

Md Rayhanur Rahman

✉ mrahman@ncsu.edu

🌐 <https://rayhanur-rahman.github.io>

🆔 0000-0003-4980-7350

🔍 Google Scholar

🔖 DBLP

Summary

My research interests are software engineering and cybersecurity, focusing on mining actionable intelligence from open-source knowledge bases for software and security practitioners to design proactive defenses. I rely on a wide range of techniques, such as, natural language processing, machine learning, static analysis, and grounded theory-based approaches.

Education

- 2018 – 2024 **Ph.D. in Computer Science, North Carolina State University**
Thesis title: *Towards mining proactive intelligence from OSCTI reports*
Advisor: Dr. Laurie Williams
Expected Graduation: May, 2024
- 2013 – 2014 **M.Sc. in Software Engineering, University of Dhaka**
Thesis title: *Towards peer to peer resource provisioning in cloud*
Advisor: Dr. Kazi Muheymin-Ul-Sakib
- 2009 – 2012 **B.IT. in Software Engineering, University of Dhaka**

Work Experience

- 2020 – 2020 **Research Intern** at Microsoft Corporation
I have worked with 1ES team to analyze and investigate how the security tools can be improved through empirical methods.
- 2018 – **Graduate Assistant** at North Carolina State University
I served as a research assistant as part of NSA Science of Security Lablet. I investigate the open-source technical reports of past cyberattack incidents to mine malicious behavior patterns. I leverage the patterns to provide proactive and actionable insights for security practitioners. I also served as a teaching assistant for three semesters in software engineering and DevOps-related courses.
- 2021 – 2021 **Summer Teaching Instructor** at North Carolina State University
I have worked as a summer teaching instructor for C and Software Tools courses designed for undergraduate students.
- 2014 – 2018 **Lecturer** at University of Dhaka
I taught undergraduate courses such as Discrete Mathematics, Data Structure, Combinatorial Optimization, Object Oriented Concepts, and Operating Systems. I also taught Formal Methods and Models of Software Engineering to graduate students. Apart from teaching, I oversaw undergraduate students' academic affairs and designed course curricula for external institutions.
- 2015 – 2017 **Guest Lecturer** at Daffodil International University, Dhaka
I taught undergraduate courses: Software Engineering and Object-oriented Concepts.
- 2015 – 2016 **Guest Lecturer** at East West University, Dhaka
I taught undergraduate courses: Introduction to Computing.
- 2013 – 2014 **Junior Software Engineer** at Kaz Software
I worked on a proprietary Google Chrome extension named LinkableNews and a web application named LinkableService, which provided web ontology and identity services.

Selected Research Publications

Journal Articles

- 1 **Md Rayhanur Rahman**, R. Mahdavi-Hezaveh, and L. Williams, "What are the attackers doing now? automating cyberthreat intelligence extraction from text on pace with the changing threat landscape: A survey," *ACM Computing Surveys*, vol. 55, no. 12, pp. 1–36, 2023.
- 2 **Md Rayhanur Rahman**, N. Imtiaz, M.-A. Storey, and L. Williams, "Why secret detection tools are not enough: It's not just about false positives-an industrial case study," *Empirical Software Engineering*, vol. 27, no. 3, p. 59, 2022.

- 3 A. Rahman, **Md Rayhanur Rahman**, C. Parnin, and L. Williams, "Security smells in ansible and chef scripts: A replication study," *ACM Transactions on Software Engineering and Methodology (TOSEM)*, vol. 30, no. 1, pp. 1–31, 2021.
- 4 M. M. Rahman, R. R. Riyadh, S. M. Khaled, A. Satter, and **Md Rayhanur Rahman**, "Mmruc3: A recommendation approach of move method refactoring using coupling, cohesion, and contextual similarity to enhance software design," *Software: Practice and Experience*, vol. 48, no. 9, pp. 1560–1587, 2018.
- 5 **Md Rayhanur Rahman** and K. Sakib, "A scalable resource provisioning scheme for the cloud using peer to peer resource discovery and multi-attribute utility theory," *International Journal of Cloud Computing*, vol. 6, no. 3, pp. 211–237, 2017.
- 6 M. M. Rahman, **Md Rayhanur Rahman**, and B. M. Hossain, "Recommendation of move method refactoring to optimize modularization using conceptual similarity," *International Journal of Information Technology and Computer Science*, 2017.
- 7 M. M. Rahman, S. Rahman, **Md Rayhanur Rahman**, B. M. Hossain, and M. Shoyaib, "Dtcth: A discriminative local pattern descriptor for image classification," *EURASIP Journal on Image and Video Processing*, vol. 2017, pp. 1–24, 2017.
- 8 A. Imran, A. U. Gias, **Md Rayhanur Rahman**, and K. Sakib, "Provintsec: A provenance cognition blueprint ensuring integrity and security for real life open source cloud," *International Journal of Information Privacy, Security and Integrity*, vol. 1, no. 4, pp. 360–380, 2013.

Conference Proceedings

- 1 **Md Rayhanur Rahman**, W. Enck, and L. Williams, "Do configuration management tools make systems more secure? an empirical research plan," in *Proceedings of the 7th Symposium on Hot Topics in the Science of Security*, 2020, pp. 1–2.
- 2 **Md Rayhanur Rahman**, R. Mahdavi-Hezaveh, and L. Williams, "A literature review on mining cyberthreat intelligence from unstructured texts," in *2020 International Conference on Data Mining Workshops (ICDMW)*, IEEE, 2020, pp. 516–525.
- 3 **Md Rayhanur Rahman**, A. Rahman, and L. Williams, "Share, but be aware: Security smells in python gists," in *2019 IEEE International conference on software maintenance and evolution (ICSME)*, IEEE, 2019, pp. 536–540.
- 4 A. S. Ami, M. M. Hasan, **Md Rayhanur Rahman**, and K. Sakib, "Mobicomonkey: Context testing of android apps," in *Proceedings of the 5th International Conference on Mobile Software Engineering and Systems*, 2018, pp. 76–79.

In Review

- 1 S. Elder, **Md Rayhanur Rahman**, G. finger, K. Kapoor, and L. Williams, "A survey on software vulnerability exploitability assessment," *ACM Transactions on Privacy and Security*, 2023.
- 2 **Md Rayhanur Rahman**, R. Mahdavi-Hezaveh, S. Basak, and L. Williams, "Attackers reveal their arsenal: An investigation of adversarial techniques in cti reports," *ACM Transactions on Privacy and Security*, 2023.
- 3 **Md Rayhanur Rahman**, B. Wroblewski, Q. Matthews, B. Morgan, T. Menzies, and L. Williams, "Mining temporal attack patterns from cyberthreat intelligence reports," *IEEE Transactions on Software Engineering*, 2023.

Preprints

- 1 **Md Rayhanur Rahman** and L. Williams, "An investigation of security controls and mitre att&ck techniques," *arXiv preprint arXiv:2211.06500*, 2022.
- 2 **Md Rayhanur Rahman** and L. Williams, "From threat reports to continuous threat intelligence: A comparison of attack technique extraction methods from textual artifacts," *arXiv preprint arXiv:2210.02601*, 2022.
- 3 **Md Rayhanur Rahman** and L. Williams, "Investigating co-occurrences of mitre att&ck techniques," *arXiv preprint arXiv:2211.06495*, 2022.

Skills

Research methods	■ Mixed methods, meta-analysis, grounded theory approach, survey, empirical analysis
Machine learning	■ Classical learning, deep learning, graph learning, multi-modal learning, association rule mining, social network analysis
Natural language processing	■ Transformers, large language models, language representation learning, fine-tuning, semantic analysis, text classification, entity and relation extraction, knowledge graph extraction
Cybersecurity	■ Threat intelligence, security control, threat modelling, MITRE ATT&CK, NVD, CWE, NIST SP800-53, vulnerability analysis
Program Analysis	■ Static analysis, abstract syntax tree
Tools	■ PyTorch, Deep graph library, Scikit-learn, Networkx, Spacy, OpenAI, Transformers, CodeQL, ZAP, Fortify
Languages	■ Python, C#, Javascript, Prolog, Java, C

Research Tools

ADT4APT	■ Recommending security countermeasures from open source textual descriptions of past cyberattacks
ChronoCTI	■ Extracting temporal patterns of malicious malware behavior from open source textual descriptions of past cyberattacks
PyGistSecuritySmell	■ A static analyzer for finding security weaknesses in Python
SLIC-Ansible	■ A static analyzer for finding security weaknesses in Ansible scripts
Scalable-VFDT	■ An online tree based learner for software defect predictions for large-scale codebases

Miscellaneous

Scholarly Contribution

- 2023 ■ **Reviewer** for Computers & Security
- **Guest Talk** Inviting Security, and Privacy into DevOps, NC State University
- 2021 ■ **Sub-reviewer** for International Conference of Software Engineering
- **Sub-reviewer** for International Conference of Software Engineering
- 2020 ■ **Sub-reviewer** for Mining Software Repositories
- **Sub-reviewer** for Empirical Software Engineering Methods, and Measurements

Mentoring

- 2023 ■ **Undergraduate students:** Brantley Morgan, Brandon Wroblewski, Quinn Matthews
- 2022 ■ **Undergraduate students:** Jonathan Buck
- 2021 ■ **Graduate students:** Aishwarya Seth
- 2017 ■ **Graduate Students:** Deepak Chandra Das
- 2016 ■ **Graduate Students:** Masudur Rahman
- 2015 ■ **Graduate Students:** Md Shafiuzzaman

Awards and Achievements

- 2020 ■ **Travel Grant**, Science of Security, National Security Agency
- 2019 ■ **Travel Grant**, College of Engineering, NC State University, United States
- 2017 ■ **Research Grant**, United Grants Commission, Bangladesh
- 2016 ■ **Research Grant**, United Grants Commission, Bangladesh
- 2015 ■ **Innovation Fund**, Ministry of Information, Communication and Technology, Government of Bangladesh

Miscellaneous (continued)

- 2014 ■ **National Science and Technology Fellowship**, Ministry of Science and Technology, Government of Bangladesh
- 2012 ■ **Champion**, ByteKnight Cybersecurity Challenge, organized by OWASP, Bangladesh
■ **Finalist**, Microsoft Imagine Cup, Bangladesh
- 2011 ■ **Champion**, GetRoot Cybersecurity Challenge, organized by OWASP, Bangladesh

References

1. **Dr. Laurie Williams**
Distinguished University Professor, Computer Science, NC State University
Email: lawilli3@ncsu.edu
Cell: 919-513-4151
2. **Dr. Munindar P. Singh**
SAS Institute Distinguished Professor of Computer Science, Computer Science, NC State University
Email: mpsingh@ncsu.edu
Cell: 919-515-5677
3. **Dr. Timothy Menzies**
Professor, Computer Science, NC State University
Email: tjmenzie@ncsu.edu
Cell: 304-376-2859
4. **Dr. Akond Rahman**
Assistant Professor, Computer Science and Software Engineering, Auburn University
Email: akond@auburn.edu
Cell: 334-844-6352
5. **Dr. John-Paul Ore**
Assistant Professor, Computer Science, NC State University
Email: jwore@ncsu.edu
Cell: 919-515-5164