Soundarya Ramesh

CONTACT

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EDUCATION

National University of Singapore *Aug 2018 – Present*
PhD Student, Department of Computer Science *Current GPA : 5/5*
Area : Cyber-physical Systems Security
Advisor : Jun Han

National Institute of Technology Karnataka, India *Jul 2014 – May 2018*
Bachelor of Technology in Information Technology GPA : 9/10

CONFERENCES AND WORKSHOPS

Soundarya Ramesh, Harini Ramprasad, Jun Han. Listen to Your Key: Towards Acoustics-based Physical Key Inference. *To appear in the Proceedings of the* 21^{st} *Annual International Workshop on Mobile Computing Systems and Applications (HotMobile '20).*

Soundarya Ramesh, Thomas Pathier, Jun Han. SoundUAV: Towards Delivery Drone Authentication via Acoustic Noise Fingerprinting. *In the Proceedings of the* 5^{th} *ACM Workshop on Micro Aerial Vehicle Networks, Systems, and Applications (DroNet '19).*

Shen Shiqi, Shweta Shinde, Soundarya Ramesh, Abhik Roychoudhury and Prateek Saxena. Neuro-Symbolic Execution: Augmenting Symbolic Execution with Neural Constraints. *In the Proceedings of the* 26^{th} *Annual Network and Distributed System Security Symposium (NDSS '19).*

POSTERS

Soundarya Ramesh, Thomas Pathier, Jun Han. SoundUAV: Fingerprinting Acoustic Emanations for Delivery Drone Authentication. *In the Proceedings of* 17^{th} *Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '19).*

RESEARCH EXPERIENCE

National University of Singapore May – Dec 2017

Research Intern in System Security Lab
Supervisor : Prateek Saxena
Project : Domain-agnostic Constraint Learning using Neural Networks

Indian Institute of Science May – Jun 2016

Research Intern in Cryptography and Information Security Lab
Supervisor : Arpita Patra
Project : Developing efficient protocol for Graph Consensus Problem in Directed Graphs

HONORS AND AWARDS

- MobiSys 2019 *Best Poster Runner-Up Award* *Jun 2019*
- *Graduate Research Fellowship*, National University of Singapore *Aug 2018 – Present*

- *Research Forum Award* at the Deep Learning and Security Workshop, National University of Singapore *Dec 2017*
- *Indian Academy of Sciences Fellowship* *May – Jun 2016*

MEDIA COVERAGE OF RESEARCH

- Forbes Magazine (Aug 2020) - *How Hackers Use Sound To Unlock The Secrets Of Your Front Door* by Davey Winder. Available at: `https://www.forbes.com/sites/daveywinder/2020/08/22/how-hackers-use-sound-to-unlock-the-secrets-of-your-front-door-key-spikey-singapore-university-research/`.
- ACM News (Aug 2020) - *Picking Locks with Audio Technology* by Paul Marks. Available at: `https://cacm.acm.org/news/246744-picking-locks-with-audio-technology/`
- ScienceAlert (Aug 2020) - *Security Researchers Found a New Way to Pick Locks, Using Only The Sound of The Key* by David Nield. Available at: `https://www.sciencealert.com/researchers-can-break-locks-just-from-the-sound-of-a-key-being-inserted`

TEACHING EXPERIENCE

- Teaching Assistant for CS3235 Computer Security *Spring 2020*
- Teaching Assistant for CS5476 IoT Security *Fall 2019, Fall 2020*

Personal Statement

I'm Soundarya Ramesh, a first year Computer Science Ph.D. student, working with Assistant Professor Jun Han at the National University of Singapore. My research interests broadly lie in the security and privacy aspects of *cyber-physical systems.*

Over the last few months, I worked on a project involving fingerprinting drones using their acoustic emanations as a defense against drone impersonation attacks, to prevent theft of goods in drone delivery. To solve this problem, we leveraged the manufacturing defects in the drones' motors to distinguish across same make and model drones and achieved high accuracy in distinguishing eleven drones. This work has been accepted as part of DroNet '19 [2], a workshop co-located with MobiSys conference, and will also a part of the poster track in MobiSys '19 [1].

Prior to this, I worked on finding efficient methods to detect bugs in software, which was published in NDSS '19 [3]. We developed a tool to learn relationships between variables of a program as a neural network. This tool, when augmented with symbolic execution, helps in detecting bugs even when the variables cannot be expressed as pure symbolic constraints.

In MobiSys '19, I'm particularly looking forward to attend talks related to my interests, on *mobile security*, such as LTE spoofing attacks and SpecEye, as well as on *sensing systems*, such as BreathListener and WaveEar. Also, as this will be my first time attending MobiSys, this opportunity will provide perspectives on different related research fields, which can help identify specific areas of interest for my research. In addition, it will also provide me with a good chance to interact with researchers and Ph.D. students with similar interests from various institutions.

References

[1] Soundarya Ramesh, Thomas Pathier, Jun Han. Poster: SoundUAV: Fingerprinting Acoustic Emanations for Delivery Drone Authentication. *To appear in the Proceedings of* 17^{th} *Annual International Conference on Mobile Systems, Applications, and Services (MobiSys '19).*

[2] Soundarya Ramesh, Thomas Pathier, Jun Han. SoundUAV: Towards Delivery Drone Authentication via Acoustic Noise Fingerprinting. *To appear in the Proceedings of the* 5^{th} *ACM Workshop on Micro Aerial Vehicle Networks, Systems, and Applications (DroNet '19).*

[3] Shen Shiqi, Shweta Shinde, Soundarya Ramesh, Abhik Roychoudhury and Prateek Saxena. Neuro-Symbolic Execution: Augmenting Symbolic Execution with Neural Constraints. *In the Proceedings of the* 26^{th} *Annual Network and Distributed System Security Symposium (NDSS 2019).*

Personal Statement

I'm Soundarya Ramesh, a second year Computer Science Ph.D. student, working with Assistant Professor Jun Han at the National University of Singapore. My research interests broadly lie in the security and privacy aspects of *cyber-physical systems*.

1. Summary of research interests and accomplishments

Currently I am working on a problem that involves utilizing acoustics to infer the key inserted into a physical lock. The initial idea of this work has been accepted at HotMobile '20, and we are now working on addressing the challenges to make this attack practical.

My previous work also involved acoustic sensing, where we showed the possibility of fingerprinting drones using their acoustic emanations as a defense against drone impersonation attacks. This work won 'Best Poster Runner-Up Award' at MobiSys '19, and was also presented at DroNet '19.

Prior to starting my Ph.D., I worked on finding efficient methods to detect bugs in software, which was published in NDSS '19.

2. Type of participation

At HotMobile '20, I will be presenting my paper and poster, 'Listen to Your Key: Towards Acoustics-based Physical Key Inference'.

3. A description of areas that would impact the student's research

As I work on acoustic sensing, I'm looking forward to the first keynote talk by Prof. Cecilia Mascolo, and also the Acoustic and Mobile Sensing tracks.

4. Importance of attending the conference to the student's research activities

My projects so far has given me some experience in acoustic sensing and security implications of such sensing. Moving forward, I would like to work on some paradigm shifting ideas, and demonstrate interesting ways of performing sensing, not specific to acoustics, to solve core problems in the sensing security space.

By attending HotMobile '20, I would like to gain insights on different aspects of sensing, to help me identify some core problems that need to be solved, and inspire me to discover out-of-the-box ideas.