Iffat Anjum

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RESEARCH INTERESTS

Networks & Systems Security, Access Control Frameworks, Cloud Security, 5G

TEACHING INTERESTS

Computer Networks, Computer and Networks Security, Introduction to Programming Language, Introduction to Compiler, Privacy, Cellular Network Security.

EDUCATION

Doctor of Philosophy in Computer Science Expected May 2023
Department of Computer Science, North Carolina State University, NC, USA
Adviser: Dr. William Enck
Dissertation Title: Removing Trust within On-Premises Enterprise Networks

Master of Science (M.Sc.) in Computer Science and Engineering July 2015
Department of Computer Science and Engineering, University of Dhaka, Bangladesh
Advisor: Dr. Md. Abdur Razzaque
Thesis Title: Quality-of-service-aware weighted-fair medium access control protocol for coexisting cognitive radio networks

Bachelor of Science (B.Sc.) in Computer Science and Engineering June 2013
Department of Computer Science and Engineering, University of Dhaka, Bangladesh

PROFESSIONAL EXPERIENCE

Graduate Research Assistant Aug 2018 – present
Wolfpack Security and Privacy Research (WSPR) Laboratory
North Carolina State University, USA

Graduate Teaching Assistant Aug 2018 – Dec 2019
North Carolina State University, USA

Lecturer Aug 2016 – present (On study leave)
University of Dhaka, Bangladesh

Research Adviser Jan 2017- May 2018
Green Networking Research Group (GNR)
University of Dhaka, Bangladesh

Guest Lecturer Aug 2016 – May 2018
BRAC University, Dhaka, Bangladesh

Guest Lecturer Aug 2017 – May 2018
Green University of Bangladesh, Bangladesh

Lecturer Jan 2014 – Jul 2016
BRAC University, Bangladesh

Graduate Research Assistant Dec 2013 – Jun 2015
Green Networking Research Group (GNR)
University of Dhaka, Bangladesh

Junior Software Engineer May 2013 – Jan 2014
REVE Systems, Dhaka, Bangladesh

Undergraduate Research Assistant Jun 2011 – Nov 2012
Green Networking Research Group (GNR)
University of Dhaka, Bangladesh

PUBLICATIONS

[1] Iffat Anjum, Daniel Kostecki, Ethan Leba, Jessica Sokal, Rajit Bharambe, William Enck, Cristina Nita-Rotaru, and Bradley Reaves, "Removing the Reliance on Perimeters for Security using Network Views", *SACMAT '22: Proceedings of the ACM Symposium on Access Control Models and Technologies,* June 2022.

[2] Iffat Anjum, Mu Zhu, Isaac Polinsky, William Enck, Michael K. Reiter and Munindar Singh, "Role-Based Deception in Enterprise Networks", *CODASPY '21: Proceedings of the Eleventh ACM Conference on Data and Application Security and Privacy,* April 2021.

[3] Iffat Anjum, Mohammad Sujan Miah, Mu Zhu, Nazia Sharmin, Christopher Kiekintveld, William Enck, Munindar P Singh, "Optimizing Vulnerability-Driven Honey Traffic Using Game Theory", *AAAI Workshop on Artificial Intelligence for Cyber Security (AICS),* 2020.

[4] Mahbuba Afrin, Md Abdur Razzaque, Iffat Anjum, Mohammad Mehedi Hassan, and Atif Alamri, "Trade-off between User Quality-of-Experience and Service Provider Profit in 5G Cloud Radio Access Network", *Sustainability*, vol. 9, pp. 2127, 2017.

[5] Iffat Anjum, Md Abdur Razzaque, Mohammad Mehedi Hassan, Abdul hameed Alelaiwi, and Sk. Md. Mizanur Rahman, "Quality-of-service-aware weighted-fair medium access control protocol for coexisting cognitive radio networks", *EURASIP Journal on Wireless Communications and Networking (2016)*, vol. 2016, no. 1, pp. 77, Mar 2016.

[6] Iffat Anjum, Nazia Alam, Md. Abdur Razzaque, Mohammad Mehedi Hassan, and Atif Alamri, "Traffic Priority and Load Adaptive MAC Protocol for QoS Provisioning in Body Sensor Networks", *International Journal of Distributed Sensor Networks*, 2013.

[7] Najmun Nahar Bhuiyan, Roza Tabassum Ratri, Iffat Anjum and Dr. Md. Abdur Razzaque, "Traffic-load Aware Spectrum Allocation in Cloud assisted Cognitive Radio Networks", 2017 IEEE Region 10 Humanitarian Technology Conference (R10-HTC)

[Under Review] Iffat Anjum, Jessica Sokal, Hafiza Ramzah Rehman, Ben Weintraub, Ethan Leba, William Enck, Cristina Nita-Rotaru, Brad Reaves , "MSNetViews: Geographically Distributed Management of Enterprise Network Security Policy".

[In Preparation] Iffat Anjum, Ben Weintraub, William Enck, Cristina Nita-Rotaru, Brad Reaves, "Security Analysis of Next Generation Access Control".

[In Preparation] Ramzah Rehman, Iffat Anjum, Ben Weintraub, William Enck, Cristina Nita-Rotaru, Brad Reaves, "Device to Device Least Privilege Access Control Enforcement in 5G User Plane".

TEACHING EXPERIENCE

North Carolina State University

CSC216 Software Development Fundamentals I worked as a Teaching Assistant in this course where I introduced the students to the basics of Software Development in Object Oriented Language of JAVA. I also taught them the implementation of large programming projects using object-oriented design techniques.

CSC230 C and Software Tools I worked as a Teaching Assistant in this course where I introduced the students to the basics of the C programming language and its application to system level programming, speed and efficiency of execution and basics of simulations and modeling. I helped the professor by conducting lectures, preparing exams and labs.

CSC574 Computer and Network Security This is a graduate-level introduction to computer and network security and privacy. I worked as a teaching assistant to help professor design lectures, exams, research projects, and grading.

University of Dhaka

Course Instructor: Compiler Design and Construction, Computer Architecture and Organization

Lab Instructor: Introduction to Programming Language, Algorithms, Data and Telecommunication Systems

BRAC University

Course Instructor: Compiler Design and Construction, Introduction to Computer Science

Lab Instructor: Data Structures, Algorithms, Digital Logic Design, Microprocessors, Artificial Intelligence, Database Systems

Green University

Course Instructor: Compiler Design and Construction, Introduction to Computer Networks

HONORS

Best Student Paper, Proceedings of the 27th ACM on Symposium on Access Control Models and Technologies (SACMAT 2022).

NCSE CoE Summer Graduate Merit Award, College of Engineering, North Carolina State University, USA (2021)

RSA Conference Security Scholar, RSA Conference, USA (2019)

Grad Cohort CRA-W Student Scholarship, CRA-W, USA (2019)

Dean's Award, Faculty of Engineering & Technology, University of Dhaka, Bangladesh (2013)

University Merit Scholarship, for academic excellence in M.Sc., University of Dhaka, Bangladesh (2015)

Fellowship and Scholarship for research in ICT Sector, Ministry of ICT, Bangladesh (2013 to 2015)

University Merit Scholarship, for academic excellence in B.Sc., University of Dhaka, Bangladesh (2013)

Award of Excellence in Secondary School Certificate Exam (2006) and Higher Secondary Certificate Exam (2008), Education Ministry of Bangladesh.

Bangladesh Bank Scholarship, recognizing the outstanding result in Secondary School Certificate Exam (2006) and and Higher Secondary Certificate Exam (2008), Bangladesh Bank

MENTORING EXPERIENCE

North Carolina State University

Graduate Research Mentor Mentored two graduate students in defining enterprise security and access control research opportunities.

Northeastern University

Graduate Research Mentor Trained them in network simulation tools like Mininet, ONOS, Docker, and Policy Engine.

Undergraduate Research Mentor Worked with the student on project automation and graph generation techniques.

University of Dhaka

Undergraduate Research Advisor Actively advised four undergraduate students in their thesis requirements and got one paper out of this collaboration.

Graduate Research Mentor Actively mentored one graduate student in her M.Sc. thesis requirements and got one paper from this collaboration.

BRAC University

Undergraduate Research Advisor Advised two undergraduate students toward fulfilling their thesis requirements.

ACTIVITIES AND SERVICES

Reviewer, ACM Transactions on Privacy and Security (2022).

Participant, Reflective Educational Design (RED) Inclusive Teaching Certification, North Carolina State University (2022).

Student Volunteer, Secure and Trustworthy CyberSpace Principal Investigators' Meeting (2022 SaTC PI Meeting).

Student Volunteer, North Carolina Cybersecurity Symposium, Raleigh, NC (2022).

Student Participant, MURI Cyberdeception Review Meeting, Los Angeles, CA (2018).

Conducted ICT (Internet and Communication Technologies) workshop for High School Teachers, National University, Bangladesh (2018).

Committee Member of the IQAC cell which deals with governance, staff and facilities, recruitment and staff development and internal process control, University of Dhaka (2018).

Member of purchase committee, Department of Computer Science and Engineering, University of Dhaka (2018).

Representative for Central Admission Examination, University of Dhaka (2018).

Participated in workshop on "Teaching Methods & Techniques", Centre of Excellence in Teaching & Learning (DU, CoETL), University of Dhaka (2017).

Arranged and volunteered at the "1st Cleaning Campaign", Department of Computer Science and Engineering, University of Dhaka (2017).

Member of B.Sc. examination committees, Department of Computer Science and Engineering, University of Dhaka (2016, 2017, 2018).

Organized the workshop on Cloud Infrastructure and Services, Green Networking Research group, University of Dhaka (2015).

RESEARCH EXPERIENCE

Current Projects

Geographically Distributed Management of Enterprise Network Security Policy: This work extends a single, globally-defined and managed, enterprise network security policy to many geographically distributed sites. Each site operates independently and enforces a least-information policy slice that is dynamically parameterized with user location as employees roam between sites. We build a prototype of MSNetViews and analyse performance. As such, we demonstrate the utility of SDN towards achieving zero trust for on-premises network resources, even for organizations with many geographically distributed sites.

Security Analysis of Next Generation Access Control: To analyze NIST Next Generation Access Control, we follow the application-independent approach; later, we will expand it for particular application scenarios (like MSNetViews, and NetViews). We want to verify that the interplay among the policy classes is more restrictive than the individual policy class. We want to ensure that the dynamic policy update using obligation does not violate the access control policy's security properties. Furthermore, we envision formalizing the multi-tenant or multi-administration policy definition of NGAC.

Device to Device Least Privilege Access Control in 5G User Plane: As enterprises move from the wired network to 5G cellular, there is a need to migrate the access control enforcement from the wired network to the 5G network. To achieve this, we define policies between enterprise end-hosts using the NGAC policy language. And develop a custom policy network function in 5G core that takes the NGAC policy, transforms the access control rules to a 5G specified format, and feeds those rule into the Network Repository Function (NRF).

Past Projects

Removing the Reliance on Perimeters for Security using Network Views: We propose Network Views (abbrev. NetViews) for least-privilege network access control where each host has a different, limited view of the other hosts and services within a network. We present an SDN-based design and demonstrate that NetViews provides a practical primitive for removing the reliance on security perimeters within enterprise networks.

Role-Based Deception in Enterprise Networks: The goal of this paper is to show that role-based network deception is a promising approach for defending against adversaries in compromised network devices. We propose HoneyRoles, which uses honey connections to build metaphorical haystacks around the network traffic of client hosts belonging to high-value organizational roles.

Optimizing Vulnerability-Driven Honey Traffic Using Game Theory: In this paper, we propose Snaz, a technique that uses deceptively crafted honey traffic to confound the knowledge gained through passive network reconnaissance. We present a two-player non-zero-sum Stackelberg game model that characterizes how a defender should deploy honey traffic in the presence of an adversary who is aware of Snaz.

Medium Access Control Protocol for Coexisting Cognitive Radio Networks: Opportunistic usage selection of a licensed channel by a secondary user (SU) and its contention for data transmission is a challenging problem in coexisting cognitive radio network (CCRN). In this paper, a weighted fair medium access control protocol, namely WF-MAC, has been developed for overlay CR network that gives users proportionate accesses to the opportunistic spectrum following their application QoS requirements.

Utility-Cost Trade-off in 5G Cloud Radio Access Network: The Cloud Radio Access Network (CRAN) has become a promising solution for increasing network capacity in terms of high data rates and low latencies for 5G cellular networks. Meeting the baseband processing of heterogeneous requests while keeping their Quality-of-Service (QoS) requirements with the limited computational resources as well as enhancing service provider profit is a challenging multi-constraint problem.

GRADUATE COURSES

Computer and Network Security, Computer Networks, Artificial Intelligence, Cellular Network Security, Technical Communication for Engineering Research, Compiler Construction, Advanced Network Security, Automata, Languages and Computability Theory, Privacy

REFERENCES

Dr. William Enck, Professor
Department of Computer Science
North Carolina State University, NC, USA
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Dr. Brad Reaves, Assistant Professor,
Department of Computer Science and
North Carolina State University, NC, USA
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Michael Reiter, James B. Duke Distinguished Professor
Departments of Computer Science and
Electrical & Computer Engineering
Duke University, NS, USA
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Cristina Nita-Rotaru, Professor
Khoury College of Computer Sciences
Northeastern University, MA, USA
c.nitarotaru@northeastern.edu