Elie F. Kfoury

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EDUCATION

University of South Carolina, Columbia *January 2019 - Present*
Doctor of Philosophy (Ph.D.), Informatics, Funded by NSF
College of Engineering and Computing

American University of Science and Technology, Beirut *September 2015 - July 2018*
Master of Science (M.S.), Computer Science GPA: 4.0/4.0

American University of Science and Technology, Beirut *January 2012 - July 2015*
Bachelor of Science (B.S.), Computer Science GPA: 3.75/4.0

ACADEMIC EXPERIENCE

Research/Teaching Assistant *January 2019 - Present*
Department of Computer Science and Engineering
University of South Carolina (USC)

Research/Teaching Assistant *September 2015 - July 2018*
Department of Computer Science and ICT
American University of Science and Technology (AUST)

AWARDS

Best paper award, "Secure End-to-End VoIP System based on Ethereum Blockchain", International Conference on Communication and Network Protocol (ICCNP 2018), Paris, France, 2018.
Link: `https://tinyurl.com/bde2ph3d`.

Ericsson Startup Challenge 2017: Ericsson Garage has launched this competition in cooperation with Capital A Partners (CAP A), and Butterfly Ventures. I was the lead developer as part of Secumobi AB, a Swedish startup specialized in IoT, systems security and Blockchain technology. The project was among the nine finalists from the 189 startup participation forms received. The nine startups were selected to pitch their ideas in front of a live Dragons Den (a jury of specialized experts) which included Börje Ekholm, the CEO of Ericsson, at the Ericsson Studio in collaboration with the STHLM TechFest. Secumobi AB won the second prize, which included one hour of mentoring and investments with Cap A or Butterfly, as well as free access to run the project and test it in the Urban ICT Arena in Stockholm, Sweden for three months (2017).
Link: `https://tinyurl.com/2p9a77d8`, `https://tinyurl.com/4d683msy`.

Alfa and Ericsson Internet of Things (IoT) Award: Alfa (the main mobile network in Lebanon) and Ericsson launched the competition in November 2016 in collaboration with the IEEE chapter in Lebanon. Twenty teams constituted of students in telecom, computer, and electrical engineering in senior years from eleven universities took part in this multi-phase competition over eight weeks, presenting their IoT projects before a jury of experts. Five teams were qualified for the final round, and my team won the first prize for the project entitled "eHealth Monitoring & Reporting Device for Real-time Patient Monitoring and Anomaly Reporting" (2017). The prize included $5000, as well as investment opportunities with main tech companies in Lebanon: `https://tinyurl.com/32594747`.

Best Paper Award, "An Innovative Lightweight IoT eHealth Monitoring System for Patients of Cardiac, Dementia and Cognitive Decline Diseases", AIS Lebanese Conference on Information Systems (LCIS 2017), Beirut, Lebanon, 2017

Best Computer Science Project, Yearly Expo at AUST. In this project, I developed an Android application that provides recommendations and instructions to obtain a healthy tanning experience. The project used computer vision and machine learning techniques. (2015)

BOOKS

1. J. Crichigno, E. Kfoury, E. Bou-Harb, and N. Ghani. High-Speed Networks: A Tutorial Book. Springer International Publishing, First Edition, 2022

PAPERS IN REFEREED CONFERENCES AND JOURNALS

1. E. Kfoury, J. Crichigno, and E. Bou-Harb. P4BS: Leveraging Passive Measurements from P4 Switches to Dynamically Modify a Router's Buffer Size. *submitted to IEEE/ACM Transactions on Networking*, 2022
2. E. Kfoury, J. Crichigno, and E. Bou-Harb. P4Tune: Enabling Programmability in Non-Programmable Networks. *submitted to IEEE Communications Magazine*, 2022
3. K. Friday, E. Kfoury, E. Bou-Harb, and J. Crichigno. INC: In-Network Classification of Botnet Propagation at Line Rate. In *27th European Symposium on Research in Computer Security (ESORICS)*, 2022
4. A. AlSabeh, E. Kfoury, J. Crichigno, and E. Bou-Harb. P4DDPI: Securing P4-Programmable Data Plane Networks via DNS Deep Packet Inspection. In *Network and Distributed Systems Security (NDSS), MADWeb Workshop*, 2022
5. J. Gomez, E. Kfoury, J. Crichigno, and G. Srivastava. A Survey on TCP Enhancements using P4-programmable Devices. *Computer Networks*, page 109030, 2022
6. A. AlSabeh, J. Khoury, E. Kfoury, J. Crichigno, and E. Bou-Harb. A Survey on Security Applications of P4 Programmable Switches and a STRIDE-based Vulnerability Assessment. *Computer Networks*, page 108800, 2022
7. E. Kfoury, J. Crichigno, and E. Bou-Harb. Dynamic Router's Buffer Sizing using Passive Measurements and P4 Programmable Switches. In *IEEE Global Communications Conference (GLOBECOM)*. IEEE, 2021
8. J. Crichigno, E. Kfoury, K. Caudle, and P. Crump. A Distributed Academic Cloud and Virtual Laboratories for Information Technology Education and Research. In *2021 44th International Conference on Telecommunications and Signal Processing (TSP)*, pages 195–198. IEEE, 2021
9. E. Kfoury, J. Crichigno, and E. Bou-Harb. An Exhaustive Survey on P4 Programmable Data Plane Switches: Taxonomy, Applications, Challenges, and Future Trends. *IEEE Access*, 2021
10. C. Vega, J. Pezoa, E. Kfoury, and J. Crichigno. Coarse Estimation of Bottleneck Router's Buffer Size for Heterogeneous TCP Sources. In *3rd Workshop on Data Driven Intelligence for Networks and Systems, IEEE International Conference on Communications (ICC)*. IEEE, 2021
11. H. Farran, D. Khoury, E. Kfoury, and L. Bokor. A Blockchain-based V2X Communication System. In *2021 44th International Conference on Telecommunications and Signal Processing (TSP)*, pages 208–213. IEEE, 2021
12. E. Kfoury, J. Gomez, J. Crichigno, and E. Bou-Harb. An Emulation-based Evaluation of TCP BBRv2 Alpha for Wired Broadband. *Elsevier Computer Communications*, 2020

13. E. Kfoury, D. Khoury, A. AlSabeh, J. Gomez, J. Crichigno, and E. Bou-Harb. A Blockchain-based Method for Decentralizing the ACME Protocol to Enhance Trust in PKI. In *IEEE 43rd International Conference on Telecommunications and Signal Processing (TSP 2020)*. IEEE, 2020

14. J. Gomez, E. Kfoury, J. Crichigno, E. Bou-Harb, and G. Srivastava. A Performance Evaluation of TCP BBRv2 Alpha. In *IEEE 43rd International Conference on Telecommunications and Signal Processing (TSP 2020)*. IEEE, 2020

15. A. AlSabeh, E. Kfoury, J. Crichigno, and E. Bou-Harb. Leveraging SONiC Functionalities in Disaggregated Network Switches. In *IEEE 43rd International Conference on Telecommunications and Signal Processing (TSP 2020)*. IEEE, 2020

16. E. Kfoury, J. Crichigno, and E. Bou-Harb. Offloading Media Traffic to Programmable Data Plane Switches. In *54th IEEE International Conference on Communications (ICC)*. IEEE, 2020

17. K. Friday, E. Kfoury, E. Bou-Harb, and J. Crichigno. Towards a Unified In-Network DDoS Detection and Mitigation Strategy. In *IEEE International Conference on Network Softwarization (NetSoft)*. IEEE, 2020

18. J. Crichigno, E. Bou-Harb, E. Kfoury, J. Gomez, and A. Magnino. Training Engineering Students and IT Professionals on High-throughput Networking and Cybersecurity using a Virtual Environment. In *Annual Conference of American Society for Engineering Education (ASEE)*, 2020

19. E. Kfoury, J. Gomez, J. Crichigno, E. Bou-Harb, and D. Khoury. Decentralized Distribution of PCP Mappings Over Blockchain for End-to-End Secure Direct Communications. *IEEE Access*, 7:110159–110173, 2019

20. E. Kfoury, J. Crichigno, E. Bou-Harb, D. Khoury, and G. Srivastava. Enabling TCP Pacing using Programmable Data Plane Switches. In *IEEE 42nd International Conference on Telecommunications and Signal Processing (TSP 2019)*, pages 273–277. IEEE, 2019

21. D. Khoury, E. Kfoury, J. Ged, J. Crichigno, and E. Bou-Harb. Method for Securing and Terminating a CS Call over a VoIP System with Multi-Device Support. In *IEEE 42nd International Conference on Telecommunications and Signal Processing (TSP 2019)*, pages 318–322. IEEE, 2019

22. E. Kfoury, J. Saab, P. Younes, and R. Achkar. A Self Organizing Map Intrusion Detection System for RPL Protocol Attacks. *International Journal of Interdisciplinary Telecommunications and Networking (IJITN)*, 11(1):30–43, 2019

23. E. Nasr, E. Kfoury, and D.J. Khoury. A Pervasive IoT Scheme to Vehicle Overspeed Detection and Reporting Using MQTT Protocol. In *ICT for a Better Life and a Better World*, pages 19–34. Springer, 2019

24. J. Crichigno, E. Kfoury, E. Bou-Harb, N. Ghani, Prieto Y., Vega C., J. Pezoa, C. Huang, and D. Torres. A Flow-based Entropy Characterization of a NATed Network and its Application on Intrusion Detection. In *53rd IEEE International Conference on Communications (ICC)*, pages 1–7. IEEE, 2019

25. E. Kfoury and D.J. Khoury. Secure End-to-End VoIP System based on Ethereum Blockchain. *Journal of Communications*, 13(8):450–455, 2018

26. D.J. Khoury, E. Kfoury, Ali Kassem, and Hamza Harb. Decentralized Voting Platform Based on Ethereum Blockchain. In *2018 IEEE International Multidisciplinary Conference on Engineering Technology (IMCET)*, pages 1–6. IEEE, 2018

27. E. Kfoury and D.J. Khoury. Securing NATted IoT Devices Using Ethereum Blockchain and Distributed TURN Servers. In *The 10th International Conference on Advanced Infocomm Technology*. IEEE, 2018

28. E. Kfoury and D. Khoury. Distributed Public Key Infrastructure and PSK Exchange Based on Blockchain Technology. In *2018 IEEE International Conference on Internet of Things (iThings) and IEEE Green Computing and Communications (GreenCom) and IEEE Cyber, Physical and Social Computing (CPSCom) and IEEE Smart Data (SmartData)*, pages 1116–1120. IEEE, 2018

29. E. Kfoury and D.J. Khoury. Secure End-to-End VoLTE based on Ethereum Blockchain. In *2018 41st International Conference on Telecommunications and Signal Processing (TSP)*, pages 1–5. IEEE, 2018

30. D.J. Khoury and E. Kfoury. Generic Hybrid Methods for Secure Connections based on the Integration of GBA and TLS/CA. In *2017 Sensors Networks Smart and Emerging Technologies (SENSET)*, pages 1–4. IEEE, 2017

31. E. Nasr, M. Owayjan, D.J. Khoury, E. Kfoury, and H. Zanbarakji. An Innovative Lightweight IoT eHealth Monitoring System for Patients of Cardiac, Dementia and Cognitive Decline Diseases. In *2017 Lebanese Conference on Information Systems (LCIS)*, pages 1–4. AIS, 2017

32. E. Nasr, E. Kfoury, M. Kfoury, and L. Karam. An Analytical Approach to Psychological Behavior of Hackers Motives. In *2016 Lebanese Conference on Information Systems (LCIS)*, pages 1–4. AIS, 2016

33. E. Nasr, E. Kfoury, and D. Khoury. An IoT Approach to Vehicle Accident Detection, Reporting, and Navigation. In *2016 IEEE International Multidisciplinary Conference on Engineering Technology (IMCET)*, pages 231–236. IEEE, 2016

GRANT PROPOSALS PARTICIPATION

During my years as a PhD student at the University of South Carolina, I was assisting my advisor in writing various grants that were submitted to the National Science Foundation (NSF). I was the lead developer under the direction of the Principal Investigator for the following projects:

1. "CyberTraining: Implementation: Small: Cybertraining on P4 Programmable Devices using an Online Scalable Platform with Physical and Virtual Switches and Real Protocol Stacks", NSF Office of Advanced Cyberinfrastructure (OAC), award number 2118311. In this project, I was involved in defining the list of lab series to be developed and creating the programming environment and the virtual testbed. I am currently the lead developer of training material for the P4 programming language using the BMv2 software switch and Intel's Tofino chip. Additionally, we are in the process of writing a book, in which I am the lead author, that provides hands-on sessions and tutorials on programmable data planes.

2. "NSF CC* Networking Infrastructure: Building a Science DMZ for Data-intensive Research and Computation at the University of South Carolina", NSF Office of Advanced Cyberinfrastructure (OAC), award number 1925484. In this project, I was involved in conducting network performance tests using various TCP congestion control algorithms (Cubic, BBR, BBRv2), router buffer sizes, propagation delays, MTUs, packet loss rates, etc., to better understand how to tune the Data Transfer Nodes (DTNs) at the University of South Carolina.

3. "CyberTraining CIP: Cyberinfrastructure Expertise on High-throughput Networks for Big Science Data Transfers", NSF Office of Advanced Cyberinfrastructure (OAC), award number 1829698. The goal of this project is to develop self-paced self-training material on networking technologies that facilitate the transfer of very large scientific data (big data) across geographically separated sites. The hands-on material is delivered over NDG's NetLab platform. In this project, I was the lead developer of the Network Tools and Protocols (NTP) lab series which included the following topics: emulating Wide Area Network (WAN) conditions with NETEM (latency, jitter, packet loss, duplication, reordering, etc.), setting the link capacity using the Token Bucket Filter (TBF)

queueing discipline, experimenting with traditional TCP congestion control algorithms (HTCP, Cubic, NewReno) and rate/model-based TCP congestion control algorithms (BBR, BBRv2), understanding the Bandwidth-delay Product (BDP) and the importance of the TCP/router's buffer sizes, impact of parallel streams, measuring the fairness between flows, configuring TCP pacing, mitigating router's bufferbloat, and configuring Active Queue Management (AQM) algorithms such CoDel, Random Early Detection (RED), Proportional Integral Controller-Enhanced (PIE), Hierarchical Token Bucket (HTB), Stochastic Fair Queueing (SFQ). The list of labs were compiled into a book ("High-Speed Networks: A Tutorial"), in which I am the second author; the book is being used nationally for deploying, troubleshooting, and tuning ScienceDMZ networks.

I also contributed to the following lab series: SDN , Open Virtual Switch (OVS), Zeek, MPLS and Advanced BGP Topics. The full list of labs can be found here:
`http://ce.sc.edu/cyberinfra/cybertraining.html`.

4. "Enhancing the Preparation of Next-generation Cyber Professionals through a Hands-on Academic Program, Undergraduate Research Experiences, and Community Partnerships", Office of Naval Research (ONR), award number GRANT13049248. In this project, I was supervising and guiding undergraduate students in developing cybersecurity projects. The projects were mostly built using the PaloAlto NGFW and programmable data planes. Projects include stateful packet filter using P4, policy-based forwarding, geoblocking, application ID, DDoS attacks detection and prevention. More information about the projects can be found here: `http://ce.sc.edu/cyberinfra/onr.html`.

TEACHING EXPERIENCE

ITEC 493: IT Security for Managers (USC) *Fall 2022, Spring 2022*
This course provides students with a managerially-focused overview of information security and how to effectively administer it. The material is intended to prepare student to become an information security management practitioner and analyst who is able to secure systems and networks to meet the challenges in a world where continuously emerging threats, ever-present attacks, and the success of criminals illustrate weaknesses in current information technologies. The course provides hands-on labs using the PaloAlto Networks Next-generation Firewall (NGFW). Avg student evaluation: 4.74/5.00

ITEC 445: Advanced Networking (USC) *Fall 2021, Fall 2020*
This course covers network infrastructure topics (client/server protocols, routing, switching) with emphasis on hands-on implementations using network operating system software. It describes routing concepts, the operation of link state and distance vector protocols, routing schemes based on static and dynamic routing protocols, the role of trunking VLANs in a network, Access Control Lists, DHCP and NAT. The course includes CCNA-related topics; the Cisco Packet Tracer simulator is used throughout the course. Avg student evaluation: 4.60/5.00

CSI 205L: Computer Programming I Lab (AUST) *Fall, Spring 2015-2018*
This course explains the basic principles of algorithmic problem solving and programming in C++. Topics include: use of methods of top down design, stepwise refinement and procedural abstraction, basic control structures, data types, and input/output. Avg student evaluation: 3.51/4.00

CSI 250L: Computer Programming II Lab (AUST) *Fall, Spring 2015-2018*
This course is a continuation of CSI 205. It introduces the fundamentals of computer science and software methodologies using Java. Topics include: abstract data types, object-oriented models and methods, specifications and program composition. Avg student evaluation: 3.54/4.00

CSI 418L: Web Programming Lab (AUST) *Fall, Spring 2015-2018*
This course gives the student a deep understanding of how to create dynamic, data driven websites.

It focuses on the integration of HTML, CSS, MySQL, and PHP, to provide a platform for building database-driven web applications.

ICT 225L: Linux Fundamentals Lab (AUST) *Fall, Spring 2015-2018*
This course explains the basic principles of Linux operating system, and provides the student with comprehensive information on the open source software community. Topics include: Linux history, licensing, distributions, features, command line, file system, process control, text editing tools, X windows, security and networking basics. Avg student evaluation: 3.61/4.00

ICT 250L: Computer Programming II Lab (Python) (AUST) *Fall, Spring 2015-2018*
This course introduces the student to the Python programming language. Topics include: Spyder IDE, language components, control flow constructs, file objects and I/O, sequences, collections, mapping types (dictionaries), object oriented programming (classes).

ICT 355L: Internet of Things (IoT) and Security Lab (AUST) *Fall, Spring 2015-2018*
This course introduces the student to the building blocks of the Internet of Things (IoT), and the IoT key enabling technologies and their security aspects. Hands-on labs include: Raspberry Pi programming, WSN 6LoWPAN in Cooja Contiki simulator, CoAP, and MQTT.

ICT 350L: Linux Kernel & Shell Programming (AUST) *Fall, Spring 2015-2018*
This course is designed to give the student a deep understanding of how to build, customize, and debug a Linux Kernel. It also introduces the student to Shell scripting. Topics cover: menuconfig, retrieving the kernel source (git) and building it, programming/scripting tools (make, gcc, strace, git, awk, sed, grep, regex) and shell scripts (bash). Avg student evaluation: 3.62/4.00

ICT 360L: Network and Web Programming Lab (AUST) *Fall, Spring 2015-2018*
This course introduces the student to the different types of network programming and services. Topics include: TCP/UDP sockets, multithreading, file handling and serializations, RMI, Database Connectivity, and an introduction to web applications programming using Java (JSP), AJAX, and many other Internet services. Avg student evaluation: 3.65/4.00

CONDUCTED WORKSHOPS

Below is a list of workshops where I presented hands-on sessions on various networking topics as part of the Cyberinfrastructure Lab at USC. The workshops are funded by the National Science Foundation (NSF). The co-organizers include: Engagement and Performance Operations Center (EPOC), Western Academy Support and Training Center (WAST), Energy Sciences Network (ESnet), New York State Education and Research Network (NYSERNET), and others.

- Tutorial on Science DMZ, NSF CC* PI Workshop, Monday September 19, 2022, Minneapolis, Minnesota. Link: `https://tinyurl.com/4dmb4wwr`.
- Introductory and Advanced Topics on P4 Programmable Data Plane Switches, Monday June 13 - Friday June 17, 2022, Online. Link: `https://tinyurl.com/8cch9pcn`.
- Hands-on Workshop on Networking Topics, Tuesday April 5, Tuesday April 12, 2022, Online. Link: `https://tinyurl.com/2asck8c2`.
- P4 Programmable Switches Workshop, February 16, 23, 2022, Online.
  Link: `https://tinyurl.com/5dc2ntb8`.
- Virginia Cybersecurity Education Conference, Tuesday July 20 - Thursday July 22, 2021, Online.
  Link: `https://tinyurl.com/mw6s36fm`.
- Advanced Networking Topics: BGP, BGP Hijacking, MPLS, MPLS-based VPNs, Segment Routing, and others, Monday June 14 - Friday June 18, 2021, Online.
  Link: `https://tinyurl.com/3w7cdzf9`, `https://tinyurl.com/8e4s8xyb`.

- NSF CC* Workshop, Thursday April 15, 2021, Online.
  Link: `https://tinyurl.com/y6cv3pv3`.
- High-speed Networks, Cybersecurity, and Software-defined Networking Workshop, Monday June 15 - Friday June 19, 2020, Online.
  Link: `https://tinyurl.com/39nmdwhm`.
- Training Workshop for Educators and Network Engineers on High Speed Network Protocols and Security, Monday May 4 - Wednesday May 6, 2020, Online.
  Link: `https://tinyurl.com/mut5fmw5`.
- Workshop on Cyberinfrastructure at Arizona State University (ASU), July 30 - August 1, 2019.
  Link: `https://tinyurl.com/yeynsuab`.
- Training Workshop for Network Engineers and Educators on Tools and Protocols for High-Speed Networks and Cybersecurity, Monday July 22, Tuesday July 23, 2019, Columbia, South Carolina.
  Link: `https://tinyurl.com/5t3x4djt`.

CERTIFICATIONS OR PROFESSIONAL REGISTRATIONS/WORKSHOPS

- Cisco Network Programmability and Automation, Western Academy Support & Training Center (WASTC) 2022 virtual Faculty Development Weeks (vFDW), Online, June 20 - 24, 2022.
- Cybersecurity Infrastructure Configuration, Palo Alto Network Cybersecurity Academy, Authorization Number: s9dyCZb3et. Santa Clara, CA, USA, August 2020.
- BA-9111: Introduction to Data Plane Development with P416/TNA, Tofino ASIC and P4Studio SDE, Intel/Barefoot Networks. San Jose, CA, USA, July 2020.
- P4 Developer Day 2019, Advanced Track. Stanford University, CA, USA, May 2019.
- BA 101: Introduction to Data Plane Development with P4, Tofino ASIC and P4Studio SDE, Intel/Barefoot Networks. San Jose, CA, USA, March 2019.
- Scrum Master (Scrum Arabia).
- Cisco Certified Network Associate Routing & Switching (CCNA 1, 2).
- Cisco Certified Network Associate Security (CCNAS).
- Linux Professional Institute certification LPI 101.

INVITED/REFEREED TALKS

- "Netlab Libraries on Security Fundamentals (Sec+) and Programmable Switches", Western Academy Support & Training Center (WASTC) 2023 Winter ICT Educators' Conference, Online, January 6, 2023.
- "A Cloud System for Teaching and Research on P4 Programmable Data Plane", KNIT 5: A FABRIC Community Workshop, Northwestern University, Wieboldt Hall, Chicago, September 21, 2022.
- "An Overview on CILab's Current Projects in the Integrated Information Technology Department", Vayl Oxford's USC Visit, IIT Conference Room, University of South Carolina, June 13, 2022.

- "P4Tune: Enabling Programmability in a non-Programmable Network", CI Engineering Lunch and Learn, Online, April 15, 2022.
  Link: `https://youtu.be/KwIm8kpc64w`.
- "Performance Evaluation of TCP BBRv2 Alpha for Wired Broadband, considering Buffer Sizes, Packet Loss Rates, RTTs, and Number of Flows", CI Engineering Lunch and Learn, Online, March 26, 2021.
  Link: `https://youtu.be/YoMWmmiUgHY`.
- "Virtual Labs for Training, Teaching, and Research on Networks and Cybersecurity Topics", CI Engineering Lunch and Learn, Online, February 19, 2021.
  Link: `https://youtu.be/y1WNFkeFsD8`.
- "Offloading Media Traffic to Programmable Data Plane Switches", P4 Expert Roundtable Series, April 2020.
  Link: `https://youtu.be/WoMdiuLai5g`.
- "Offloading Media Traffic to Programmable Data Plane Switches", at ESnet Cyberinfrastructure Engineering Lunch and Learn Series Series, Online, February 28, 2020.
  Link: `https://youtu.be/tQv3cYTLRC8`.

POSTERS PRESENTATION

- "SYN Flood Attack Detection and Mitigation using P4 Programmable Switches", demo at FABRIC KNIT 5 Workshop, Chicago, September 2022.
- "Leveraging Programmable Data Plane Switches to Mitigate Cyberattacks in Non-programmable Networks", poster at TechNet, AFCEA, Augusta GA, August 2022.
- "Towards a Unified In-Network DDoS Detection and Mitigation Strategy", poster at TechNet, AFCEA, Augusta GA, January, 2020.
- "A Flow-based Entropy Characterization of a NATed Network and its Application on Intrusion Detection", poster at TechNet, AFCEA, Augusta GA, August 2019

TECHNICAL SKILLS

Technologies: Programmable data planes (P4), Software-defined Networking (SDN), Blockchain, compiler design/construction, cryptography, Public Key Infrastructure (PKI), socket programming, congestion control (algorithms (CUBIC, BBR, etc.), end-host tuning, router buffer sizing, etc.), Voice over IP (VoIP), video streaming (DASH), network measurements, Internet of Things (IoT), science DMZ.

Programming/Scripting Languages: P4, C, C++, Java SE/EE, Android, Python, SQL, JavaScript, HTML, shell scripting, UNIX, backend web programming (ASP.NET, PHP).

SOCIETIES AND TECHNICAL GROUPS

- ACM Student Membership. (2020 - Present)
- IEEE Communications Society (ComSoc) Membership. (2020 - Present)
- IEEE (Institute of Electrical and Electronics Engineering), Graduate Student Member. (2015 - Present)
- IEEE Young Professionals. (2015 - Present)

- AIS (Association for Information Systems), Academic member. (2016 - Present)

LANGUAGES

- English, Arabic, French