memory devices in 1T1R-configuration	***O. Solfronk****, F. Cüppers, X. Liu, S. Wiefels, S. Son, S. Menzel, and S. Hoffmann-Eifert*
S01-P09	Tuning Iontronic Resistive Switching in Copper Liquid-Based Devices	***A. V. Silva****, A. T. Brandão, C. M. Pereira, J. Ventura and C. Dias*
S01-P10	Stochasticity-enhanced memristive gradient descent	***K. Nikiruy****, M. Ziegler*
S01-P11	Copolymer coated quartz resonators and silicon wafers for in-situ monitoring of environmental changes in humidity	***Katerina Lazarova****, Silvia Bozhilova, Martina Docheva, Ketrin Pavlova, Gergana Alexieva, Darinka Christova and Tsvetanka Babeva*
S01-P12	Material-Driven Variability Mitigation for Reliable Multi-Level Switching in 1T-1R Memristive Devices	***Godwin Paul*** *and Vikas Rana*

S01-P13	A Fully Parallel Online Update Scheme for Meta Learning in Edge Memristor CIM Systems	***Chenfei Miao***, *Huanglong Li*
S01-P14	Memristor-based in-memory computing for simulation of biologically detailed neurons	***Yiyuan Gao***, *Huanglong Li*
S01-P15	A memristor-based approach to solving the quantum supremacy problem of the permanent of the matrix computation	***Ruikai Kong***, *Huanglong Li*
S01-P16	Substrate temperature impact on low-cost production of ZnO films and its application	***Georgi Marinov***, *Gergana Alexieva, Katerina Lazarova, Petar Ivanov, Tsvetanka Babeva*
S01-P17	Design and Comparison of Sensing Circuits for Event-based Compute-in-Memory with RRAM	***Siqi Liu***, *Filippo Moro, Sebastian Billaudelle, Melika Payvand*
S01-P18	“It’s not just Memory”: what AI demands to memory technology	*Filippo Moro, Siqi Liu, Sebastian Billaudelle*,* ***Melika Payvand***
S01-P19	Analog In-Memory Computing Attention Mechanism for fast and low-power Transformers	*Nathan Leroux, Paul-Philipp Manea, Chirag Sudarshan, Jan Finkbeiner, Sebastian Siegel, John Paul Strachan, Emre Neftci*
S01-P20	Beyond von Neumann: Emerging Architectures for High-Performance Computing	***Elizabeth Velikova Koleva***
S01-P21	Photo-induced anisotropy in azo-dye doped rigid films: how to describe the increase of the optical response when the illumination is stopped	*Peter Sharlandjiev, Nataliya Berberova-Buhova, Dimana Nazarova,* ***Blaga Blagoeva***
S01-P22	Next-generation zero-chain traceability using an intrinsic, room-temperature quantum resistance memristor SI standard	***L. Boarino***, *G. Milano, X. Zheng, F. Michieletti, G. Leonetti, G. Caballero, I. Oztoprak, Ö. Bozat, L. Callegaro, N. De Leo, I. Godinho, D. Granados, I. Koymen, M. Menghini, E. Miranda, L. Ribeiro, C. Ricciardi, J. Suñe, V. Cabral, I. Valov*
S01-P23	Novel Parallel Spiking Neural P-Systems networks	***Emmanouil Stavroulakis***, *Iosif-Agelos Fyrigos, Konstantinos Rallis, Panagiotis Dimitrakis and Georgios Ch. Sirakoulis*
S01-P24	In-sensor Dynamic Computing for Intelligent Machine Vision	***Yuekun Yang***, *Chen Pan, Yixiang Li, Shi-Jun Liang, Feng Miao*
S01-P25	In-Pixel Dual-Band Intercorrelated Compressive Sensing Based on van der Waals Vertical Heterostructure	*Zhu-An Li, Chen Pan, Pengfei Wang, Yuekun Yang, Shi-Jun Liang, Feng Miao*

S01-P26	Computing with SiNx-based RRAM crossbar arrays	***A.E. Mavropoulis***, *N. Vasileiadis, I.A. Fyrigos, G. Ch. Sirakoulis, P. Dimitrakis*
S01-P27	A novel micro-thermography based approach for the investigation of resistive switching temporal and spatial activity in gold cluster assembled film	***Davide Decastri***, *Francesca Borghi, Paolo Milani*
S01-P28	Mortise-tenon-shaped Memristors for Scientific Computing	***Weiqi Dang***, *Yu Shen, Wei Wei, Chen Pan, Shi-Jun Liang, and Feng Miao*
S01-P29	Structure-Aware Vector Encoding Enabled by 2D Material–Memristor Hybrid Hardware	***Jingwen Shi***, *Wei Wei, Pengfei Wang, Yuekun Yang, Chen Pan, Shi-Jun Liang, Feng Miao*
S01-P30	ROBUST ANALOGUE NEUROMORPHIC HARDWARE NETWORKS USING HAREWARE-NATIVE LEARNING	*Cong Wang, Yichen Zhao, Yu Shen, Shi-Jun Liang, Feng Miao*
S01-P31	Prediction of Chaotic Time Series Achieved by in-materio Reservoir Computing Utilizing Nonlinear Interfered Spin Wave Multi-detection	***Sota Hikasa***, *Wataru Namiki, Daiki Nishioka, Kazuya Terabe, and Takashi Tsuchiya*
S01-P32	Iontronics-based Physical Reservoir Computing Utilizing Ambipolar Electric Transport in Monolayer Graphene	***Hina Kitano***, *Daiki Nishioka, Kazuya Terabe, and Takashi Tsuchiya*
S01-P33	A novel micro-thermography based approach for the investigation of resistive switching temporal and spatial activity in gold cluster assembled film	***Davide Decastri***, *Francesca Borghi, Paolo Milani*
S01-P34	Communication-aware in-memory wireless neural networks	*Zai-Zheng Yang, Hang Zhao, Cong Wang, Shuo Ding, Yichen Zhao, Shi-Jun Liang, Feng Miao*
S01-P35	Design of Hybrid Nanodevice/CMOS Systems for Optimization and AI Applications	***Mohammed Akib Iftakhera***, *Hugo Levicesb, Kamel-Eddine Harabia,b, Philippe Talatchianc, Kévin Garelloc, Louis Hutinb, Damien Querlioza*
S01-P36	Harnessing nonlinear conductive characteristic of TiO2/HfO2 memristor crossbar for implementing parallel vector–matrix multiplication	*Wei Wei, Cong Wang, Chen Pan, Xing-Jian Yangdong, Zai-Zheng Yang, Yuekun Yang, Bin Cheng, Shi-Jun Liang, and Feng Miao*
S01-P37	Physics-Based Compact Modeling of BiFeO3 Memristive Devices	***Yaohui Liu***
S01-P38	A Unified Platform for Memristor Characterization and Computing	***Simranjeet Singh***, *Isha Kamone, Johannes Mohr, Ankit Bende*