Xinming Shi

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Research Interest

- Evolvable hardware based on emerging electronic devices; Memristor-based neural networks; Genetic Programming

Education

University of Birmingham Sep. 2019– Present
Ph. D. in Computer Science *Birmingham, UK*

Huazhong University of Science and Technology Sep. 2016 – Jun. 2019
M.Eng. in Control Science and Engineering ***(Exempt from Admission Exam)*** *Wuhan, China*

Wuhan University of Technology Sep. 2012 – Jun. 2016
B. Eng. in Electronic Engineering with ***Highest Honors (Top 5%)*** *Wuhan, China*

Wuhan University Sep. 2014 – Jun. 2016
B. Art. in English Literature *Wuhan, China*

Project Experience

Guangdong Provincial Key Laboratory Project Oct. 2019 – Present
"Brain-inspired reconfigurable computing" *Birmingham, UK*

- Proposed a novel tree-based circuit representation to evolve the analog circuits.
- Proposed a more efficient evolution algorithm to evolve the analog circuits.
- Proposed evolutionary memristive reconfigurable architectures for reservoir computing.
- Proposed memory-enhanced time delay reservoir and its memristive implementations.

Huawei Ph.D. Internship Project Dec. 2020 – Mar. 2021
"Intelligent compiler of brain-like chip" *Shenzhen, China*

- Worked on the compiler of brain-like chip and completed the summary report.

Hubei Innovative Research Project May 2018 – Jun. 2019
"Theory and its application of autonomous control based on brain-like intelligence" *Wuhan, China*

- Proposed a novel memristor model used in a memristor-based crossbar of spiking neural network.
- Worked on implementing the Deep Q Network into the hybrid memristor-capacitor crossbar.

NSFC Project May 2017 – May 2018
"Analysis and design of memristive circuit based on brain-like computing " *Wuhan, China*

- Designed a memirstor-based neuron circuit with homeostatic plasticity.
- Proposed a memristor-based neuron circuit with an adaptive firing rate.

Huawei Innovation Program Jun. 2016 – Oct. 2016
"Neuromorphic processor architecture research based on memristor" *Wuhan, China*

- Studied over 50 papers about neuromorphic computing and completed the summary report.

Work Experience

Teaching assistant of Evolutionary Computation and Its Application Feb. 2022–Jun. 2022
Southern University of Science and Technology *Shenzhen, China*

- **Execllent Student Teaching Assisant Award**

Four-month Part-time Internship Dec. 2020–Mar. 2021
Huawei 2012 Laboratories Central Research Institute *Shenzhen, China*

- Worked on the project of intelligent complier of the brain-like chip.

Teaching assistant of Data Structures and Algorithms Jan. 2020–Jun. 2020
University of Birmingham *Birmingham, UK*

Publications

- **Xingming Shi**, Leandro L. Minku and Xin Yao, "Adaptive Memory-Enhanced Time Delay Reservoir and its Memristive Implementation," in *IEEE Transactions on Computers*, vol. 71, no. 11, pp. 2766-2777, 1 Nov. 2022, doi: 10.1109/TC.2022.3173151. **(Excellent Science and Technology Academic Paper presented by SZSTA)**

- **Xinming Shi**, Leandro L. Minku, and Xin Yao, "A Novel Tree-based Representation for Evolving Analog Circuits and Its Application to Memristor-based Pulse Generation Circuit," *Genetic Programming and Evolvable Machines*, 23, pp. 453–493, 2022, https://doi.org/10.1007/s10710-022-09436-w.

- **Xinming Shi**, Jiashi Gao, Leandro L. Minku, and Xin Yao, "Evolving Parsimonious Circuits Through Shapley Value-based Genetic Programming," in *Proceedings of the Genetic and Evolutionary Computation Conference Companion*, 2022, pp. 602–605.

- **Xinming Shi**, Jiashi Gao, Leandro L. Minku, James Jian Qiao Yu and Xin Yao, "Second-order Time Delay Reservoir Computing for Nonlinear Time Series Problems," *2021 IEEE Symposium Series on Computational Intelligence (SSCI)*, Orlando, FL, USA, 2021, pp. 1-8, doi: 10.1109/SSCI50451.2021.9659913.

- **Xinming Shi**, Zhigang Zeng, Le Yang and Yi Huang, "Memristor-Based Circuit Design for Neuron With Homeostatic Plasticity," in *IEEE Transactions on Emerging Topics in Computational Intelligence*, vol. 2, no. 5, pp. 359-370, Oct. 2018, doi: 10.1109/TETCI.2018.2829914.

- Le Yang, Zhigang Zeng, and **Xinming Shi**, "A memristor-based neural network circuit with synchronous weight adjustment," *Neurocomputing*, vol. 363, pp. 114–124, 201.

- **Xinming Shi** and Zhigang Zeng, "Memristor-Based Neuron Circuit with Adaptive Firing Rate," *2018 Eighth International Conference on Information Science and Technology (ICIST)*, Cordoba, Granada, and Seville, Spain, 2018, pp. 176-181, doi: 10.1109/ICIST.2018.8426182.

- Jiashi Gao, **Xinming Shi** and James Jian Qiao Yu, "Attn-CommNet: Coordinated Traffic Lights Control On Large-Scale Network Level," *2021 IEEE 33rd International Conference on Tools with Artificial Intelligence (ICTAI)*, Washington, DC, USA, 2021, pp. 289-293, doi: 10.1109/ICTAI52525.2021.00048.

- Jiashi Gao, **Xinming Shi** and James Jian Qiao Yu, "Social-dualcvae: Multimodal Trajectory Forecasting Based on Social Interactions Pattern Aware and Dual Conditional Variational Auto-encoder," *arXiv preprint*, arXiv:2202.03954.

Patents

- **Xinming Shi** and Xin Yao, "Automatic design method and device for analog circuit based on tree structure, equipment and medium," Pub Number: CN202110713376.7, Jun. 2021.

- **Xinming Shi** and Xin Yao, "Automatisches Entwurfsvorrichtung fur eine analoge Schaltung basierend auf enier Baumstruktur," Prioritat: 25.06.2021, Sep. 2022. (German patent)

- **Xinming Shi** and Zhigang Zeng, "A memristor-based neuron circuit with homeostatic plasticity", Huazhong University of Science and Techology, Pub Number CN107742153A, Feb. 2018.

- Huazhong Xu, Miaoke Chen, **Xinming Shi**, Hang Yang, Xiao Peng and Jian Luo, "Concentrated treatment of living oil fumes emissions" Wuhan University of Technology, Pub Number 201530152318.7, May. 2015.

- Huazhong Xu, Yixin Wang, **Xinming Shi**, Xipeng Yu, Xiao Peng, Miaoke Chen, "An emission device of living oil fumes", Wuhan University of Technology, Pub Number 201520324700.6, May. 2015.

Talks

Conference proceeding talk of GECCO 2022 Jul. 2022
"Evolving Parsimonious Circuits Through Shapley Value-based Genetic Programming"Boston, USA (Virtually participated)

Conference proceeding talk of SSCI 2021 Dec. 2021
"Second-order Time Delay Reservoir Computing for Nonlinear Time Series Problems" Orlando, USA (Virtually participated)

Invited talk of Sustech-Huawei RAMS Technology Innovation Lab Mid-Year Meeting Jul. 2021
"Novel EHW based Emerging Electronic Devices" *Shenzhen, China*

Conference proceeding talk of ICIST 2018 Jun. 2018
" Memristor-Based Neuron Circuit with Adaptive Firing Rate" *Cordoba, Spain*

Awards and Honors

Execllent Science and Technology Academic Paper
Shenzhen Association for Science and Technology (SZSTA) *2022*

Execllent Student Teaching Assisant Award
Southern University of Science and Technology *2022*

Outstanding Graduate Student Leader
Huazhong University of Science and Technology *2018*

Meritorious Winner of Mathematical Contest in Modeling (MCM)
Consortium for Mathematics and Its Applications (COMAP) *2015*

Second Prize of The 1st Delta Advanced Automation Contest
Chinese Association of Automation *2014*

Merit Student Award (2 times)
Wuhan University of Technology *2012–2014*

Prominent Student Award (top 5%)
Wuhan University of Technology *2012*

Scholarship for Outstanding Learning Achievement (top 5%)
Wuhan University of Technology *2012*

Professional Service

Memberships

- 2022–Present: SIGEVO Membership

Committee Services

- 2021–Present: Committee Member of Conference Activities and Communications subcommittee in IEEE Computational Intelligence Society (CIS).