# Sandeep **Kumar**

Ph.D. Student

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## Education

**Indian Institute of Technology Delhi** — *New Delhi, India*

Doctor of Philosophy (DGPA: 9.4/10) — *Jul. 2017 - Jul. 2022 (Expected)*

- Advised by Prof. S. R. Sarangi
- Thesis: "Secure Computing". We study the challenges faced in today's world in the secure execution of an application on an untrusted system.

**Indian Institute of Science** — *Bangalore, India*

Master of Engineering in Computer Science ($1^{st}$ class, CGPA: 5.9/8 ) — *Jul. 2011 - Aug. 2013*

- Thesis: "Modeling Storage Performance in an HPC System". We analyzed the performance of a parallel file system (GlusterFS, in our case) and study the factors (size of read/write, amount of read/write, replications, striping, network speed, underlying file system. etc.) that impacts its performance in an high performance computing system.
- Advised by Prof. K. Gopinath
- Thesis: https://tinyurl.com/yezfhmdw

**Ambedkar Institute of Technology (Guru Gobind Singh Indraprastha University)** — *New Delhi, India*

Bachelor of Technology in Computer Science ($1^{st}$ class, $73.4\%$) — *Jul. 2007 - Aug. 2011*

## Publications

1. **Sandeep Kumar**, Abisek Panda, and Smruti R. Sarangi. SecureLease: Maintaining Execution Control in The Wild using Intel SGX. **Under Submission**
2. **Sandeep Kumar**, Abisek Panda, and Smruti R. Sarangi. SGXGauge: A Comprehensive Benchmark Suite for Intel SGX. **Under Submission**
3. **Sandeep Kumar**, Diksha Moolchandani, and Smruti R. Sarangi. Hardware-Assisted Mechanisms to Enforce Control Flow Integrity: A Comprehensive Survey. **Under Submission**
4. **Sandeep Kumar** and Smruti R. Sarangi. SecureFS: A Secure File System for Intel SGX. In **RAID**, Spain, 2021.
5. **Sandeep Kumar**, Aravinda Prasad, Smruti R. Sarangi, and Sreenivas Subramoney. Page Table Management for Heterogeneous Memory Systems . In **ISMM**, Virtual, Canada, 2021.
6. **Sandeep Kumar**, Diksha Moolchandani, Takatsugu Ono and Smruti Sarangi. *F-LaaS: A Control-Flow-Attack Immune License-as-a-Service Model* . In **IEEE SCC**, Milan, Italy, 2019.
7. **Sandeep Kumar**, Poorna Talkad Sukumar, K. Gopinath, Dr. Jayanth Sampath, Laura Rocchi, Suyameendra Kulkarni. *Towards a Portable Human Gait Analysis & Monitoring System* . In **IEEE ICSigSys**, Bali, Indonesia, 2018.
8. **Sandeep Kumar**, Sindhu Padakandla, Chandrashekar L, Priyank Parihar, Gopinath K, Shalabh Bhatnagar. *Scalable Performance Tuning of Hadoop MapReduce: A Noisy Gradient Approach* . In **IEEE Cloud**, Hawaii, USA, 2017.

## Patent

1. Methods and apparatus to profile page tables for memory management. (Patent Pending)
   Aravinda Prasad, **Sandeep Kumar**, Sreenivas Subramoney, Andy Rudoff

# Work Experience

### Intel Labs
*Bangalore, Karnataka (Virtual)*

Graduate Research Intern
*Jul. 2020 - Jan 2021*

- Worked on improving the performance of a page table walk in a tiered memory system – equipped with traditional DRAM and Intel Optane NVMM, by enabling dynamic, transparent migration of the page table from the high-latency NVMM to low-latency DRAM based on the workload characteristics.

### Indian Institute of Science
*Bangalore, Karnataka*

Research Associate
*Jun. 2015 - Jun. 2017*

- Worked on the problem of auto-tuning Hadoop systems based on the workload characteristics to improve the overall performance of the systems. We leverages *stochastic* algorithms to quickly converge to an optimal solution. This work as was published in IEEE Cloud, 2017.
- Worked on the problem of reducing the cost of a "Human gait analysis" using inexpensive IMU sensors. This work was published in IEEE ICSigSys.

### Dell Research & Development
*Bangalore, India*

Software Development Engineer
*Jul. 2013 - Jun. 2014*

- Responsible for BIOS configuration and system management tools: Dell Command Configure (DCC) and Open Manage Client Instrumentation (OMCI). DCC provides a GUI interface that allows BIOS configuration (Windows and Linux). OMCI is a command-line tool that allows remote management application programs to access information about a client computer.
- Complete Re-branding of DCC to the latest "flat-look" design.

# Selected Projects

### Toy C Compiler
*Prof. Sorav* Bansal

Course project for Compiler design
*2018, IITD*

- Implemented a Toy C Compiler using Flex Bison and LLVM as part of the Compiler Course Work. It contains LLVM IR code generation and implementation of some basic optimizations.
- Code: https://github.com/sandeep007734/Toy-C-Compiler-using-Flex-Bison-LLVM (private repository).

### Distributed Computing
*Prof. R. C.* Hansdah

Course project
*2012, IISc*

- Wrote Distributed Programs to solve TSP (Travelling sales man problem), ABP (Alpha Beta pruning search) and MST (Minimum spanning tree) using rpcgen 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.
- Report: https://tinyurl.com/2p97ak33

### Communication Network
*Prof. Shalabh* Bhatnagar

Course project
*2012, IISc*

- 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.
- Report: https://tinyurl.com/2p8jv6su

### Game Theory
*Prof. Y.* Narahari

Course project
*2012, IISc*

- Studied existing scheme for handling "Kidney Exchange Programs" and proposed a new scheme **SPAR** for this.
- Report: https://goo.gl/3Mujoh

### Network and Distributed Systems Security
*R.C. Hansdah*

Course project
*2012, IISc*

- Designed 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.

### Software Architecture
*Prof. Raghu* Hudli

Course project
*2012, IISc*

- 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.

## Courses Taken

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|---|---|
| **Ph.D** | Advance Operating System, Compiler Design, and Principles of Multiprocessing |
| **Master** | Algorithms, Cryptography, Operating System, Computer Communication Networks, Network and Distributed Systems and Security, Topics in Cryptography, Game Theory, Software Architecture, Distributed Computing Systems, and Topics in System Research |
| **B.Tech. (Selected)** | Computer Architecture, Circuit & System, Object Oriented Programming, Digital Circuit and System, Database, Computer Networks. |

## Teaching Assistant

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|---|---|
| **Ph.D** | Digital Logic and System Design, Operating System, Advanced Distributed Systems, Data structures, Introduction to Computer Science, and Cryptography. |

## Honors & Awards

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|---|---|---|
| 2018 | **Research grant**, Visit to Kyushu University for research collaboration | *Fukuoka, Japan* |
| 2017 | **Scholarship**, Visvesvaraya PhD Scheme for Electronics & IT | *New Delhi, India* |
| 2011 | **642 Rank in GATE**, Graduate Aptitude Test in Engineering Exam (Total Students: 136,027) | *New Delhi, India* |

## Interests & Activities

**Reading books**
Goodreads profile:
https://goodreads.com/sandeep007734

**Running, Cycling, and Hiking**
Strava profile:
https://www.strava.com/athletes/sandeep007734