Hanrui Li

Ph.D. student
Smart, Advanced Memory devices and Applications Lab, KAUST
Thuwal, Saudi Arabia 23955-6900
Webpages: Homepage | Google Scholar | LinkedIn

Email : hanrui.li@kaust.edu.sa
Mobile: +966-547196085

Education

- **King Abdullah University of Science and Technology** — Jeddah, Saudi Arabia
  M.S./Ph.D. in Electrical and Computer Engineering; Nazek El-Atab's Lab — *Sept. 2022 - Present*
- **Changchun University of Science and Technology** — Jilin, China
  B.Sc. in Microelectronics Science and Engineering; GPA: 3.62 (top 5%) — *Sept. 2018 - June 2022*
- **Westlake University** — Zhejiang, China
  Visiting Research Student; Mohamad Sawan's Lab — *June 2021 - April 2022 & June 2023 - August 2023*
- **Peking University** — Beijing, China
  Summer Camp, Integrated Circuit Design; Excellent Internship — *July 2020*

Honors

- KAUST Fellowship
- Dean's list award with 2500 USD, KAUST, 2023
- 8 times scholarship during Bachelor's degree
- Student mentor, Intel ISEF Preparation Program - 2024.2
- Student mentor, IBDAA National Competition - 2023
- Second prize, University Students' Entrepreneurship Competition Challenge Cup - 2019.10
- Second prize, Provincial Physics Experiment Competition - 2019.12
- Third prize, International Collegiate Programming Contest (ICPC) held by ACM - 2019.10
- Third prize, Mathematical Modelling Competition - 2020.3

Research Interest

- Simulation and fabrication on non-volatile memory
- Neuromorphic Computing algorithms: theories and applications.

Research Experience

- **Emerging Non-Volatile Memory and Neuromorphic Computing** — SAMA lab, KAUST
  Advisor: Nazek El-Atab (Assitant Professor) — *Sept. 2022 - Present*
  - Fabrication of 2D material-based memristor
  - SNN-related algorithm and new applications for memory devices
  - Device simulation using TCAD
- **Brain-Machine Interfaces and Neuromorphic Engineering** — CenBRAIN, Westlake University
  Advisor: Mohamad Sawan (Chair Professor, FIEEE, FCAE, FEIC) — *June 2021 - April 2022*
  - Biosignal analysis and processing (ECG, EMG, EEG)
  - Machine learning and hardware co-design (FPGA-based)
  - Built a full-loop biosignal analysis system

- **Real-time object detection and tracking system** Bachelor thesis
  Advisor: Weijun Chen (Professor) *Feb 2022 - June 2022*
  - Develop and optimize object detection algorithm based on YOLOV5
  - Build a GUI interface system based on PyQt5
  - Achieve real-time and low-latency object detection and contour track

Publications

- Kumar D, Joharji L, **Li H**, et al. Artificial Visual Perception Nervous System Using a Solution Processable MoS2-Based In-Memory Light Sensor[J]. Light: Science & Applications, 2023, 12(1): 109.
- Kumar D, **Li H**, Das U, et al. Flexible Solution Processable Black Phosphorus Based Optoelectronic Memristive Synapse for Neuromorphic Computing and Artificial Visual Perception Applications[J].Advanced Materials, 2023, 35(28): 2300446.
- **Li H**, Lone A H, Tian F, et al. Novel Knowledge Distillation to Improve Training Accuracy of Spin-based SNN[C]//2023 IEEE 5th International Conference on Artificial Intelligence Circuits and Systems (AICAS). IEEE, 2023: 1-5.
- **Li H**, Kumar D, El-Atab N. Solution Processable Mos 2 Based Memristive Synapse for Brain Inspired Computing[C]//2023 IEEE 23rd International Conference on Nanotechnology (NANO). IEEE, 2023: 349-352.
- **Li H**, Wang J, Zhao S, et al. Real-time Biosignal Recording and Machine-Learning Analysis System[C]//2022 IEEE 4th International Conference on Artificial Intelligence Circuits and Systems (AICAS). IEEE, 2022: 427-430.
- **Li H**, Tian F, Yang J, et al. NMBNN: Noise-Adaptive Memristive Bayesian Neural Network for Energy-Efficient Edge Health Care[C]//2023 IEEE Biomedical Circuits and Systems Conference (BioCAS). IEEE, 2023.
- Xia F, **Li H**, Li Y, et al. Minimally Invasive Hypoglossal Nerve Stimulator Enabled by ECG Sensor and WPT to Manage Obstructive Sleep Apnea[J]. 2023. Sensors, 2023.
- Ansari M H R, **Li H**, El-Atab N. Vertically Stacked Nanosheet FET: Charge-Trapping Memory and Synapse With Linear Weight Adjustability for Neuromorphic Computing Applications[J]. IEEE Transactions on Electron Devices, 2023, 70(3): 1344-1350.
- Lone A H, **Li H**, El-Atab N, et al. Voltage Gated Domain Wall Magnetic Tunnel Junction for Neuromorphic Computing Applications[J]//IEEE Transactions on Electron Devices, 2023.
- Ansari M H R, **Li H**, El-Atab N. Mimicking Synaptic Behaviors with Junctionless Transistor for Low Power Neuromorphic Computing[C]//2022 IEEE International Conference on Emerging Electronics (ICEE). IEEE, 2022: 1-4.
- Lone A H, Zou X, **Li H**, et al. Discrete Anomalous Hall Resistance-based Quantized Convolutional Neural Network[C]//2023 IEEE International Magnetic Conference-Short Papers (INTERMAG Short Papers). IEEE, 2023: 1-2.
- Lone A H, Ganguly A, **Li H**, et al. Controlling the Skyrmion Density and Size for Quantized Convolutional Neural Networks[J]. arXiv preprint arXiv:2302.01390, 2023.
- **Li H**, Wei C. Material Transporter for Microelectronic Products within the Workshop. CN Utility Patent.

Service Records

- IEEE International Conference on Artificial Intelligence Circuits and Systems (AICAS): 2022, 2023
- IEEE International Conference on Nanotechnology (NANO): 2023
- IEEE International Symposium on Circuits and Systems (ISCAS): 2024

Technical Skills

- **Fabrication and Characterization**
  - Thin Film Deposition: Atomic Layer deposition, Sputtering
  - Wet Etching, Plasma Etching (RIE), Photo Lithography
  - Mask Layout Design
  - Scanning Electron Microscope
  - X-Ray Diffraction
  - Kelvin probe force microscopy
- **Software skills**
  - Machine learning
  - Device simulation based on Silvaco TCAD
  - UI design based on PyQt5
  - L-Edit / Mask design
  - Matlab programming and calculations
  - FPGA design based on Vivado
  - Linux skills
  - chatgpt-prompt-engineering-for-developers (Coursera)