

Song Liu

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Education

- **Department of EECS, Northwestern University, Evanston, IL** 09/2006 to present
Ph.D. student in Computer Engineering
Advisor: Seda Ogrenci Memik
- **Department of Electronic Engineering, Tsinghua University, Beijing, China** 09/2002 to 07/2006
B.S. in Information Engineering and Electronics

Research Projects

- **Power, Temperature, and Reliability Aware DRAM Architectures**
 - Architectural solutions for thermal issues in high performance DRAM systems:
 - Designed a page hit aware write buffer (PHA-WB) is to improve DRAM power efficiency.
 - Developed a temperature aware least recent used (TA-LRU) cache replacement policy to reduce on DIMM temperature variations.
 - Developed a DRAM temperature aware page allocation (TA-PA) scheme to reduce peak DRAM temperature.
- **Flicker: Saving Refresh-Power in Mobile Devices through Critical Data Partitioning**
 - Develop a software scheme that partitions program data according the criticality of the data and achieves DRAM power reduction by reducing refresh rate of non-critical data
- **DRAM Operating Condition Aware Real Time Scheduling**
 - Developed an operating condition aware scheduler to achieve best schedule efficiency for real time applications with variable execution times. The scheduler adapts for variations in DRAM access time due to fluctuating operating temperatures.
- **Comprehensive Tapered Buffer**
 - Improve tapered buffer design to achieve optimal power-delay tradeoff.

Work Experience

- **Internship at Facebook Inc.** 09/13/2010 to 12/10/2010
Work as software develop engineer (SDE) in the Platform Infrastructure group.
- **Internship at Microsoft Redmond** 06/21/2010 to 09/10/2010
Work as software develop engineer (SDE) in the SQL Server group.
- **Internship at Microsoft Research Redmond** 06/08/2009 to 09/04/2009
Work on project "[Flicker: Saving Refresh-Power in Mobile Devices through Critical Data Partitioning](#)", which trades off reliability of non-critical DRAM data for less DRAM refresh power consumption.

Teaching Experience

- **Instructor of Engineering Design and Communication (EDC)** 2010 Spring
- **Teaching Assistant of Numerical Method for Engineers** 2010 Spring
- **Teaching Assistant of Fundamentals of Computer Programming 2** 2010 Winter

Publications

Journal:

- **Song Liu**, Seda Ogrenci Memik, Yu Zhang, Gokhan Memik, An Approach for Adaptive DRAM Temperature and Power Management, *IEEE Transactions on Very Large Scale Integration Systems* Volume: 18, Issue:4 [TVLSI].
- Rajarshi Mukherjee, **Song Liu**, Somsubhra Mondal, and Seda Ogrenci Memik, A high-level clustering algorithm targeting dual V_{dd} FPGAs, *ACM Transactions on Design Automation of Electronic Systems* Volume 13, Issue 4 [TODAES].

Conference:

- **Song Liu**, Brian Leung, Alexander Neckar, Seda Ogrenci Memik, Gokhan Memik, Nikos Hardavellas, Hardware/Software Techniques for DRAM Thermal Management, *17th IEEE International Symposium on High Performance Computer Architecture [HPCA'11]*.
- **Song Liu**, Karthik Pattabiraman, Thomas Moscibroda, Benjamin Zorn, H Flicker: Saving DRAM Refresh-power through Critical Data Partitioning, *16th International Conference on Architectural Support for Programming Languages and Operating Systems [ASPLOS'11]*.
- Feng Lu, Russ Joseph, Goce Trajcevski, **Song Liu**, Efficient Parameter Variation Sampling for Architecture Simulations, *Design, Automation & Test in Europe [DATE'11]*.

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- **Song Liu**, Seda Ogrenci Memik, Yu Zhang, and Gokhan Memik. TAP: An Approach for Adaptive DRAM Temperature and Power Management, *22nd ACM International Conference on Supercomputing June 7-12, 2008 Island of Kos, Aegean Sea, Greece* [ICS'08].
- **Song Liu**, Seda Ogrenci Memik, Yu Zhang, and Gokhan Memik, A Power and Temperature Aware DRAM Architecture, *IEEE/ACM Design Automation Conference (DAC), June 8-13, 2008, Anaheim, CA* [DAC'08].

Other:

- **Song Liu**, Karthik Pattabiraman, Thomas Moscibroda, and Benjamin G. Zorn: Flicker: Saving Refresh-Power in Mobile Devices through Critical Data Partitioning, Microsoft Research Technical Report, MSR-TR-2009-138, 2009.
- **Song Liu**, Karthik Pattabiraman, Thomas Moscibroda, Benjamin Zorn, Flicker: Refresh Power Reduction in DRAMs by Critical Data Partitioning (Work In Progress), *22nd ACM Symposium on Operating Systems Principles* [SOSP'09].
- **Song Liu**, Seda Ogrenci Memik, and Yehea Ismail, A Comprehensive Tapered Buffer Optimization Algorithm for Unified Design Metrics, under review

Honors and Awards

- Murphy Fellowship, Northwestern University, 2006
- Best Bachelor Thesis Award, Department of Electronic Engineering, Tsinghua University, 2006
- First Class Award in 9th National Challenge Cup, China Association of Sciences, 2005
- Second Prize Scholarship for Academic Excellency, Tsinghua University, 2003/2004/2005

Skills

- Computer Languages: C/C++, Python, Verilog/VHDL, Matlab
- Data Mining Toolset: Weka
- Architectural Simulation Tools: M5, SimpleScalar/Zesto, Simics/Flexus
- Dynamic Instrumentation Tool: Pin
- EDA Tools: Hspice, Design Compiler, ModelSim, PrimePower, Silicon Ensemble, Virtuoso, Protel, and Mentor Graphics
- Embedded System: ARM, DSP (use TI's processors), RF System (use Nordic Semiconductor's chips)

Courses

- Algorithm Design
Design and Analysis of Algorithms, Introduction to VLSI CAD, Introduction to Parallel Computing, VLSI Algorithmics, Machine Learning, Numerical Method
- VLSI System Design and Computer Architecture
ASIC and FPGA Design, Computer Architecture, VLSI System Design, Embedded System Design and Synthesis, High Performance Issues in VLSI Circuits, Low Power and Thermal Aware Design and Synthesis of Digital System
- Other Courses
Information Processing in Wireless Sensor Networks