Kaushal Kafle

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I am a PhD student in the Department of Computer Science at the College of William and Mary, being advised by [Prof. Adwait Nadkarni](http://adwaitnadkarni.com/). My research interests lie in analyzing the security practices employed in modern operating systems as well as designing practical security frameworks for such systems. I work at the [Secure Platforms Lab (SPL)](https://spl-wm.github.io/) at William & Mary, where currently, I am actively involved in identifying and analyzing security problems in smart home platforms and devices, especially concerning home automation.

**EDUCATION**

**College of William and Mary PhD in Computer Science August 2017 - Present**

***Advisor***: Dr. Adwait Nadkarni

***Relevant Courses:***

Computer and Network Security, Cybersecurity Research Analysis, Systems Security, Advanced Software Engineering, Practice of Machine Learning, Analysis of Algorithms

**Pulchowk Campus, Tribhuwan University Bachelor’s in Computer Engineering Nov 2011- Nov 2015**

**PUBLICATIONS**

**Journal Papers**

**Kaushal Kafle**, Kevin Moran, Sunil Manandhar, Adwait Nadkarni, and Denys Poshyvanyk. Security in Centralized Data Store-based Home Automation Platforms- A Systematic Analysis of Nest and Hue. In *ACM Transactions on Cyber-Physical Systems (TCPS)*. To appear.[[Preprint]](https://kaushalkafle.com/assets/pdf/kafle-tcps20-preprint.pdf)

**Conference Papers**

Sunil Manandhar, Kevin Moran, **Kaushal Kafle**, Ruhao Tang, Denys Poshyvanyk, and Adwait Nadkarni. Towards a Natural Perspective of Smart Homes for Practical Security and Safety Analyses. *To Appear in the Proceedings of the 41st IEEE Symposium on Security and Privacy (S&P*), San Francisco, CA, USA, May 2020. [[PDF]](https://kaushalkafle.com/assets/pdf/manandhar-oakland20.pdf)

**Kaushal Kafle**, Kevin Moran, Sunil Manandhar, Adwait Nadkarni, and Denys Poshyvanyk. A Study of Data Store-based Home Automation. In *Proceedings of the 9th ACM Conference on Data and Application Security and Privacy (CODASPY)*. Dallas, TX, USA, March 2019.***Best Paper Award*** [[PDF]](https://kaushalkafle.com/assets/pdf/kafle-codaspy19.pdf) [[press coverage]](https://kaushalkafle.com/publications#press)

Richard Bonett, **Kaushal Kafle**, Kevin Moran, Adwait Nadkarni, and Denys Poshyvanyk. Discovering Flaws in Security-Focused Static Analysis Tools for Android using Systematic Mutation. In Proceedings of the 27th USENIX Security Symposium. Baltimore, MD, USA, August 2018. [[Source code]](https://muse-security-evaluation.github.io/) [[PDF]](https://kaushalkafle.com/assets/pdf/bonett-sec18.pdf)

**Undergraduate Work**

**Kaushal Kafle**, Diwas Sharma, Aayush Subedi, and Arun Kumar Timalsina. Improving Nepali Document Classification by Neural Network. In Proceedings of IOE Graduate Conference (pp. 317–322), Pulchowk, Kathmandu, Nepal, 2016. [[PDF]](https://kaushalkafle.com/assets/pdf/kafle-ioegc16.pdf)

**WORK EXPERIENCE**

**Research Assistant, Department of Computer Science, William & Mary** *Jan 2018 – Present*

Over the course of my research, I have worked in analyzing and discovering flaws in different smart home systems (e.g., Google Nest, Philips Hue, SmartThings), security tools (e.g., Flowdroid, Amandroid) as well as third-party apps developed for smart homes or Android. I have also helped build security frameworks that aim to protect from those flaws. Details of my work are as follows:

***Ongoing Research Project***

* **Towards integrity of shared platform resources (Project Lead)**
  + A supplementary security framework for smarthome platforms to protect the integrity of their shared resources such as states shared with 3rd party apps

***Completed Research Projects****:*

* **Security of Data-Store Based Home Automation (Project Lead):**
  + Analyzed the security of various components of smart home platforms that facilitate routines
  + Analysis of two major platforms: *Google Nest* and *Philips Hue*
  + Analyzed components included the Cloud backend, smart-apps review process, SSL enforcement in third-party smart-apps of the platforms.
  + A journal version was recently accepted to *ACM TCPS’20*.
  + Won the **Best Paper Award** in *ACM CODASPY ’19*
  + [Press coverage](https://kaushalkafle.com/publications#press)
* **MUSE (MUtation-based Soundness Evaluation)**:
  + Designed a framework for analyzing *soundness claims* of Android static analysis tools leveraging concepts from mutation testing
  + Discovered undisclosed flaws in multiple prominent Android static analysis security tools
  + *USENIX ‘18*
* **Helion (Home automation security EvaLuatION)**:
  + Conducted a user study to collect and understand smart home routines from real users.
  + Designed representation of user-driven routines gathered from user-study to be used for natural language processing
  + Created safety policies by analyzing automation sequences generated from a user’s automation preferences
  + *IEEE S&P ‘20*

**Teaching Assistant, Department of Computer Science, William & Mary** *Aug 2017 – May 2019*

*Taught labs and graded assignments for the following classes:*

* Computational Problem Solving (CSCI 141), Fall 2017 – *133 Students*
* Programming for Data Science (CSCI 140), Spring 2019 – *93 Students*

*Graded assignments for the following classes:*

* Mobile App Security (CSCI 520), Spring 2018 – *20 Students*
* Mobile App Security (CSCI 520), Fall 2018 – *12 Students*

**IT Manager, Lionize Travel and Tours, Patan, Nepal** *Nov 2015 – May 2017*

**CONFERENCE PRESENTATIONS & INVITED TALKS**

* **Journal Club** - William & Mary, Williamsburg, VA *Sep 26th, 2019*
  + “The Security of Smart Home Platforms”
* **9th ACM CODASPY** – Dallas, TX *Mar 25th, 2019*
  + “A Study of Data-store Based Home Automation”
* **18th Graduate Research Symposium ­**– William & Mary, Williamsburg, VA *Mar 15th, 2019*
  + “A Study of Data-store Based Home Automation”
* **USENIX’18** – Baltimore, MD *Aug 17th, 2018*
  + “Discovering Flaws in Security-Focused Static Analysis Tools for Android using Systematic Mutation”

**AWARDS & HONORS**

* **Best Paper Award**, ACM CODASPY, Dallas, TX, USA, March 2019
* USENIX **Travel Award** (USENIX Security Symposium 2018).

**PROFESSIONAL SERVICE**

* **Sub-reviewer for Conferences**
  + ISOC Network and Distributed System Security Symposium (NDSS), 2020
  + USENIX Security Symposium (USENIX), 2019
  + The International Conference on Information Systems Security (ICISS), 2019

**OTHER ACTIVITIES**

* One of the founding members of Secure Platforms Lab at William & Mary ([Lab website](https://spl-wm.github.io/))
* Volunteer, IOE Graduate Conference, Pulchowk, Lalitpur, Nepal 2015
* Volunteer, Latex Workshop at IOE Graduate Conference, Pulchowk, Lalitpur, Nepal 2015
* Organizer, Hackathon, Locus 2015
* Organizer, Yomari Codecamp, Locus 2015