

Sandeep KUMAR

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EDUCATION

- 2011 - 2013 Master of Engineering in COMPUTER SCIENCE, 1st class
Computer Science and Automation Department,
Indian Institute of Science, Bangalore, India
Thesis: “Modeling Storage Performance in a HPC System”, Grade “A” (7/8)
Advisor: Prof. K. GOPINATH
- 2007 - 2011 Bachelor of Technology in COMPUTER SCIENCE, 1st class
Guru Gobind Singh Indraprastha University, New Delhi, India

RESEARCH INTEREST

Distributed and Parallel Systems, Operating Systems, Machine Learning.

RESEARCH PROJECTS

- **SCALABLE PERFORMANCE TUNING OF HADOOP MAPREDUCE: A NOISY GRADIENT APPROACH**
The simultaneous perturbation stochastic approximation (SPSA) algorithm is a noisy gradient algorithm that has been successfully deployed for parameter tuning in a variety of applications ranging from traffic control to service systems. The SPSA algorithm tunes the parameters by directly observing the performance of the real system. Further, the SPSA is independent of parameter dimensions and requires only two or fewer observations per iteration. We tune the Hadoop parameters using the Simultaneous Perturbation Stochastic Approximation (SPSA) algorithm in order to achieve better performance than the default configuration. We are currently comparing this method with other techniques such as Starfish.

Advisor: Prof. K. GOPINATH & Prof. Shalabh Bhatnagar

Collaborators: Sindhu Padakandla, Priyank Parihar & Chandrashekhar Lakshminarayanan

- **HUMAN GAIT ANALYSIS.**
Human GAIT Analysis is the study of Human Motion and is used to figure out the problem in people with abnormal Gait and if possible fix it. The current gold standard method of doing a Gait Analysis is by using Optical system, which are very expensive and not so easy to use. We are looking into ways to use IMU(Imperial Measurement Unit) sensors, which comes with inbuilt Gyroscope, Accelerometer and Magnetometer, to perform Gait Analysis . We are currently looking at algorithms and methods which can make the results from IMU system clinically relevant. We can use Machine Learning techniques to provided suggestion to Doctors and Surgeons based on the data recorded.

Advisors: Laura Rocchi, Prof. K. GOPINATH

- **MODELING STORAGE PERFORMANCE IN A HPC SYSTEM USING MACHINE LEARNING.**

[ME Thesis]

We present a mathematical model that can capture the relationship between the *features* (configuration parameters of a file system, hardware configuration and the workload configuration) and the *performance metrics* (Read speed, write speed of disk etc.) and use this to rank the features according to their importance in deciding the performance of the parallel file system (Gluster FS). With the knowledge about the importance of the features and by using the prediction model, the bottleneck in the system can be identified which can help in improving the efficiency of the cluster.

Advisor: Prof. K. GOPINATH | GRADE: “A” (7/8)

Thesis: <https://goo.gl/eglBjh>

PUBLICATIONS

- Sandeep Kumar, Sindhu Padakandla, Chandrashekhar L, Priyank Parihar, K. G. (2017). Performance Tuning of Hadoop MapReduce: A Noisy Gradient Approach. *IEEE Cloud*, 8.
<https://arxiv.org/abs/1611.10052>

COURSE PROJECTS

- **PINTOS: OPERATING SYSTEM.** [2011]
Worked on *PINTOS* (a simple instructional Operating System) and implemented the functionality of Thread Synchronization, User Program, Virtual Memory and File System in the kernel of the Operating System.
Advisor: [Prof. K. GOPINATH](#)
- **DISTRIBUTED COMPUTING.** [2012]
Wrote [Distributed Programs](#) to solve TSP (Travelling sales man problem), ABP (Alpha Beta pruning search) and MST (Minimum spanning tree) using *rpqgen* in C++ and showed a speed up of factor 9, 6 and 2.5 respectively when the number of servers went up from 1 to 6.
Advisor: [Prof. R.C. HANSDAH](#)
Report: <https://goo.gl/BnTpTF>
- **COMMUNICATION NETWORK.** [2012]
Studied the algorithm [SOFA \(Sleep optimal Fair attention\)](#), which aims the energy conservation in wireless devices by changing the scheduling policy by simulating it to see the performance.
Advisor: [Prof. Shalabh BHATNAGAR](#)
Report: <https://goo.gl/Lh5Q9>
- **GAME THEORY.** [2012]
Studied existing scheme for handling [Kidney Exchange Programs](#) and proposed a new scheme **SPAR** for this.
Advisor: [Prof. Y. NARAHARI](#)
Report: <https://goo.gl/3Mujoh>
- **NETWORK AND DISTRIBUTED SYSTEMS SECURITY.** [2012]
Design and implemented a Secure Email server, using *Diffie Hellman* key exchange algorithm for secure exchange of keys and *DES* algorithm for encrypting the messages using the keys exchanged earlier. *SHA-512* hashing algorithm was used to store password on server side.
Advisor: [Prof. R.C. HANSDAH](#)
- **SOFTWARE ARCHITECTURE.** [2012]
Design and Implemented Hospital Insurance Portal using *MVC (Model View Controller)* architecture for managing the insurance related activities of a Hospital and communicate with other services using *REST* architecture. It had two Views, Desktop and Mobile, using the same Model and Controller. The Design was kept the design simple and flexible, so that it should be easy to upgrade.
Advisor: [Prof. Raghu HUDLI](#)

WORK EXPERIENCE

SEPT 14-PRESENT	INDIAN INSTITUTE OF SCIENCE, Bangalore, Karnataka <i>Research Associate</i>
JUL 13-JUN 14	DELL R&D, Bangalore, India <i>Software Development Engineer</i> At Dell R&D, I was a part of the BizClient team working on BIOS configuration and system management tools, <i>DCC</i> (Dell Command Configure) and <i>OMCI</i> (Open Manage Client Instrumentation) respectively. DCC allows BIOS configuration from the Desktop (Windows and Linux) and OMCI allows remote management application programs to access information about the client computer. My primary job was to implement new features in the program as they become available in the BIOS. I also worked on remapping the GUI of the DCC using WPF (Windows Presentation Foundation).

TALK

- **USING IMU SENSORS AND ANDROID FOR HUMAN GAIT ANALYSIS**
Gave a talk on techniques used for doing Human Gait Analysis using IMU (Inertial Measurement Sensors) and Android smart phone along with some preliminary results at Robert Center for Cyber Physical System, IISc, Bangalore.
Slides: <https://goo.gl/x6XRWw>

TECHNICAL SKILLS

- Programming:
 - Proficient in C++, C, JAVA, .NET (C# and WPF).
 - Prior Experience in R, Python, MATLAB, SQL, JavaScript.
- Working knowledge of a *Linux Kernel*.
- Experience with *Hadoop* and *GlusterFS*.
- Experience in Developing **Android Apps** and maintaining the Back-end Server.
 - [Cricket Jyotishi](#)
 - [Daily Book Quotes](#)
 - Human Gait Analysis (In Progress)

REFERENCES

Gopinath K.
Professor
gopi@csa.iisc.ernet.in
Computer Science and Automation
Indian Institute of Science.

INTERESTS AND ACTIVITIES

- Apart from field of Computer Science, I love to read books, specially Fiction, Biographies and History books.
List of Books read so far :<https://goo.gl/bEjjJ>
- I love to play an Online strategy game, called Defense of the Ancients 2 (DOTA 2).
Profile: <http://www.dotabuff.com/players/88064784>
- I occasionally go for Cycling and Trekking Trips.
Some Pics: <https://goo.gl/ue6qeH>
Strava Profile: <https://goo.gl/F1ow46>