

Muhammad Saad

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EDUCATION

PH.D., Computer Science, University of Central Florida Orlando, FL, USA (2017 – Current)

Advisor: Prof. Aziz Mohaisen.

Topic: Blockchain technology: Attack surface and Applications

M.Sc., Electrical Engineering, Lahore University of Management Sciences (LUMS) – Pakistan (2015 – 2017)

Advisor: Prof. Fareed Zaffar.

Topic: Web Security and Privacy

RESEARCH INTERESTS

I am broadly interested in the area of security and privacy. Currently, I am working on blockchains, covering a range of topics, from primitives and foundations to applications and translations. More precisely, I am perusing three thrusts: 1) principled research into distributed systems and cryptographic primitives that ensure desirable properties in blockchain systems, such as privacy, security, fairness, high throughput, and concurrency, 2) instrumenting requirements of legacy applications (conventional database solutions, audit logs, etc.), and new applications (e.g., IoT, smart systems, etc.) for successful translation into a blockchain framework by combining requirements engineering and composable designs, and 3) ensuring sustainability of existing applications in the blockchain ecosystem through active measurements and predictive models. Concurrently, I am also interested in understanding avenues of the abuse of blockchains through systematic attack surface analysis.

PROFESSIONAL APPOINTMENTS

08/2017 – Current	Research Assistant	University of Central Florida	Blockchain Design and Security
05/2019 – 08/2019	Visiting Research Assistant	Information Sciences Institute	Distributed Systems Security

TECHNICAL PUBLICATIONS AND MANUSCRIPTS

CONFERENCES

1. **Muhammad Saad**, Aminollah Khormali, and Aziz Mohaisen, Dine and Dash: Static, Dynamic, and Economic Analysis of In-Browser Cryptojacking”. In Electronic Crime Research (**eCrime 2019**), Pittsburgh, USA.
2. **Muhammad Saad**, Victor Cook, Lan Nguyen, My T Thai, and Aziz Mohaisen, “Partitioning Attacks on Bitcoin: Colliding Space, Time, and Logic”. In IEEE International Conference on Distributed Computing Systems (**IEEE ICDCS 2019**), Dallas, USA. **Acceptance Rate: 19.3%**
3. **Muhammad Saad**, Laurent Njilla, Charles Kamhoua, Joongheon Kim, DaeHun Nyang, and Aziz Mohaisen, “Mempool Optimization for Defending Against DDoS Attacks in PoW-based Blockchain Systems”. In IEEE International Conference on Blockchain and Cryptocurrency (**IEEE ICBC 2019**), Seoul, South Korea, 14-17 May, 2019. **Acceptance Rate: 19.6%**
4. **Muhammad Saad**, Afsah Anwar, Ashar Ahmad, Hisam Alasmay, Murat Yukesl, and Aziz Mohaisen. RouteChain: Towards Blockchain-based Secure and Efficient BGP Routing. IEEE International Conference on Blockchain and Cryptocurrency (**IEEE ICBC 2019**), Seoul, South Korea, 14-17 May, 2019. **Acceptance Rate: 19.6%**
5. Ashar Ahmad, **Muhammad Saad**, Laurent Njilla, Charles A. Kamhoua Mostafa Bassiouni, and Aziz Mohaisen, BlockTrail: A Scalable Multichain Solution for Blockchain-based Audit Trails. In IEEE International Conference on Communications, (**IEEE ICC 2019**), Shanghai, China, May 18-22, 2019

JOURNALS

1. **Muhammad Saad**, Jinchun Choi, DaeHun Nyang, Joongheon Kim, and Aziz Mohaisen, "Towards Characterizing Blockchain-based Cryptocurrencies for Highly-Accurate Predictions. *IEEE Systems Journal (ISJ 2019)*.
2. Ashar Ahmad, **Muhammad Saad**, and Aziz Mohaisen, "Secure and Transparent Audit Logs with BlockAudit". *Elsevier Journal of Network and Computer Applications (JNCA 2019)*.

BOOK CHAPTERS

1. **Muhammad Saad**, Charles Kamhoua, Laurent Njilla, Kevin Kwait, Aziz Mohaisen Shocking Bitcoins Memory with Unconfirmed Transactions: New DDoS Attacks and Countermeasures. In "Blockchain for Distributed Systems. IEEE Press 2019.
2. **Muhammad Saad**, Jeffrey Spaulding, Charles Kamhoua, Laurent Njilla, DaeHun Nyang, and Aziz Mohaisen. Exploring the Attack Surface of Blockchain. In "Blockchain for Distributed Systems. IEEE Press 2019.

WORKSHOPS

1. **Muhammad Saad**, Laurent Njilla, Charles Kamhoua, and Aziz Mohaisen. Countering Selfish Mining in Blockchains. *IEEE Workshop on Computing, Networking and Communications, CNC 2019* Honolulu, USA.
2. Ashar Ahmad, **Muhammad Saad**, Mostafa Bassiouni, and Aziz Mohaisen. Towards Blockchain-Driven, Secure and Transparent Audit Logs. *International Workshop on Distributed Ledger of Things, DLoT 2018* (in conjunction with *MobiQuitous 2018*), New York City, USA. (**Best Paper Award**).
3. **Muhammad Saad** and Aziz Mohaisen. Towards Characterizing Blockchain-based Cryptocurrencies for Highly-Accurate Predictions. *International Workshop on Hot Topics in Pervasive Mobile and Online Social Networking, HotPOST 2018* (in conjunction with *IEEE INFOCOM 2018*), Honolulu, HI, USA.

POSTERS

1. **Muhammad Saad**, My.T.Thai, and Aziz Mohaisen. POSTER: Deterring DDoS Attacks on Blockchain-based Cryptocurrencies through Mempool Optimization. *ACM Asia Conference on Computer and Communications Security, AsiaCCS 2018*, Incheon, Korea.
2. **Muhammad Saad**, Victor Cook, Lan Nguyen, My T Thai, and Aziz Mohaisen, "Partitioning Attacks on Bitcoin: Colliding Space, Time, and Logic". In *The Network and Distributed System Security Symposium (NDSS 2019)*, San Diego, USA.

TECHNICAL REPORTS AND WORK IN SUBMISSION

1. **Muhammad Saad**, Aminollah Khormali, and Aziz Mohaisen. End-to-End Analysis of In-Browser Cryptojacking. *The Web Conference, ArXiv 2018* .
2. Ashar Ahmad, **Muhammad Saad**, Mostafa Bassiouni, and Aziz Mohaisen, "BlockTrail: A Service for Secure and Transparent Blockchain-Driven Audit Trails". *Transactions on Service Computing (TSCJ 2019)*.
3. Aminollah Khormali, Hisham Alasmay, Afsah Anwar, Jinchun Choi, Jeman Park, **Muhammad Saad**, and Aziz Mohaisen, *Advances in Domain Name System Security and Privacy: A Survey*, *ACM Computing Surveys*, 2018 (in submission)

REPRESENTATIVE RESEARCH PROJECTS

1. **Blockchain Attack Surface**: This project aims to develop a systematic understanding of blockchain attack surface. We explore various attack vectors associated with cryptographic constructs of blockchains, its peer-to-peer architecture, and its application-specific use case. For each attack, we propose countermeasures to motivate the secure use of blockchains in emerging applications. Parts of this work have appeared in HotPOST 2018, ASIACCS 2018, NDSS 2019, ICDCS 2019, and eCrime 2019.

2. **Blockchain Applications:** This project is an effort to understand the correct and feasible use of blockchains in various existing applications. Since each application has varying design requirements and challenges with respect to scalability, throughput, concurrency, non-blocking, and fault tolerance, therefore, a successful translation of such application into blockchain systems requires careful construction of the network structure and appropriate usage of the consensus algorithm. To that end, we have successfully applied blockchains in the eGovernment applications for secure-by-design auditing and end-to-end provenance. Parts of this work have appeared in DLoT 2018 and ICBC 2019.

SERVICES AND MENTORSHIP

1. **TPC and Shadow PC Member:** I have served as a reviewer for International Conference on Parallel and Distributed Systems (ICPADS 2019), Internet Measurements Conference (IMC 2019 and received the highest review feedback among 76 TPC members), International Workshop on Lightweight Blockchain for Edge Intelligence and Security (LightChain 2019), ETRI Journal, IEEE Access.
2. **External Reviewer:** I have also served as an external reviewer for Network and Distributed Systems Security (NDSS 2018), International Conference on Computer Communications (INFOCOM 2018 and 2019), Transactions on Dependable and Secure Computing (TDSC 2018), and International Conference on Web and Social Media (ICWSM 2018).
3. **Mentor:** Since 2018, I have been mentoring high school students to encourage their participation in Computer Science. The student mentorship program is organized by Camp Connect.

REFERENCES

Aziz Mohaisen, Associate Professor
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