Rui Xie

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Education

- **Southern University of Science and Technology** Mainland China
  Bachelor of Engineering in Microelectronics Science and Engineering; GPA: 3.7/4.0, 88.14/100 *Expected Summer 2022*
  Courses: *Analog Circuits, Digital Circuits, Electronic Design Automation (EDA) Basics, Embedded System and Microcomputer Principle, System-on-a-Chip Design, Advanced Integrated Circuit Design: Microprocessor, MEMS, Engineering Electromagnetics*
  Advisor: *Dr. Quan Chen*

Skills

- **Languages**: Python, MATLAB, C, Java, Verilog HDL, Scala, Chisel
- **Software**: Virtuoso, Quartus, ModelSim, Icepack, Silvaco, LTSPICE, Comsol, SolidWorks, AutoCAD

Experience

- **University of Oxford** Summer School
  Visit Student *Jul. 2019 – Aug. 2019*
  - **Big Data and Social Media**: R Programming and Data Analysis.
  - **University, Tutorial System and Interdisciplinary**: Research on Mass Psychology and Higher Education.
- **The University of Hong Kong** Remote
  Online Summer Research (Advisor: Dr. Zhongrui Wang) *Jun. 2021 – Aug. 2021*
  - **Feedback States Convergence Adjustment of Memristor**: Program to adjust through device characteristic of I-V curve of the memristor.
  - **ARC One Programming**: Fast programming converge method of memristor reading and writing through ArC ONE (Instrument for measuring conductance of memristor crossbars) and Keysights B1500A.

Research Interests

- **EDA Circuits Simulation**
  Electronic design automation
  - **Steady-State Memristor Crossbar Array (MCA) Circuit Simulation**:
    1. Exploited the structural regularity of MCAs to develop a specially-crafted preconditioner;
    2. Designed the process of inverse and application to vectors that can be efficiently evaluated by Kronecker product and block matrix inversion formula;
    3. Experimentalized the numerical test of the specific band matrices;
    4. Obtain a Fund of **10,000 CHY** and won the third prize of 2021 School of Microelectronics Innovation Competition.
  - **Surrogate Modeling of Electro-Thermal Simulation**:
    1. Used Ansys Icepak to modeling and simulate the process of SiC sandwich devices;
    2. Designed the surrogate nueral network model through Python programming.
  - **RRAM (Resistive RAM) Non-Ideal Simulation**:
    1. Design the multiply-add method of specific RRAM through open source RRAM simulation tool CROSSSIM from Sandia National Lab;
    2. Develop the reading and writing control of simulation by amended model of Guass White Noise model.

Projects

- **An optimization algorithm for demosaicing using DE-1 FPGA and camera with LCD screen display**:
  1. Crafted parallel demosaic algorithm, with median filtering and gamma correction;
  2. Four pipelines to store 4×4 pixel data for speed up;
  3. Deployed on DE1 FPGA, 5CSEMA5F31C6.
- **SOBEL operator edge detection on FPGA based on ARM architecture**:
  1. Customized architecture by CMSDK of Arm Cortex-M3 DesignStart Eval IP;
  2. Floats avoid operations by lookup tables, simplify the square and multiplication operations;
  3. Pixel thresholds tests to ensure accuracy while achieving faster real-time display operations.
- **TPU development based on RISC-V and Chisel based on Scala**:
  1. A Google TPU structure based on systolic array using Chisel;
  2. Reconfigured processing elements using Bit-Fusion to accelerate flowing;
  3. VGG-16 network test, 10× less energy consumption than common structure.
- **Campus Bus Travel Time Prediction Based on LSTM and Big Data Techniques**:

1. LSTM and Big Data based prediction method, showing the individuals congestion level and arrival time;
2. With UI and Deployed on WeChat Program, accepted by SUSTech School Bus;
3. The project got a fund of **10,000 CHY** and won the first prize of 2021 School of Microelectronics Innovation Competition.

- **A design of 4×4 Bits array multiplier based on virtuoso**:
  1. A 4×4 array multiplier of $180nm$ technique on Virtuoso of Cadence with special carry method;
  2. $10\times$ less area consumption than common design;
  3. Designed with layered structure and organized locating and wiring.
- **Neural architectural search for RRAM-based AI accelerator**:
  1. An organized network with One-Shot NAS by NNI (An open source AutoML toolkit by Microsoft);
  2. For EDAthon 2021 project, an competition held by CEDA Hong Kong with graduate students;
  3. Attain the rank of 7/24 in the EDAthon 2021.
- **An innovative single-threaded automatic target detection system based on Raspberry Pi**:
  1. Sophomore course project with Raspberry Pi;
  2. Designed the technique of logical value with dichotomous approximation;
  3. Utilized the CAD and Solidworks software design a Electromagnetic gun shell implementing the algorithm.

Publications

- **A Fast Method for Steady-State Memristor Crossbar Array Circuit Simulation, 2021 IEEE International Conference on Integrated Circuits Technologies and Applications**:
  Rui Xie, Mingyang Song, Junzhuo Zhou, Jie Mei, Quan Chen*(Corresponding Author)

Patents

- **Construction and optimization of neural networks for memristor arrays based on circuit simulation (Pending), CN 202110673101.5**:
  Quan Chen, Dayi Fan, Rui Xie, Mingyang Song

Honors and Awards

- **Third Class of Zhicheng College Scholarship** — Sep. 2019
  1500 CHY — $< 20\%$
- **Second Class of Zhicheng College Scholarship** — Sep. 2020
  3000 CHY — $< 7\%$
- **Third Price of China College IC Competition (Provincial Competition Area)** — Jul. 2020
  ARM Cup — $< 10\%$
- **Outstanding Leaders of Zhicheng College** — Apr. 2020
  School-level — 3%
- **College Student Innovation and Entrepreneurship Training Program** — Mar. 2021
  School-level — 10%
- **First Class of Zhicheng College Scholarship** — Sep. 2021
  6000 CHY — $< 3\%$