

Bin Gao

List of Publications by Year in descending order

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140
papers

9,723
citations

66343

42
h-index

43889

91
g-index

145
all docs

145
docs citations

145
times ranked

6131
citing authors

#	ARTICLE	IF	CITATIONS
1	Fully hardware-implemented memristor convolutional neural network. <i>Nature</i> , 2020, 577, 641-646.	27.8	1,198
2	Face classification using electronic synapses. <i>Nature Communications</i> , 2017, 8, 15199.	12.8	683
3	A Low Energy Oxide-Based Electronic Synaptic Device for Neuromorphic Visual Systems with Tolerance to Device Variation. <i>Advanced Materials</i> , 2013, 25, 1774-1779.	21.0	445
4	Bridging Biological and Artificial Neural Networks with Emerging Neuromorphic Devices: Fundamentals, Progress, and Challenges. <i>Advanced Materials</i> , 2019, 31, e1902761.	21.0	418
5	Neuro-inspired computing chips. <i>Nature Electronics</i> , 2020, 3, 371-382.	26.0	402
6	HfO _x -Based Vertical Resistive Switching Random Access Memory Suitable for Bit-Cost-Effective Three-Dimensional Cross-Point Architecture. <i>ACS Nano</i> , 2013, 7, 2320-2325.	14.6	309
7	Understanding memristive switching via in situ characterization and device modeling. <i>Nature Communications</i> , 2019, 10, 3453.	12.8	275
8	Dynamic memristor-based reservoir computing for high-efficiency temporal signal processing. <i>Nature Communications</i> , 2021, 12, 408.	12.8	231
9	Improving Analog Switching in HfO _x -Based Resistive Memory With a Thermal Enhanced Layer. <i>IEEE Electron Device Letters</i> , 2017, 38, 1019-1022.	3.9	203
10	Reliability of analog resistive switching memory for neuromorphic computing. <i>Applied Physics Reviews</i> , 2020, 7, .	11.3	199
11	Ultra-Low-Energy Three-Dimensional Oxide-Based Electronic Synapses for Implementation of Robust High-Accuracy Neuromorphic Computation Systems. <i>ACS Nano</i> , 2014, 8, 6998-7004.	14.6	172
12	A Physics-Based Compact Model of Metal-Oxide-Based RRAM DC and AC Operations. <i>IEEE Transactions on Electron Devices</i> , 2013, 60, 4090-4097.	3.0	169
13	Unified Physical Model of Bipolar Oxide-Based Resistive Switching Memory. <i>IEEE Electron Device Letters</i> , 2009, 30, 1326-1328.	3.9	167
14	Gd-doping effect on performance of HfO ₂ based resistive switching memory devices using implantation approach. <i>Applied Physics Letters</i> , 2011, 98, .	3.3	165
15	Alloying conducting channels for reliable neuromorphic computing. <i>Nature Nanotechnology</i> , 2020, 15, 574-579.	31.5	160
16	RRAM Crossbar Array With Cell Selection Device: A Device and Circuit Interaction Study. <i>IEEE Transactions on Electron Devices</i> , 2013, 60, 719-726.	3.0	155
17	Ionic doping effect in ZrO ₂ resistive switching memory. <i>Applied Physics Letters</i> , 2010, 96, .	3.3	154
18	Binary neural network with 16 Mb RRAM macro chip for classification and online training. , 2016, , .		154

#	ARTICLE	IF	CITATIONS
19	A neuromorphic visual system using RRAM synaptic devices with Sub-pJ energy and tolerance to variability: Experimental characterization and large-scale modeling. , 2012, , .		148
20	Power-efficient neural network with artificial dendrites. Nature Nanotechnology, 2020, 15, 776-782.	31.5	141
21	Direct Observations of Nanofilament Evolution in Switching Processes in HfO ₂ -Based Resistive Random Access Memory by In Situ TEM Studies. Advanced Materials, 2017, 29, 1602976.	21.0	137
22	Stochastic learning in oxide binary synaptic device for neuromorphic computing. Frontiers in Neuroscience, 2013, 7, 186.	2.8	129
23	A Methodology to Improve Linearity of Analog RRAM for Neuromorphic Computing. , 2018, , .		124
24	Improved Uniformity of Resistive Switching Behaviors in HfO ₂ Thin Films with Embedded Al Layers. Electrochemical and Solid-State Letters, 2010, 13, H36.	2.2	121
25	Monitoring Oxygen Movement by Raman Spectroscopy of Resistive Random Access Memory with a Graphene-Inserted Electrode. Nano Letters, 2013, 13, 651-657.	9.1	121
26	33.2 A Fully Integrated Analog ReRAM Based 78.4TOPS/W Compute-In-Memory Chip with Fully Parallel MAC Computing. , 2020, , .		121
27	A SPICE Model of Resistive Random Access Memory for Large-Scale Memory Array Simulation. IEEE Electron Device Letters, 2014, 35, 211-213.	3.9	111
28	Device and materials requirements for neuromorphic computing. Journal Physics D: Applied Physics, 2019, 52, 113001.	2.8	105
29	In-memory Learning with Analog Resistive Switching Memory: A Review and Perspective. Proceedings of the IEEE, 2021, 109, 14-42.	21.3	96
30	24.4 Sandwich-RAM: An Energy-Efficient In-Memory BWN Architecture with Pulse-Width Modulation. , 2019, , .		92
31	A Threshold Switching Selector Based on Highly Ordered Ag Nanodots for Xâ€Point Memory Applications. Advanced Science, 2019, 6, 1900024.	11.2	91
32	Resistive Random Access Memory for Future Information Processing System. Proceedings of the IEEE, 2017, 105, 1770-1789.	21.3	88
33	Analogâ€Type Resistive Switching Devices for Neuromorphic Computing. Physica Status Solidi - Rapid Research Letters, 2019, 13, 1900204.	2.4	83
34	Neural signal analysis with memristor arrays towardsâ€high-efficiency brainâ€machine interfaces. Nature Communications, 2020, 11, 4234.	12.8	82
35	Three-Dimensional nand Flash for Vectorâ€Matrix Multiplication. IEEE Transactions on Very Large Scale Integration (VLSI) Systems, 2019, 27, 988-991.	3.1	78
36	Analog memristive synapse based on topotactic phase transition for high-performance neuromorphic computing and neural network pruning. Science Advances, 2021, 7, .	10.3	63

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37	Modeling of Retention Failure Behavior in Bipolar Oxide-Based Resistive Switching Memory. IEEE Electron Device Letters, 2011, 32, 276-278.	3.9	61
38	Conduction mechanisms, dynamics and stability in ReRAMs. Microelectronic Engineering, 2018, 187-188, 121-133.	2.4	59
39	Investigation of statistical retention of filamentary analog RRAM for neuromorphic computing. , 2017, , .		57
40	Recent progress of integrated circuits and optoelectronic chips. Science China Information Sciences, 2021, 64, 1.	4.3	56
41	Device and circuit optimization of RRAM for neuromorphic computing. , 2017, , .		53
42	Atomic threshold-switching enabled MoS ₂ transistors towards ultralow-power electronics. Nature Communications, 2020, 11, 6207.	12.8	52
43	Unsupervised Learning on Resistive Memory Array Based Spiking Neural Networks. Frontiers in Neuroscience, 2019, 13, 812.	2.8	50
44	Associative Memory for Image Recovery with a High-Performance Memristor Array. Advanced Functional Materials, 2019, 29, 1900155.	14.9	50
45	A Novel Defect-Engineering-Based Implementation for High-Performance Multilevel Data Storage in Resistive Switching Memory. IEEE Transactions on Electron Devices, 2013, 60, 1379-1383.	3.0	48
46	Electrode-induced digital-to-analog resistive switching in TaO _x -based RRAM devices. Nanotechnology, 2016, 27, 305201.	2.6	48
47	Compact Model of HfO _x -Based Electronic Synaptic Devices for Neuromorphic Computing. IEEE Transactions on Electron Devices, 2017, 64, 614-621.	3.0	48
48	Sign backpropagation: An on-chip learning algorithm for analog RRAM neuromorphic computing systems. Neural Networks, 2018, 108, 217-223.	5.9	48
49	Ultrafast RESET Analysis of HfO _x -Based RRAM by Sub-Nanosecond Pulses. Advanced Electronic Materials, 2017, 3, 1700263.	5.1	46
50	Optimization of RRAM-Based Physical Unclonable Function With a Novel Differential Read-Out Method. IEEE Electron Device Letters, 2017, 38, 168-171.	3.9	44
51	Characterizing Endurance Degradation of Incremental Switching in Analog RRAM for Neuromorphic Systems. , 2018, , .		44
52	Rotating neurons for all-analog implementation of cyclic reservoir computing. Nature Communications, 2022, 13, 1549.	12.8	44
53	High-Uniformity Threshold Switching HfO ₂ -Based Selectors with Patterned Ag Nanodots. Advanced Science, 2020, 7, 2002251.	11.2	43
54	Memristor-based analogue computing for brain-inspired sound localization with in situ training. Nature Communications, 2022, 13, 2026.	12.8	42

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55	HfO ₂ /Al ₂ O ₃ multilayer for RRAM arrays: a technique to improve tail-bit retention. Nanotechnology, 2016, 27, 395201.	2.6	41
56	Stateful Logic Operations in One-Transistor-One- Resistor Resistive Random Access Memory Array. IEEE Electron Device Letters, 2019, 40, 1538-1541.	3.9	41
57	Optimized learning scheme for grayscale image recognition in a RRAM based analog neuromorphic system. , 2015, , .		39
58	Design Guidelines of RRAM based Neural-Processing-Unit. , 2019, , .		39
59	Impacts of State Instability and Retention Failure of Filamentary Analog RRAM on the Performance of Deep Neural Network. IEEE Transactions on Electron Devices, 2019, 66, 4517-4522.	3.0	37
60	Multichannel parallel processing of neural signals in memristor arrays. Science Advances, 2020, 6, .	10.3	36
61	Low-Voltage Oscillatory Neurons for Memristor-Based Neuromorphic Systems. Global Challenges, 2019, 3, 1900015.	3.6	35
62	Memristors for Hardware Security Applications. Advanced Electronic Materials, 2019, 5, 1800872.	5.1	35
63	A Parallel Multibit Programming Scheme With High Precision for RRAM-Based Neuromorphic Systems. IEEE Transactions on Electron Devices, 2020, 67, 2213-2217.	3.0	34
64	A Highly Reliable RRAM Physically Unclonable Function Utilizing Post-Process Randomness Source. IEEE Journal of Solid-State Circuits, 2021, 56, 1641-1650.	5.4	32
65	A physical model for bipolar oxide-based resistive switching memory based on ion-transport-recombination effect. Applied Physics Letters, 2011, 98, .	3.3	31
66	Engineering oxide resistive switching materials for memristive device application. Applied Physics A: Materials Science and Processing, 2011, 102, 991-996.	2.3	31
67	Modeling disorder effect of the oxygen vacancy distribution in filamentary analog RRAM for neuromorphic computing. , 2017, , .		31
68	A Compact Model of Analog RRAM With Device and Array Nonideal Effects for Neuromorphic Systems. IEEE Transactions on Electron Devices, 2020, 67, 1593-1599.	3.0	29
69	Modeling and Optimization of Bilayered TaO _x RRAM Based on Defect Evolution and Phase Transition Effects. IEEE Transactions on Electron Devices, 2016, 63, 1524-1532.	3.0	28
70	Relaxation Effect in RRAM Arrays: Demonstration and Characteristics. IEEE Electron Device Letters, 2016, 37, 182-185.	3.9	27
71	Concealable physically unclonable function chip with a memristor array. Science Advances, 2022, 8, .	10.3	27
72	Metal oxide resistive random access memory based synaptic devices for brain-inspired computing. Japanese Journal of Applied Physics, 2016, 55, 04EA06.	1.5	26

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73	A Unified PUF and TRNG Design Based on 40-nm RRAM With High Entropy and Robustness for IoT Security. IEEE Transactions on Electron Devices, 2022, 69, 536-542.	3.0	26
74	Analysis of the Voltage-Time Dilemma of Metal Oxide-Based RRAM and Solution Exploration of High Speed and Low Voltage AC Switching. IEEE Nanotechnology Magazine, 2014, 13, 1127-1132.	2.0	24
75	3-D Cross-Point Array Operation on $\text{AlO}_y/\text{HfO}_x$ -Based Vertical Resistive Switching Memory. IEEE Transactions on Electron Devices, 2014, 61, 1377-1381.	3.0	22
76	Investigation of the synaptic device based on the resistive switching behavior in hafnium oxide. Progress in Natural Science: Materials International, 2015, 25, 47-50.	4.4	22
77	Short Time High-Resistance State Instability of TaOx-Based RRAM Devices. IEEE Electron Device Letters, 2017, 38, 32-35.	3.9	22
78	Device and Circuit Interaction Analysis of Stochastic Behaviors in Cross-Point RRAM Arrays. IEEE Transactions on Electron Devices, 2017, 64, 4928-4936.	3.0	22
79	A drain leakage phenomenon in poly silicon channel 3D NAND flash caused by conductive paths along grain boundaries. Microelectronic Engineering, 2018, 192, 66-69.	2.4	22
80	Nonvolatile Logic and <i>In Situ</i> Data Transfer Demonstrated in Crossbar Resistive RAM Array. IEEE Electron Device Letters, 2015, 36, 1142-1145.	3.9	21
81	Endurance and Retention Degradation of Intermediate Levels in Filamentary Analog RRAM. IEEE Journal of the Electron Devices Society, 2019, 7, 1239-1247.	2.1	20
82	Oxide-based filamentary RRAM for deep learning. Journal Physics D: Applied Physics, 2021, 54, 083002.	2.8	20
83	Highly Compact (4F2) and Well Behaved Nano-Pillar Transistor Controlled Resistive Switching Cell for Neuromorphic System Application. Scientific Reports, 2014, 4, 6863.	3.3	19
84	Oxide-based analog synapse: Physical modeling, experimental characterization, and optimization. , 2016, , .		19
85	Suppress variations of analog resistive memory for neuromorphic computing by localizing Vo formation. Journal of Applied Physics, 2018, 124, 152108.	2.5	19
86	Write disturb analyses on half-selected cells of cross-point RRAM arrays. , 2014, , .		18
87	A Memristors-Based Dendritic Neuron for High-Efficiency Spatial-Temporal Information Processing. Advanced Materials, 2023, 35, .	21.0	18
88	3-D Resistive Memory Arrays: From Intrinsic Switching Behaviors to Optimization Guidelines. IEEE Transactions on Electron Devices, 2015, 62, 3160-3167.	3.0	16
89	Self-Selection RRAM Cell With Sub- μA Switching Current and Robust Reliability Fabricated by High- κ /Metal Gate CMOS Compatible Technology. IEEE Transactions on Electron Devices, 2016, 63, 4295-4301.	3.0	16
90	Multiplication on the edge. Nature Electronics, 2018, 1, 8-9.	26.0	16

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91	Diagonal Matrix Regression Layer: Training Neural Networks on Resistive Crossbars With Interconnect Resistance Effect. IEEE Transactions on Computer-Aided Design of Integrated Circuits and Systems, 2021, 40, 1662-1671.	2.7	15
92	An Improved RRAM-Based Binarized Neural Network With High Variation-Tolerated Forward/Backward Propagation Module. IEEE Transactions on Electron Devices, 2020, 67, 469-473.	3.0	14
93	Array-level boosting method with spatial extended allocation to improve the accuracy of memristor based computing-in-memory chips. Science China Information Sciences, 2021, 64, 1.	4.3	13
94	Thermal Stability of HfO _x -Based Resistive Memory Array: A Temperature Coefficient Study. IEEE Electron Device Letters, 2018, 39, 192-195.	3.9	12
95	Cryogenic HfO _x -Based Resistive Memory With a Thermal Enhancement Capping Layer. IEEE Electron Device Letters, 2021, 42, 1276-1279.	3.9	12
96	Trends and challenges in the circuit and macro of RRAM-based computing-in-memory systems. , 2022, 1, 100004.		12
97	Investigation of Resistive Switching Mechanisms in Ti/TiO _x /Pd-Based RRAM Devices. Advanced Electronic Materials, 2022, 8, .	5.1	12
98	Weighted Synapses Without Carry Operations for RRAM-Based Neuromorphic Systems. Frontiers in Neuroscience, 2018, 12, 167.	2.8	10
99	Reliability Perspective on Neuromorphic Computing Based on Analog RRAM. , 2019, , .		10
100	Enhancing LiAlO _x synaptic performance by reducing the Schottky barrier height for deep neural network applications. Nanoscale, 2020, 12, 22970-22977.	5.6	10
101	The Impact of Thermal Enhance Layers on the Relaxation Effect in Analog RRAM. IEEE Transactions on Electron Devices, 2022, 69, 4254-4258.	3.0	10
102	Solution Processed Resistive Random Access Memory Devices for Transparent Solid-State Circuit Systems. Materials Research Society Symposia Proceedings, 2014, 1633, 105-110.	0.1	9
103	Compact Reliability Model of Analog RRAM for Computation-in-Memory Device-to-System Codesign and Benchmark. IEEE Transactions on Electron Devices, 2021, 68, 2686-2692.	3.0	9
104	Oscillation neuron based on a low-variability threshold switching device for high-performance neuromorphic computing. Journal of Semiconductors, 2021, 42, 064101.	3.7	8
105	Crossbar-Level Retention Characterization in Analog RRAM Array-Based Computation-in-Memory System. IEEE Transactions on Electron Devices, 2021, 68, 3813-3818.	3.0	8
106	Resistive switching characteristics in HfO _x layer by using current sweep mode. Microelectronic Engineering, 2012, 94, 14-17.	2.4	7
107	Multi-bit nonvolatile logic implemented with metal-oxide based resistive switching device. Solid State Communications, 2015, 205, 51-54.	1.9	7
108	Uniformity improvements of low current 1T1R RRAM arrays through optimized verification strategy. , 2017, , .		6

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109	New structure with SiO ₂ -gate-dielectric select gates in vertical-channel three-dimensional (3D) NAND flash memory. <i>Microelectronics Reliability</i> , 2017, 78, 80-84.	1.7	6
110	Forming-free and Annealing-free V/VO _x /HfWO _x /Pt Device Exhibiting Reconfigurable Threshold and Resistive switching with high speed ($\lt; 30\text{ns}$) and high endurance (10^{12}). , 2021, , .		6
111	Improved unipolar resistive switching characteristics of mixed-NiO _x /NiO _y -film-based resistive switching memory devices. <i>Japanese Journal of Applied Physics</i> , 2015, 54, 094201.	1.5	5
112	Disturbance characteristics of half-selected cells in a cross-point resistive switching memory array. <i>Nanotechnology</i> , 2016, 27, 215204.	2.6	5
113	A Unified Memory and Hardware Security Module Based on the Adjustable Switching Window of Resistive Memory. <i>IEEE Journal of the Electron Devices Society</i> , 2020, 8, 1257-1265.	2.1	5
114	A Self-Terminated Operation Scheme for High-Parallel and Energy-Efficient Forming of RRAM Array. <i>Advanced Electronic Materials</i> , 2020, 6, 1901324.	5.1	5
115	An On-chip Layer-wise Training Method for RRAM based Computing-in-memory Chips. , 2021, , .		5
116	Application of mathematical morphology operation with memristor-based computation-in-memory architecture for detecting manufacturing defects. <i>Fundamental Research</i> , 2022, 2, 123-130.	3.3	5
117	A High-performance and Calibration-free True Random Number Generator Based on the Resistance Perturbation in RRAM Array. , 2020, , .		5
118	Neuromorphic Computing based on Resistive RAM. , 2017, , .		4
119	Sub-nanosecond pulse programming and device design strategy for analog resistive switching in HfO _x -based resistive random access memory. <i>Applied Physics Letters</i> , 2019, 114, .	3.3	4
120	Complementary Memtransistor-Based Multilayer Neural Networks for Online Supervised Learning Through (Anti-)Spike-Timing-Dependent Plasticity. <i>IEEE Transactions on Neural Networks and Learning Systems</i> , 2022, 33, 6640-6651.	11.3	4
121	A circuit-algorithm codesign method to reduce the accuracy drop of RRAM based computing-in-memory chip. , 2020, , .		4
122	Origin and suppressing methodology of intrinsic variations in metal-oxide RRAM based synaptic devices. , 2014, , .		3
123	Microstructure evolution characteristics induced by oxygen vacancy generation in anatase TiO ₂ -based resistive switching devices. <i>Semiconductor Science and Technology</i> , 2017, 32, 035018.	2.0	3
124	Optimization Strategy for Accelerating Multi-Bit Resistive Weight Programming on the RRAM Array. , 2019, , .		3
125	A Compact Model of Analog RRAM Considering Temperature Coefficient for Neural Network Evaluation. , 2021, , .		3
126	Identifying relaxation and random telegraph noises in filamentary analog RRAM for neuromorphic computing. , 2021, , .		3

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127	A Compact Model for Relaxation Effect in Analog RRAM for Computation-in-Memory System Design and Benchmark. , 2021, , .		3
128	Complementary Metal Oxide Semiconductor Compatible Hf-Based Resistive Random Access Memory with Ultralow Switching Current/Power. Japanese Journal of Applied Physics, 2012, 51, 04DD08.	1.5	3
129	Complementary Metal Oxide Semiconductor Compatible Hf-Based Resistive Random Access Memory with Ultralow Switching Current/Power. Japanese Journal of Applied Physics, 2012, 51, 04DD08.	1.5	2
130	Pt/TiO _x /Ti-based Dynamic Optoelectronic Memristor for Neuromorphic Computing. , 2022, , .		2
131	Investigation of forming process for metal oxide-based resistive switching memory by stochastic simulation. , 2014, , .		1
132	RRAM-based coprocessors for deep learning. , 2020, , 363-395.		1
133	Neuronal Firing Characteristics in the NbO ₂ based Mott Memristor. , 2021, , .		1
134	System and Technology Co-optimization for RRAM based Computation-in-memory Chip. , 2021, , .		1
135	Physical mechanism of resistive switching and optimization design of cell in oxide-based RRAM. , 2012, , .		0
136	Degradation Characteristics of Resistive Switching Memory Devices Correlated with Electric Field Induced Ion-Migration Effect of Anode. Chinese Physics Letters, 2013, 30, 117104.	3.3	0
137	Reliability simulation of TMO RRAM. , 2015, , .		0
138	Si Interface Barrier Modification on Memristor for Brain-Inspired Computing. Journal of Physics: Conference Series, 2017, 864, 012064.	0.4	0
139	RRAM Device Characterizations and Modelling. , 2021, , 345-381.		0
140	Real-Time-Scale 3D Kinetic Monte Carlo Simulation for Hafnium Oxide Based RRAM in 1T1R Cell. , 2022, , .		0