Xinming Shi

Homepage:
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Research Interest

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

Education

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

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

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

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

Project Experience

Guangdong Provincial Key Laboratory Project *Birmingham, UK*
"Brain-inspired reconfigurable computing" Oct. 2019 – Present
- 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 *Shenzhen, China*
"Intelligent compiler of brain-like chip" Dec. 2020 – Mar. 2021
- Worked on the compiler of brain-like chip and completed the summary report.

Hubei Innovative Research Project *Wuhan, China*
"Theory and its application of autonomous control based on brain-like intelligence" May 2018 – Jun. 2019
- 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 *Wuhan, China*
"Analysis and design of memristive circuit based on brain-like computing " May 2017 – May 2018
- Designed a memirstor-based neuron circuit with homeostatic plasticity.
- Proposed a memristor-based neuron circuit with an adaptive firing rate.

Huawei Innovation Program *Wuhan, China*
"Neuromorphic processor architecture research based on memristor" Jun. 2016 – Oct. 2016
- Studied over 50 papers about neuromorphic computing and completed the summary report.

Work Experience

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

Four-month Part-time Internship *Shenzhen, China*
Huawei 2012 Laboratories Central Research Institute Dec. 2020–Mar. 2021
- Worked on the project of intelligent complier of the brain-like chip.

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

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 *Boston, USA (Virtually participated)*
"Evolving Parsimonious Circuits Through Shapley Value-based Genetic Programming" Jul. 2022

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

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

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

Awards & Honors

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

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

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

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

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

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

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

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

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).