

Aman Mangal

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HOME PAGE	https://www.prism.gatech.edu/~amangal7/ https://github.com/mangalaman93/	
RESEARCH INTERESTS	Distributed Computing, Cloud Computing, Software Defined Networking Distributed Event Based Systems, High Performance Computing	
EDUCATION	Georgia Institute of Technology, Atlanta, GA Pre-Doctoral Student in School of Computer Science, GPA 4.0/4 Indian Institute of Technology, Bombay, India Bachelor of Technology in Computer Science & Engineering with Honors, GPA: 8.54/10 Minor in Electrical Engineering, GPA: 8.06/10	
PUBLICATIONS	1. Aman Mangal , Arun Mathew, Tanmay Randhavane and Umesh Bellur. “Predicting Power Needs in Smart Grids”. In Proceedings of the 8th ACM International Conference on <i>Distributed Event-Based Systems</i> (DEBS '14).	
RESEARCH EXPERIENCE	Optimizing Short Read Error Correction on GPU [Oct 2014 - Present] Guide: Prof Richard Vuduc [https://bitbucket.org/cjain7/cse6230-project] <ul style="list-style-type: none">■ Improved efficiency of GPU based state of the art error correction software CUDA-EC by 14.81% by increasing warp efficiency from 3.5% to 67.5% and other optimization■ Restructured the code by having one read processed by one warp and showed that <i>multiple-thread-one-read</i> model has enough task parallelism to exploit on GPU compared to the classical model of <i>one-thread-one-read</i> model■ Demonstrated that Bloom Filter access throughput cannot be further improved by showing that average bits accessed per query is only 1.25 bits Fault Tolerance in Software Defined Networks [Oct 2014 - Present] Guide: Prof Nick Feamster [https://github.com/mangalaman93/pyretic] <ul style="list-style-type: none">■ Proposed an algorithm for handling link failures in SDNs and implemented it in pyretic■ Performed reverse search by first selecting shortest paths in the network and then choosing links for which these paths can be used as back up paths■ Provided fine-grained control over the network by let the user specify flows and end nodes corresponding to which back up paths are to be installed■ Installed flow rules proactively to reduce downtime due to link failure Dynamic Server Consolidation in Virtual Cluster [July 2013 - May 2014] Guide: Prof Varsha Apte [https://github.com/mangalaman93/simcon] <ul style="list-style-type: none">■ Leveraged cyclic workload of enterprise applications and formulated Dynamic Server Consolidation Problem (DSCP) as Finite Horizon Markov Decision Process (MDP)■ Reduced state space of MDP exploiting homogeneity of Physical Machines, therefore, reducing time complexity by a factor of $(\log N)^N$, N is number of applications (VMs)■ Implemented multi-threaded search for optimal path with pthread framework of C++, further cutting down asymptotic complexity by a factor of N■ Compared with Dynamic Management Algorithm of Khanna and pMapper while providing the benefit of known cyclic workload, thus proving the optimality of MDP	

Erlang Distributed File System (Undergraduate Thesis) [July 2013 - Dec 2013]

Guide: Prof G. Sivakumar

[view report]

- Extensively surveyed existing Distributed File Systems and developed a taxonomy
- Inspired from Hadoop Distributed File System, highly concurrent & fault tolerant
- Followed cluster based architecture, replicated metadata server to remove single point failure but complete location and network transparent
- Implemented stateless worker nodes to achieve fault tolerance, event based protocol to detect component failures in the system
- Designed worker node as finite state machine with 4 different states- ReadWrite (normal state), ReadOnly, Distress and Unavailable

**WORK
EXPERIENCE**

Erlang Package Manager (Google Summer of Code 2013) [June 2013 - Present]

Mentor: Eric Merritt & Jordan Wilberding [<https://github.com/mangalaman93/epax>]

- Built a command line interface(CLI) to create and maintain index of Erlang packages
- Solved the problem of dependency hell by retrieving OTP dependencies recursively
- Separated OS dependent and OS independent code, portable on Windows and Linux
- Provided support for various version control systems like git, bzt, svn where Erlang packages can be maintained
- Working on adding the concept of publisher so that indexes of other users can be fetched

Unified Call Distributor (Novanet Ltd) [Dec 2012 - Dec 2013]

- Worked in a team of developers responsible for back end Erlang application (Call Distributor)
- Developed an algorithm to equally assign calls to agents by matching mandatory and desired skills to agent properties, considered idle time in case of a draw in properties
- Independent of channel (voice, chat, email etc.) of the request, hence unified
- Designed the OTP layout containing 14 different kinds of supervisors and workers
- Handled fail-over when master node dies, replicated database to backup node

Operation's Dashboard - opdash (Chronus Corporation) [May 2013 - June 2013]

Mentor: Murali Bhoopathy, Director of Operations & Co-founder

- Built dashboards and command line tool (CLI) to visualize operation's performance for various production environments
- Used REST APIs to gather data from Pingdom, Newrelic, Amazon, Google spreadsheets and pushed it on Geckoboard for visualization
- Provided switches to specify time duration, production environment in CLI
- Deployed on Amazon servers and scheduled periodic updates using cron utility

**TEACHING
EXPERIENCE**

Teaching Assistant

MA 214 - Introduction to Numerical Analysis

[Spring 2012]

Instructor: Prof S. Sivaji Ganesh, IIT Bombay

TALKS

Serial Communication between Arduino and MATLAB

At Electronics Club, IIT Bombay, India [slides]

[June 6, 2012]

**ACADEMIC
ACHIEVEMENTS**

- Secured All India Rank 70 in IIT JEE 2010 among 400,000 students
- Participated in Student Exchange Program and completed the spring semester 2011-12 in Nanyang Technological University (NTU), Singapore
- Secured A+ grade for exceptional performance in Algorithms course (NTU, 2012)
- Secured All India Rank 256 in AIEEE 2010 among 800,000 students
- Awarded Narotam Sekhsaria Scholarship - 2010 for undergraduate studies in engineering
- Distinguished by Vasundhara Raje, Chief Minister of Rajasthan, India for 13th merit in Secondary Board Examination 2010

CAMPS &
OLYMPIADS

- Stood amongst the top 1% students of the country in Indian National Physics Olympiad
- Secured 56th position in the final round of 12th National Science Olympiad (NSO)
- Accomplished 7th position in second round of Indian National Mathematics Olympiad
- Invited for the session of Council of Scientific and Industrial Research (CSIR) Programme on Youth for Leadership in Science (CPYLS) 2008 in CEERI Pilani, India
- Invited for Google Summer of Code (GSoC) Mentor Summit (Reunion), 2014 held at San Jose, CA, USA [23-26 Oct, 2014]

KEY PROJECTS
UNDERTAKEN

Querifier (Implementation Techniques for Relational Databases) [Oct'12-Nov'12]

Guide: Prof. N. L. Sarda [https://github.com/mangalaman93/querifier]

- Designed an interface using JSP and Servlets for students to submit SQL queries, and verify the submitted queries with the desired result as per the query provided by instructor
- Used AJAX calls throughout the session of a user to minimize HTML traffic
- Implemented news forum where users can post questions and reply to the existing threads
- Provided updates and upcoming deadlines on the user's homepage

Click to Cheat (Hack U Competition by Yahoo)

[Aug'12]

[https://github.com/mangalaman93/click_to_cheat]

- Developed an Android application that answers a natural-language fact based multiple choice question given a clicked image
- Developed a JNIWrapper to use OpenCV's Adaptive Thresholding functions in android for efficient text recognition (using Google's Tesseract OCR engine)

Singapore Mass Rapid Transit (Business Operations and Processes) [Feb'12-Apr'12]

Guide: Prof Liu Fang

- Studied behavior of SMRT, proposed possible improvements based on statistical analysis
- Conducted a survey focused on train efficiency, operations, service standards to support existence of problems in MRT (local train system of Singapore)
- Theoretically calculated the train inventory using Little's Law, compared it with the collected data thereby proving the optimality of the existing system

Steganography (Data Structures and Algorithms)

[Sept'11-Nov'11]

Guide: Prof. Varsha Apte [http://github.com/mangalaman93/steganography]

- Developed using OpenCV to hide secret texts, files or small images in image files
- Implemented Least Significant Bit (LSB) Insertion algorithm to ensure invisibility of change in cover image
- Huffman Compression of the secret data is used to achieve high payload capacity

Voice Recognition System (Electronics Club Summer Project) [May'11-June'11]

- Implemented Discrete Wavelet Transform(DWT) using suitable mother wavelet to recognize voice commands independent of the characteristics of the speaker
- Prototyped in MATLAB and implemented it in C to run it onto ATMEGA-328 μ C
- Solved the problem of small memory of μ C by using external EEPROM (25LC1024) and designed a software cache to speed up writes and reads
- Developed a library to interface 7-seg LED Display to show static & dynamic text on it

OTHER
PROJECTS

- Developed a language processor CFGLP extending features of C++, generates assembly code (x84 architecture) from Control Flow Graph
- Designed virtual memory system with page in/out schemes, page fault handling, TLB, swap space management in OS/161 operating system
- Developed a prototype of electronic eyes for blinds to cross road on Atmega-32 platform using Ultrasound technology and Doppler effect

- Developed a strategy based 2-player game Connect-4 in MIT Scheme, implemented an AI player using minimax algorithm with alpha beta pruning
- Programmed Snake game having 10 levels of difficulty using EzWindows C++ library

SOFTWARE & PROGRAMMING SKILLS

- Proficient in C, C++, Erlang, Java, Prolog, Python
- *LTSA*, Scilab, Xilinx(Verilog), Android
- Ruby on Rails (RoR), Java (JSP Servlets), AJAX, Javascript, PHP

POSITION OF RESPONSIBILITY

Convener of IIT Bombay Broadcasting Channel (IIT-BBC) [July'11-Dec'11]

- Founded first ever online broadcasting channel by an institute in India, with the help of Insight, IIT Bombay's Student Media Body and Newsletter
- Provides cultural, technical, sports and academic updates through videos
- Published over 50 videos in the first four months of the channel

ITSP Mentor (Institute Technical Summer Projects)

- Helped sophomore teams in their respective summer projects in 2012 and 2013
- Awarded for unprecedented mentorship by Student Technical Activities Body (STAB)

EXTRA CURRICULARS

- Contributed to spoken tutorial on Pre-Processor in GCC under Spoken Tutorial Project by testing the scripts as a novice (2011)
- Successfully completed the basic module in Japanese offered by Japanese Embassy (2012)
- Guided the under-privileged in regular doubt clearing classes organized by Abhyasika under Group for Rural Activities(GRA) (2011 - 2013)
- Secured first prize in short film making competition by Silverscreen club, IIT Bombay
- Designed a Wireless car using RF Module and an autonomous Line Follower on Arduino
- Successfully completed training in NSO Music(Keyboard) in 2010-11