Irene Y. Zhang

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Education

Massachusetts Institute of Technology — Cambridge, MA
Candidate for **M. Eng.** in Electrical Eng. and Computer Science — June 2009
Advisor: Prof. M. Frans Kaashoek
Graduate **GPA: 5.0/5.0**

Massachusetts Institute of Technology — Cambridge, MA
S. B. in Computer Science and Eng. — June 2008
Undergraduate **GPA: 4.7/5.0**

Interests

Operating systems, distributed systems, networking, storage systems and databases

Research

WheelFS and Large File Distribution
Work with Jeremy Stribling, Prof. Frans Kaashoek and Prof. Robert Morris on a flexible, wide-area distributed file system. The goal of WheelFS is to provide a general wide-area storage solution with a standard POSIX interface. The challenge is that any storage system operating in the wide-area must make trade-offs for performance and trade-off decisions are often better made by applications. WheelFS solves this problem by allowing applications to configure the file system using keywords embedded in the pathname. My thesis work focuses on adding support for efficient file distribution to WheelFS for distributing large files and handling flash crowds.

Improving VMware Workstation Restore using Working Set Estimation
Work on improving the performance of restoring saved virtual machines with mentor, Ken Barr. Performed a performance analysis of the restore process and implemented performance improvements that reduced the time to restore by more than 50%. To hide the latency of reading a multi-gigabyte file from disk, the current implementation starts the VM before the entire image has been fetched. Subsequently, almost every guest memory access requires a disk read, slowing the guest down so much that it is unusable. To minimize disk access, our implementation fetches the working set of guest memory pages before starting the VM, so the guest OS is usable significantly faster.

InHome: A Local Area Peer-to-Peer Caching System
Work with Raluca Ada Popa, Mihir Kedia, Prof. Hari Balakrishnan and Prof. Barbara Liskov on using cooperative caching at a smaller scale (i.e. a university or corporate campus) to trade cheap local-area bandwidth for expensive wide-area bandwidth. Developed a novel algorithm based on the Chord DHT called Data-oriented Chord. In DOC, virtual nodes represent cached data objects, removing any indirection, so when a node leaves or fails, only that node's objects become inaccessible.

Optimizing Distributed Read-only Transactions using Multiversion Concurrency
Work with Dan Ports, Austin Clements and Prof. Sam Madden on achieving good performance in distributed transactional systems without sacrificing strict consistency. Our system weakens causality between distributed nodes instead, which we argue is reasonable because nodes are not expected to be perfectly synchronized. Prototype showed that performance comparable to other systems without strict consistency can be achieved by allowing read-only transactions to utilize slightly stale, but locally available data.

Fresh Breeze Multiprocessor Architecture
Work with Prof. Jack Dennis implementing a cycle-accurate simulator for the Fresh Breeze multiprocessor architecture. Led a 3 student team in the design and implementation of a tool for interacting with the Fresh Breeze simulator. The goal of the Fresh Breeze architecture is to provide a sound base for executing programs written following the principles of modular software construction. The architecture introduces three major departures from conventional multiprocessor design: simultaneous multithreading, global shared address space, and no memory update, cycle-free heap.

Work Experience

MIT Computer Science and Artificial Intelligence Lab — Cambridge, MA
Research Assistant, Parallel and Distributed Operating Systems — Feb 2008 - Present

VMware, Inc. — Cambridge, MA
R&D Intern, Core Performance Group — Jun - Aug 2008

Quickware Engineering and Design — Waltham, MA
Engineering Intern — Jun - Aug 2007

MIT Computer Science and Artificial Intelligence Lab — Cambridge, MA
Undergraduate Research Assistant, Computation Structures Group — Feb - Dec 2006

Cummins, Inc. — Columbus, IN
Engineering Intern, Analysis Led Design — Jun - Aug 2005

Cummins, Inc. — Beijing, China
International Business Intern — Jun - Jul 2004

ArvinMeritor, Inc. — Columbus, IN
Web development Intern — Aug 2003 - May 2004

Teaching

Operating Systems Engineering (6.828) — Sept - Dec 2008
Teaching Assistant, MIT Department of EECS
Developed and graded labs assignments where students build an exokernel-style OS. Held weekly office hours to help students with labs and OS fundamentals like virtual memory management, interrupt handlers and process management.

Intro. to Digital Systems Lab (6.111) — Jan - May 2008
Teaching Assistant, MIT Department of EECS
Taught weekly recitations and helped students with labs using FPGAs and Verilog. Helped students design and implement complex final projects such as 3D object tracking. Received student evaluation of 6.3/7.0, one of the highest ratings in the last 5 years.

Computation Structures (6.004) — Jan - Dec 2007
Lab Assistant, MIT Department of EECS
Held office hours to help students design and build a processor and small OS kernel in simulation.

Intro. to Computer Science and Programming (6.00) — Sept - Dec 2006
Lab Assistant, MIT Department of EECS
Taught students basic computer science concepts using Python such as recursion, abstraction and OOP.

Publications

I. Zhang, K. Barr. *Improving VMware Workstation Restore using Working Set Estimation.* Poster at VMworld '08, Sept 2008.

Reports and Work in Progress

J. Stribling, Y. Sovran, I. Zhang, X. Pretzer, J. Li, M. F. Kaashoek, R. Morris. *Flexible, Wide-Area Storage for Distributed Systems with WheelFS.* Submitted to NSDI '09.

M. Kedia, R. Popa, I. Zhang. *InHome: A Local Area Peer-to-Peer Caching System.* In progress.

D. Ports, A. Clements, I. Zhang. *Optimizing Distributed Read-only Transactions Using Multiversion Concurrency.* In progress.

D. Ports. A. Clements, I. Zhang. *Plaid: Pattern Language for Abstract Datatypes.* May 2007.

Honors and Awards

CRA Outstanding Undergraduate Award, Honorable Mention — 2008
Nominated for work on the Fresh Breeze Multiprocessor with Prof. Jack Dennis.

Northern Telecom/BNR Award for Best Undergrad. Lab Project — 2006
Nominated with Maura Cordial for *A Theatre Lighting Board*, final project for Intro. to Digital Systems Lab.

Officer, Eta Kappa Nu EECS Honor Society — 2008