Kaushal Kafle

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**BIO**

I am a PhD student in the Department of Computer Science at William & Mary with an expected graduation in Spring 2024. My advisor is Prof. [Adwait Nadkarni](https://www.adwaitnadkarni.com/). I am the lead graduate student at *Secure Platforms Lab (*[*SPL*](https://spl-wm.github.io/)*)*, where I currently lead 5 other graduate and 2 undergraduate students. My research analyzes the security and/or privacy of emergent, evolving systems and their implications on the end users. My work on analyzing the security of smart home platforms received the *best paper award* at CODASPY’19, and has been featured in various news outlets. My work on understanding the privacy postures of election campaign websites received the *best poster award* at CCI Symposium’23.

**EDUCATION**

**William & Mary, Williamsburg, USA August 2017 - Present**

*PhD in Computer Science*

*Advisor*: Dr. Adwait Nadkarni

*Expected graduation*: March, 2024

**Pulchowk Campus, Tribhuvan University Nov 2011 - Nov 2015**

*BE in Computer Engineering*

**PUBLICATIONS**

**Conference Papers**

1. **Kaushal Kafle**, Prianka Mandal, Kapil Singh, Benjamin Andow, and Adwait Nadkarni, “Understanding the Privacy Practices of Political Campaigns: A Perspective from the 2020 US Election Websites”, In *Proceedings of* *the 45th IEEE Symposium on Security and Privacy (IEEE S&P)*, CA, USA, 2024. *To appear* [[PDF]](https://kaushalkafle.com/assets/conference/kafle-oakland24.pdf)
2. Xin Jin\*, Sunil Manandhar\*, **Kaushal Kafle**, Zhiqiang Lin, and Adwait Nadkarni. “Understanding IoT Security from a Market-Scale Perspective*”.* In *Proceedings of the 29th ACM Conference on Computer and Communications Security (CCS)*, Los Angeles, CA, USA, Nov 2022. \*Co-first Authors. [[PDF]](https://kaushalkafle.com/assets/pdf/manandhar-ccs22.pdf)
3. Sunil Manandhar, **Kaushal Kafle**, Benjamin Andow, Kapil Singh, and Adwait Nadkarni, “Smart Home Privacy Policies Demystified: A Study of Availability, Content, and Coverage”. In *Proceedings of the 31st USENIX Security Symposium (USENIX)*, Boston, MA, USA, 2022. [[PDF]](https://kaushalkafle.com/assets/pdf/manandhar-sec22.pdf)
4. Amit Seal Ami, Nathan Cooper, **Kaushal Kafle**, Kevin Moran, Denys Poshyvanyk, and Adwait Nadkarni, “Why Crypto-detectors Fail: A Systematic Evaluation of Cryptographic Misuse Detection Techniques,” in *Proceedings of the 43rd IEEE Symposium on Security and Privacy (IEEE S&P)*, 2022. [[PDF]](https://kaushalkafle.com/assets/pdf/ami-oakland22.pdf)
5. 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.” In *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)
6. **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)
7. 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, Aug 2018. [[Source code]](https://muse-security-evaluation.github.io/) [[PDF]](https://kaushalkafle.com/assets/pdf/bonett-sec18.pdf)

**Journal Papers**

1. Amit Seal Ami, **Kaushal Kafle**, Kevin Moran, Adwait Nadkarni, and Denys Poshyvanyk. “Systematic Mutation-based Evaluation of the Soundness of Security-focused Android Static Analysis Techniques”. In *ACM Transactions on Security & Privacy (*[*TOPS*](https://dl.acm.org/journal/tops)*),* 2021. [[PDF]](https://kaushalkafle.com/assets/journal/ami-tops21.pdf)
2. **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)*, 2020. [[PDF]](https://kaushalkafle.com/assets/journal/kafle-tcps20.pdf)

**Tool Demo Papers**

1. Prianka Mandal, Sunil Manandhar, **Kaushal Kafle**, Kevin Moran, Denys Poshyvanyk, and Adwait Nadkarni. “*Helion: Enabling Natural Testing of Smart Homes”.* In *Proceedings of the ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE), Demonstration Track*, Dec 2023*.* [[PDF]](https://kaushalkafle.com/assets/tool/mandal-fse23-demo.pdf)
2. Amit Seal Ami, Syed Yusuf Ahmed, Radowan Mahmud Redoy, Nathan Cooper, **Kaushal Kafle**, Kevin Moran, Denys Poshyvanyk, and Adwait Nadkarni. “MASC: A Tool for Mutation-based Evaluation of Static Crypto-API Misuse Detectors”. In *Proceedings of the ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE), Demonstration Track*, Dec 2023. [[PDF]](https://kaushalkafle.com/assets/tool/ami-fse23-demo.pdf)
3. Amit Seal Ami, **Kaushal Kafle**, Kevin Moran, Adwait Nadkarni, and Denys Poshyvanyk. “Demo: Mutation-based Evaluation of Security-focused Static Analysis Tools for Android.” In *Proceedings of the 43rd IEEE/ACM International Conference on Software Engineering (ICSE’21), Formal Tool Demonstration,* May 2021, [[PDF]](https://kaushalkafle.com/assets/tool/ami-icse21-demo.pdf)

**Posters**

1. “Security and Privacy in the Smart Home Ecosystem”*,* at the *Annual Virginia Academy of Science, Engineering and Medicine (VASEM) Summit*, Richmond, VA – Oct 2023 [[PDF]](https://kaushalkafle.com/assets/poster/2023-vasem-summit-security-privacy-smart-home.pdf)
2. “Expanding Computer Science Learning Opportunities in K-12 Instruction in Virginia Schools”*,* at the *Annual Virginia Academy of Science, Engineering and Medicine (VASEM) Summit*, Richmond, VA – Oct 2023 [[PDF]](https://kaushalkafle.com/assets/poster/2023-vasem-summit-Expanding-CS-Learning-Virginia-COVES.pdf)
3. “Understanding the Privacy Practices of Political Campaigns”*,* at the *CCI Symposium’23*, Richmond, VA – April 2023 – ***Best Poster Award* **[[PDF]](https://kaushalkafle.com/assets/poster/2023-cci-poster-political-privacy.pdf)
4. “Smart Home Privacy Demystified”*,* at the *CCI Symposium 2022*, Richmond, VA – April 2022 [[PDF]](https://kaushalkafle.com/assets/poster/2022-cci-smart-home-privacy-policies.pdf)
5. “A Study of Data Store-based Home Automation“*,* at *ACM CODASPY’19* **,** Dallas, TX – March 2019 [[PDF]](https://kaushalkafle.com/assets/poster/2019-Codaspy-Poster-final.pdf)

**CONTRIBUTION IN AWARDED GRANT**

1. [NSF Grant CNS – 2132281](https://www.nsf.gov/awardsearch/showAward?AWD_ID=2132281)
   1. Title***:*** *“Enabling Data-Driven Security and Safety Analyses for Cyber-Physical Systems”*
   2. PI: Adwait Nadkarni, Kevin Moran, Co-Pi: Denys Poshyvanyk, **Contributor: Kaushal Kafle**
   3. Award amount: *$799,839*

**RESEARCH EXPERIENCE**

**Graduate Research Assistant** *Jan 2018 – Present*

Secure Platforms Lab (SPL)

Department of Computer Science, William & Mary

**Research Overview:** As a research assistant to Prof. Adwait Nadkarni at SPL, I have worked primarily in the analysis of security and/or privacy of emergent, evolving systems such as IoT systems, election campaigning platforms and security analysis tools.

**Projects and Artifacts**:

1. **Polityzer,** IEEE S&P’24 - Source Code: <https://github.com/polityzer>
2. **Security of Centralized Home Automation,** *Best Paper***,** ACM CODASPY’19 - Press Coverage: <https://kaushalkafle.com/publications#press>
3. **IoTSpotter,** ACM CCS’22 - Source Code: <https://github.com/Secure-Platforms-Lab-W-M/IoTSpotter>
4. **Smart Home Privacy Policies Demystified**, USENIX’22 - Data: <https://github.com/Secure-Platforms-Lab-W-M/smart-home-privacy-policies>
5. **Helion**, IEEE S&P’20 - Source Code: <https://github.com/Secure-Platforms-Lab-W-M/Helion-on-Home-Assistant#helion>
6. **HomeEndorser,** *under submission:* A security framework for securing automations in smart home platforms.
7. **Mutation-based Soundness Evaluation (MUSE),** USENIX’18 - Source Code: <https://secure-platforms-lab-w-m.github.io/muse/>
8. **Mutation Analysis for evaluating Static Crypto-API misuse detectors (MASC),** IEEE S&P’22 - Source Code: <https://github.com/Secure-Platforms-Lab-W-M/masc-artifact>

**Lead Graduate Student** *June 2022 – Present*

Secure Platforms Lab (SPL)

Department of Computer Science, William & Mary

**Responsibilities:**

* Provided individual research mentorship and support to other graduate/undergraduate students
* Helped in fostering a good working environment among lab students
* Organized and led student-run weekly meetings
* Led the daily operational activities of the lab

**INDUSTRY EXPERIENCE**

**Virginia Department of Education,** Richmond, VA*May 2023 – Aug 2023*

*Commonwealth of Virginia Engineering and Science (COVES)* *Policy Fellow*

**Mentor**: Keisha Tennessee, Virginia Computer Science Coordinator

**Responsibilities**:

* Support the strategic planning in VA to expand capacity, access, and participation in K-12 Computer Science Education
* Dataset collection, analysis and providing data-based recommendations

**Mojo Vision, Tectus Corp.,** Saratoga, CA*Sep 2022 – Nov 2022*

*Graduate Research Intern*

**Mentor**: Dr. Michael Grace

**Responsibilities**:

* Investigate the security and privacy implications of AR Contact Lens
* Design a new security framework for AR Contact Lens

**IBM Research,** Yorktown Heights, NY*May 2022 – Aug 2022*

*Graduate Research Intern*

**Mentor:** Dr. Kapil Singh

**Responsibilities:**

* Investigate the feasibility of mapping specific privacy and data policies to the software code behavior

**TEACHING EXPERIENCE**

**Guest Lecturer,** William & Mary

1. Guest Lecture on “*Practical Integrity in the Smart Home”,* in Concepts of Computer Security – CSCI 667 (Graduate-level course) – Spring 2022
2. Guest Lecture on “*Ramifications of SSL Issues in Mobile Apps for the Smart Home”,* in Mobile Application Security – CSCI 445 (Undergraduate-level course) – Fall 2021 – Online (over zoom)
3. Guest Lecture on “*Securing a Smart Home*”, in IoT Security and Safety – CSCI 680 (Graduate-level course) – Spring 2021 – Online (over zoom)

**Teaching Assistant,** William & Mary*Aug 2017 – May 2019*

1. Taught labs and graded assignments in *Computational Problem Solving* – CSCI 141 (133 Students)
2. Taught labs and graded assignments in *Programming for Data Science* – CSCI 140 (93 Students)
3. Graded assignments in *Mobile App Security* – CSCI 520 – Spring 2018 (20 Students), Fall 2018 (12 Students)

**CONFERENCE PRESENTATIONS, INVITED TALKS AND OUTREACH**

**Conference Presentations**

1. **“***A Study of Data-store Based Home Automation*” at the **9th ACM CODASPY**, Dallas, TX – March 2019
2. “*A Study of Data-store Based Home Automation*” at the **18th Graduate Research** Symposium, William & Mary, Williamsburg – March 2019
3. “*Discovering Flaws in Security-Focused Static Analysis Tools for Android using Systematic Mutation*” at the **27th USENIX Security Symposium**, Baltimore – August 2018

**Invited Talks and Outreach**

1. *“Guest Post: A PhD Student’s Experience at the LiSPI Workshop”,* **Leadership in Science Policy Institute (LiSPI)** **workshop**, invited by *Computing Research Association (CRA)*, Washington DC – Nov 2023 [[Link]](https://cra.org/govaffairs/blog/2023/12/lispi-perspective-kafle/)
2. “*Understanding the Security of Smart Home Platforms*”, as part of the **Emerging Scholar Series**, Public Scholarship Initiative, Williamsburg Regional Library – March 2022
3. *“How hackable is your home?”,* invited as an expert on smart home security in ***Which? Investigates* podcast** ([Episode Link](https://podcasts.apple.com/us/podcast/how-hackable-is-your-home/id1570247993?i=1000539342637)) – October 2021
4. “*The Security of Smart Home Platforms*”, Research talk at the **Journal Club**, William & Mary, Williamsburg – September 2019
5. “*Enabling Safe and Secure Home Automation: Problems, Best Practices and Future Opportunities”*, William & Mary Developer Outreach to Williamsburg Developers Group, Williamsburg, VA, July 2019
6. *Outreach to High School Students*, invited by **Advanced Technology Center**, V. Beach, VA – April 2019
7. “*Hacking Your Smart Home*” podcast, invited to discuss my work on smart home security by **News Radio WINA** – December 2018

**AWARDS & HONORS**

1. ***Commonwealth of Virginia Engineering & Science (COVES) Policy Fellow*,** Selected by *Virginia Academy of Science, Engineering and Medicine (VASEM)*, Host office - *Virginia Department of Education*, 2023
2. ***Best Poster Award*,** CCI Symposium 2023, Richmond, VA, USA – April 2023
3. ***Best Paper Award***, ACM CODASPY, Dallas, TX, USA - March 2019
4. ***Graduate Studies Advisory Board (GSAB) Research Grant*,** William & Mary - Fall 2021
5. ***International Student Opportunity Award*,** William & Mary - Spring 2020, Spring 2021
6. ***Travel Award*** - USENIX Security Symposium2018, Computing Research Association (CRA) 2023

**PROFESSIONAL SERVICE**

1. **Conference Program Committee Member**
   1. *USENIX Security Symposium (USENIX)* Artifact Evaluation Committee - 2021, 2022, 2023
   2. *Annual Computer Security Applications Conference (ACSAC)* Artifact Evaluation Committee - 2023
2. **Conference External Reviewer**
   1. *Top-tier conferences -* NDSS (2020, 2021, 2022, 2023), USENIX(2019, 2021)
   2. *Other conferences -* ACSAC(2022, 2023), ICISS (2019, 2022, 2023), ACNS (2022, 2023, 2024)