

RAVI TANDON

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EDUCATION

Princeton University • Princeton, USA

September 2013 - May 2015 (Expected)

MSE. Computer Science And Engineering

Master's Thesis: Faster garbage collectors for hybrid memories

Indian Institute of Technology Guwahati • Guwahati, India

July 2008 - May 2012

Bachelors of Technology. Computer Science And Engineering

Bachelor's Thesis: Recovery Protocols For Flash File Systems

RESEARCH INTERESTS

- Operating Systems (*Memory Management*)
- Storage
- Distributed Systems

PUBLICATIONS

- *Faster garbage collectors for hybrid memories.*
Ravi Tandon, Andrew Appel, *In Submission to International Symposium on Memory Management (ISMM) 2015.*
- *CRP: Cluster Head Relection Protocol for heterogeneous Wireless Sensor Networks.*
Ravi Tandon, Sukumar Nandi, *The Fifth International Conference On Communication Systems And Networks: Cosmnets 2013.*
- *Recovery Protocols For Flash File Systems.*
Ravi Tandon, Gautam Barua, *The 9th International Conference on Distributed Computing and Internet Technologies (ICDCIT 2013).*
- *Adaptive Lagrangean Clustering Protocol*
Ravi Tandon, Biswanath Dey, Sukumar Nandi, *accepted in The Second IEEE International Conference on Parallel, Distributed And Grid Computing(PDGC-2012)*

WORK EXPERIENCE

Human Computer Interaction: Ubiquitous Computing

Summer 2011

University of New Hampshire, USA, Research Intern, Advisor: Prof. Andrew L. Kun

- Designed innovative interfaces using common objects for interacting with a Microsoft Surface..
- Built applications for efficient data visualization and integration of Matlab with Microsoft Surface APIs.
- Performed user study and analysis of interfaces developed using eye-tracking, heart rate monitoring and NASA-TLX (subjective workload assessment tool).

Human Computer Interaction: Multi-Modal Interface Design

Summer 2010

Adobe Advanced Technology Labs, India, Research Intern, Advisor: Dr. Shriram Revankar

- Developed a generic interface for unifying multiple modalities of interacting with applications.
- Worked with Android APIs. Combined touch and speech into a single gesture.

PROJECTS

Operating Systems: Faster garbage collectors for hybrid memories

June 2013 - Present

- Redesigned garbage collection for applications running on non-volatile memories (flash drives)
- Introduced "*Core-Aware Garbage Collection*" in order reduce accesses to flash drives
- Quantify improvements in application throughput and I/Os to flash drive through experiments
([Code](#))

Operating Systems: Tracer: Monitoring Fine Grained Memory Access Patterns

Fall 2013

- Designed "*Tracer*" a tool to monitor access patterns at object level granularity
- Quantify overheads over native C code and improvements over a page-protection mechanism
([Report](#)) ([Code](#))

Big Data: What can go wrong with in-memory computation frameworks

Spring 2014

- Analyzed the effects of memory pressure on big data applications running on *Spark runtime*
- Quantified access patterns at the granularity of objects
- Extended RDDs to index data based on a range partitioning technique to significantly reduce query time
([Report](#)) ([Code](#))

Wireless Sensor Networks: Lagrangean Clustering Protocol

- Developed an energy efficient clustering scheme using Lagrangean Clustering for cluster formation.
- Proposed *Adaptive Lagrangean Clustering Scheme (ALCP)* for homogeneous networks and *Distributed Lagrangean Clustering Scheme (DLCP)* for heterogeneous networks.
([Paper](#)) ([Paper](#))

Wireless Sensor Networks: Sensor Network Model

- Developed a theoretical model for determination of optimal number of cluster heads in sensor networks. This model is called *Unequal Probability Election Model (UEPEM)*.
- Developed a protocol *Optimal Cluster Election Protocol (OCEP)* based on the model proposed in *UEPEM*. Comparison with existing protocols such as CODA and LEACH was done. Results showed *OCEP* outperforms existing clustering approaches. ([Paper](#))

Wireless Sensor Networks: Weight Based Clustering

- Proposed a clustering protocol that assigns weights to sensor nodes based on their residual energy. Simulation studies showed that this clustering approach (***Weight Based Clustering for Heterogeneous Sensor Networks***) improves energy efficiency over similar approaches (such as *HEED* and *GC*). ([Paper](#))

Wireless Sensor Networks: Cluster Head Reelection Protocol

- Proposed a clustering approach that elects cluster heads in two different phases. The novelty is in cluster reorganization to ensure that the sensor node with the highest residual energy becomes a cluster head.
- Simulation of SEP, LEACH and FAIR was done. Comparison with existing protocols showed that CRP elects cluster heads in a better manner and prolongs the lifetime of sensor network. ([Paper](#))

File Systems: Recovery Protocols For Flash File Systems

Fall 2011 - Spring 2012

- Designed protocols that recover file system state from a system crash or a user transaction abort.
- Implementation of protocols on an open source flash file system (***YAFFS***) and integration of [transactional file system](#) with YAFFS was done. ([Code](#)) ([Paper](#))

File Systems: Online Backup and Versioning In Log Structured File Systems

Fall 2011 - Spring 2012

- Proposed an online backup approach that circumvents user transaction aborts due to the backup process for log-structured file systems.
- Defined "Conflict Dependence" that helps identify conflicts within backup and user transactions and propose an implementation within a log-structured file system (LFS) that does not require aborts. ([Paper](#))

Operating Systems: Design Improvements In Pint Operating System

Fall 2010

- Thread Management - Provided synchronization support to the threads. Implemented a thread scheduler.
- User Programs - Enabled user programs to interact with the OS via system calls.
- Virtual Memory - Provided user programs support of an extended virtual memory. It required study of page table, the supplemental page table, the swap table implementation, management of memory mapped files and management of the frame table.
- File Systems - Provided support for extensible files, implemented buffer cache, subdirectories and system calls that read and write to a directory.

Information Retrieval: An analysis of approximate page ranking

Fall 2013

- Redesigned page ranking to reduce computation by filtering stable nodes
- Implementation and experimentation showed that the overall runtime can be improved by 27% for approximate results ([Report](#)) ([Code](#))

Computer Architecture: 4-bit CPU Design

Fall 2009

- Designed control logic for a 4-bit Microprocessor with an ALU, Register Set and 256 X 4 bit RAM based on Micro programmed Control, 4 bit data bus, 8 bit address bus. Implemented 16 Arithmetic, Logic and Procedure Call instructions.

Network Application: HTTP Proxy Server

Spring 2012

- Implemented concurrency in proxy server with thread safety, caching of objects based on different caching policies, DNS based load balancing

Other Projects

2008-2010

- Designed and implemented an LL Parser and a SLR Parser for a subset of the C language.
- Designed and implemented an assembler and a loader for assembly level instructions of a subset of x86 architecture.
- Devised a stock predictor using Batch and Stochastic Gradient Descent.
- Designed a web portal for storing and searching academic documents.

AWARDS AND ACHIEVEMENTS

- *Princeton University Graduate Fellowship*, 2013
- Qualified state level of NATIONAL TALENT SEARCH EXAMINATION (62%)
- Secured AIR 649 in 4th NCO (National Cyber Olympiad) , AIR 522 5th NCO (National Cyber Olympiad) , and AIR 833 in 6th NSO (National Science Olympiad)

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