

# Maheswaran Sathiamoorthy

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RESEARCH INTERESTS	Data Center Networks: Coding techniques for distributed storage; reliable block storage. Traditional Networks: Analysis and design of content distribution strategies that primarily rely on coded storage, with a focus on Vehicular Networks.	
EDUCATION	<b>University of Southern California</b> , Los Angeles, California, USA <i>Doctor of Philosophy, Electrical Engineering</i> <b>Aug 2008 – Present</b> <ul style="list-style-type: none"><li>• GPA: 3.93/4</li><li>• Advisors: Prof. Bhaskar Krishnamachari &amp; Prof. Alexandros G. Dimakis</li></ul> <b>Indian Institute of Technology (IIT)</b> , Kharagpur, West Bengal, India <i>B.Tech(H), Electronics and Electrical Communication Engineering</i> <b>July 2004 – May 2008</b> <ul style="list-style-type: none"><li>• GPA: 9.27 out of 10.00</li><li>• Ranked 3/50 in the department and 7/650 in the Institute</li></ul>	
PUBLICATIONS	<ul style="list-style-type: none"><li>• M. Sathiamoorthy, M. Asteris, D. Papailiopoulos, A. G. Dimakis, R. Vadali, S. Chen, D. Borthakur, “XORing Elephants: Novel Erasure Codes for Big Data”, <i>Accepted for publication, VLDB 2013</i>.</li><li>• M. Sathiamoorthy, W. Gao, B. Krishnamachari, G. Cao, “Minimum Latency Data Diffusion in Intermittently Connected Mobile Networks”, in <i>2012 IEEE 75th Vehicular Technology Conference: VTC2012-Spring, 6-9 May 2012, Yokohama, Japan</i>.</li><li>• M. Sathiamoorthy, A. G. Dimakis, B. Krishnamachari, F. Bai, “Distributed Storage Codes Reduce Latency in Vehicular Networks”, in <i>Proceedings of the IEEE INFOCOM Mini-conference, 2012</i>.</li><li>• M. Alresaini, M. Sathiamoorthy, B. Krishnamachari, M. J. Neely, “Backpressure with Adaptive Redundancy (BWAR)”, in <i>Proceedings of the IEEE INFOCOM, 2012</i>.</li><li>• S. Lee, S. Patten, M. Sathiamoorthy, B. Krishnamachari, A. Ortega, “Spatially-Localized Compressed Sensing and Routing in Multi-Hop Sensor Networks”, <i>3rd International Conference on Geosensor Networks</i>, July 2009, Pages 11-20.</li></ul>	
INTERNSHIP EXPERIENCE	<b>General Motors R&amp;D</b> , Warren, MI <i>Summer Internship</i> <b>May 2011 – Aug 2011</b> <ul style="list-style-type: none"><li>• Developed a new inter-vehicular video sharing application based on GM’s existing Wavecast system for vehicular communication.</li><li>• Integrated erasure coding into the application for faster distributed file downloads.</li><li>• Additionally, developed an Android application to act as the front end (which connects to and controls the Linux based video sharing application wirelessly).</li></ul> <b>University of Southern California</b> , Los Angeles <i>Summer Internship</i> <b>May 2007 – July 2007</b> <ul style="list-style-type: none"><li>• Worked on the energy reduction of Wireless Sensor Networks using Compressed Sensing</li><li>• Compressed Sensing is used to integrate compression and sensing to achieve energy gains as high as 90% in ideal conditions.</li><li>• The work involved using wavelet and DCT domains to perform compressed sensing to sense temperature. Sparse random projections were used to effectively reduce the number of communications to the sink. Methods for optimizing the projections were also investigated.</li></ul> <b>Nanyang Technological University</b> , Singapore <i>Summer Internship</i> <b>May 2006 – July 2006</b> <ul style="list-style-type: none"><li>• Developed an English Continuous Speech Recognizer based on TIMIT Database using HTK software.</li><li>• Automated (using Perl scripts) the process of training and testing the Speech Recognizer.</li><li>• Worked on Variable Frame Rate Algorithms and tested them on the CENSREC-3 database.</li><li>• Researched on Spectral Entropy based Speech Features and came up with modifications along with testing it on the CENSREC-3 database.</li></ul>	

**Reliable Block Placement in Data Centers****May 2012 – Present**

- Determine which nodes should store which block of files.
- Optimal block placement can significantly increase the reliability of data.
- Works for replicated and coded blocks.
- Future work involves implementing a Block Placement Policy in Hadoop.

**Implementation of Regenerating Codes for Hadoop****Sept 2011 – July 2012**

- Regenerating codes specially designed for data centers are being implemented over Hadoop HDFS
- Based on Facebook's implementation of HDFS-RAID
- Open sourced at <https://github.com/madiator/hadoop-20>
- About 2x reduction in network utilization and disk I/O during file repairs.
- Advised by Prof. Alex Dimakis.

**Network Coding for Vehicular Networks****Aug 2010 – Present**

- Network Coding applied to Vehicular Networks to minimize the delay in content retrieval.
- Obtained theoretical upper bounds on delay and showed regions where Network Coding performs better than naive distribution strategy.
- Simulated on real taxi traces to show the improvement.
- Continued the work at General Motors to test on real vehicles.
- Advised by Prof. Bhaskar Krishnamachari, Prof. Alex Dimakis and Dr. Fan Bai.

**Twitter Retweet Dynamics****Apr 2010 – Aug 2011**

- Using data collected from Twitter, we showed an interesting trend between the number of retweets received and the probability of retweeting by Twitter users.
- Work was presented at the *2nd Annual Annenberg Symposium* and was invited to present again at the *3rd Annual Annenberg Reception*.
- Future work involves characterization of Tweets based on their space-time properties, spam detection in Twitter etc.
- Advised by Prof. Antonio Ortega.

**Implementation of MapReduce****Feb 2010 – Apr 2010**

- Implemented MapReduce (a framework for distributed processing) on USC's High-Performance Computing and Communications (HPCC) cluster consisting of thousands of nodes, as part of a course.
- Used it to study huge network datasets.
- Course (Computer Communications, CS551) advised by Prof. John Heidemann.

**Other projects**

- VANETSim: A Vehicular Network Simulator - primarily designed to study coded and uncoded content distribution strategies in vehicular networks using real GPS traces.
- Implementation of Nachos, a software that simulates a small OS, involving process management, memory management, interprocess communication, fault tolerance etc. for a course on Operating Systems.
- Flash Scheduling - proposed and analyzed a new scheduling algorithm in a multi-user communication system with varying number of users (term project for Computer Communications course).

## SKILLS

*Programming Languages:* C, C++, Java, Python*Software Experiences:* Hadoop, Android, TCP/IP, Matlab, L<sup>A</sup>T<sub>E</sub>X, Processing*Databases:* MySQL, MongoDB*Scripting Languages:* Perl, Linux shell scripting*Hardware Description:* Verilog HDL*Web Technologies:* HTML, CSS, JavaScript, PHP*Foreign Languages:* German [beginner level]

## TEACHING

TA for **Wireless and Mobile Device Networks Design and Laboratory** (Spring 2012).

## COURSES

Trends in Cloud Computing and Data Center Networking  
Distributed Storage Theory                      Algebraic Coding Theory  
Analysis of Algorithms                      Approximation Algorithms  
Computer Communications                      Operating Systems  
Random Processes in Engineering                      Wavelets  
Queueing Theory  
Design and Analysis of Computer Communication Networks  
Probabilistic Methods in Computer Systems Modeling

## HONOURS AND AWARDS

- USC Annenberg Fellowship 2008-2012 - University of Southern California
- InfoUSA Summer Fellowship 2007 - University of Southern California
- One of the seven finalists of Trilogy's Pirates of the Corporate, a web 2.0 business plan contest held at Hong Kong.
- Amateur Radio License (Grade II) from Ministry of Communications, Government of India (2003).
- Ranked among top 0.5% of about 170,000 students appeared in JEE 2004.

## REFERENCES

Prof. Bhaskar Krishnamachari  
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Ming Hsieh Department of Electrical Engineering  
USC Viterbi School of Engineering, Los Angeles, CA  
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