

# Sundaresan Rajasekaran

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## EDUCATION

### THE GEORGE WASHINGTON UNIVERSITY

May 2018 (Expected) | **Doctor of Philosophy** in Computer Science

Advisor: Prof. Timothy Wood

**Thesis:** Secure and Scalable Cloud Systems

### STANFORD UNIVERSITY

2012 | **Certificate of Entrepreneurship**

PI/Advisor: Prof. Nan Zhang

NSF Award Number: 1158737

### THE GEORGE WASHINGTON UNIVERSITY

2011 | **Master of Science** in Computer Security and Information Assurance

Advisor: Prof. Poorvi Vora

### THE GEORGE WASHINGTON UNIVERSITY

2010 | **Master of Science** in Computer Science

Advisor: Prof. Nan Zhang

### ANNA UNIVERSITY, India

2008 | **Bachelor of Engineering** in Computer Science

Advisor: Prof. Thirunadana Sikamani

## WORK EXPERIENCE

### BARKLY PROTECTS

2017 – Present | **Senior Protection Engineer**

- Responsible for the development and maintenance of a patented hypervisor and Windows kernel filter driver.
- Implemented strong anti-exploit techniques within Windows kernel filter driver.
- Implemented runtime malware behavior detection for fileless attacks.
- Developed algorithms to increase the performance of the overall system.
- Reverse engineered executables to detect traces of malware.
- Analyzed memory dumps of an endpoint to detect the root cause of the failure.

### THE GEORGE WASHINGTON UNIVERSITY, CLOUD SYSTEMS LAB

2009 – 2017 | **Cloud System Security Researcher**

#### System Security:

- Implemented a novel security mechanisms for threat and malware detection on endpoint systems.
- Conducted extensive experimentation of security attacks on Amazon Web Services platform.
- Implemented a framework for real time detection of malware attacks in Virtual Machines.
- Used memory introspection techniques to protect VMs from memory based attacks.
- Implemented modules that run on VM Manager to reduce performance bottlenecks.
- Published several projects on top-tier conferences and Journals.

#### Cloud System Performance:

- Implemented a Hadoop Job scheduler for customized load balance.
- Modified the Linux CPU scheduler to avoid interference between Virtual Machines.
- Implemented several algorithms to increase the CPU and memory utilization of the Cloud.
- Proposed and tested models to run Hadoop jobs using data centers' spare resources efficiently.
- Implemented a new priority level built into Xen Hypervisor Credit Scheduler.

### Privacy Preserving Systems:

- Implemented a system that efficiently mined Enterprise search engine corpus.
- Assisted in developing privacy preserving location (Anonymous GPS) based systems.
- Developed mathematical models and algorithmic techniques for output compression, input pruning, and search space pruning.
- Was one among 12 students to receive the first ever NSF I-Corps award to carry the research at Stanford University.

### 2013 – 2015 | High Performance Computing Researcher

- Helped physically build the cluster from ground up.
- Assist with the operation and maintenance of the university's 100 node HPC GPU cluster using SLURM.
- Identified and reduced performance overhead by 25% in the cluster caused by improper job scheduling.
- Implemented the initial prototype of running OpenStack on the HPC cluster.

### 2012 – 2013 | System Administrator

- Used Puppet/Chef to manage to automate maintenance of the university's data center.
- Monitored and maintained DNS, WINS, NTP, DHCP for the servers.
- Moved 20% of the physical servers to AWS, and cut 70% of the costs on power.
- Wrote scripts in Python to automate database initialization and run patches to reduce 20% downtime.

### 2011 – 2012 | Graduate Teaching Assistant

- Spring 2012 | **Discrete Mathematics**, Undergraduate level
- Fall 2011 | **Network Security**, Graduate level
- Spring 2011 | **Algorithms and Data Structures**, Undergraduate level

### ANNA UNIVERSITY, INDIA

#### 2013 | Visiting Lecturer

- Conducted a collaborative research project in Cloud Computing.
- Taught and trained 25 undergraduate students on several projects in xen virtualization.
- Trained students to conduct quality research in Operating Systems.

## RESEARCH

**Areas:** Operating Systems, Virtualization, Resource allocation, Performance, Security and Data Science.

**Mission:** My research focus is on virtual machines and operating systems, combining a deep understanding of resource management in the cloud and systems security issues with an expertise in developing systems with real-world impact.

## PUBLICATIONS

1. In submission | **CRIMES: Using Evidence to Secure the Cloud**, Sundaresan Rajasekaran, Zhen Ni, Harpreet Singh Chawla, Neel Shah, Timothy Wood, Emery Berger
  - Implemented a framework for online detection of attacks in Virtual Machines.
  - Improved the performance of Xen Hypervisor's checkpointing mechanism by 70%.
  - Languages used: C, C++ and Python with ~10K lines of code.
2. HotCloud'16 | **Scalable Cloud Security via Asynchronous Virtual Machine Introspection**, Sundaresan Rajasekaran, Zhen Ni, Harpreet Singh Chawla, Neel Shah, Timothy Wood, Emery Berger
  - Implemented a novel security mechanism for Cloud Systems.
  - Used memory introspection techniques to protect VMs from memory based attacks.
  - Languages used: C and Python with ~2K lines of code.
3. IC2E'16 | **Multi-Cache: Dynamic, Efficient Partitioning for Multi-Tier Caches in Consolidated VM Environments**, Sundaresan Rajasekaran, Shaohua Duan, Wei Zhang, Timothy Wood
  - Implemented a standalone disk-storage simulator from scratch.
  - Developed models to analyze terabytes of storage trace data in sub-millisecond interval.
  - Languages used: C++ and Python with ~3K lines of code.

4. ACM Sigmetrics PER'15 | **Minimizing Interference and Maximizing Progress for Hadoop Virtual Machines**, Wei Zhang, Sundaresan Rajasekaran, Shaohua Duan, Timothy Wood, Mingfa Zhu
  - Implemented a Hadoop Job scheduler for customized load balance.
  - Modified the Linux CPU scheduler to avoid interference between VMs.
  - Languages used: Java and C with ~5K lines of code.
5. CCGrid'14 | **MIMP: Deadline and Interference aware scheduling of Hadoop Virtual Machines**, Wei Zhang, Sundaresan Rajasekaran, Timothy Wood, Mingfa Zhu
  - Implemented a new priority level built into Xen Hypervisor Credit Scheduler.
  - Implemented a tool to study the resource utilization of 192 production servers.
  - Languages used: C, C++ and Python with ~5K lines of code.
6. TKDE'14 | **On Skyline Groups**, Nan Zhang, Chengkai Li, Naeemul Hassan, Sundaresan Rajasekaran, Gautam Das
  - Developed mathematical models and algorithmic techniques for output compression, input pruning, and search space pruning.
  - For search space pruning, I developed novel anti-monotonic properties to filter out candidate groups.
  - Languages used: Matlab and R with ~1K lines of code.
7. TPDS'14 | **Swiper: Exploiting Virtual Machine Vulnerability in Third-Party Clouds**, Ron C Chiang, Sundaresan Rajasekaran, Nan Zhang, H Howie Huang
  - Implemented a novel workload based performance attack of Cloud Systems.
  - Conducted extensive experimentation of the attack on Amazon Web Services platform.
  - Languages used: C, C++, Java and Python with ~3K lines of code.
8. ASBD'13 | **Big Data in the Background: Maximizing Productivity while Minimizing Virtual Machine Interference**, Wei Zhang, Sundaresan Rajasekaran, Timothy Wood
  - Implemented several algorithms to increase the CPU and memory utilization of the Cloud.
  - Proposed and tested models to efficiently run Hadoop jobs using data centers' spare resources.
  - Languages used: C, Java and Python with ~2K lines of code.
9. CIKM'13 | **On Skyline groups**, Chengkai Li, Nan Zhang, Naeemul Hassan, Sundaresan Rajasekaran, Gautam Das
  - Implemented statistically sound techniques to find skyline groups.
  - Languages used: Matlab, R and Python with ~1K lines of code.

## SKILL SET

**Programming:** C, C++, x86 Assembly, Python, Java, Matlab, Android

**Agile Methodology:** atlassian Jira

**Cloud Platforms:** AWS, Azure, Google Cloud

**Cloud tools:** OpenStack, Docker, Puppet, Chef

**System Tools:** Bash scripting, Git, Gnuplot,  $\text{\LaTeX}$

**Operating Systems:** Unix, Windows, Mac

## PROFILES

GitHub: <http://github.com/SunnyRaj>

Google Scholar: Sunny Rajasekaran

## AWARDS AND HONORS

2016 | **Won** NASA Space Apps challenge

2013 | **Best teacher**, Anna University

2012 | **Speaker**, I-Corps program at NSF on University Startups Conference

2011 | **Entrepreneur Lead**, Stanford University