Manaar Alam

Secured Embedded Architecture Laboratory
Department of Computer Science and Engineering
Indian Institute of Technology, Kharagpur, West Bengal, India.

+91 9073202113 • alam.manaar@iitkgp.ac.in • manaar.alam

Current Position

Indian Institute of Technology, Kharagpur **Kharagpur**
Ph. D. in Computer Science and Engineering, *July 2016–Present*
I am working under the supervision of *Dr. Debdeep Mukhopadhyay* and *Dr. Sourangshu Bhattacharya*. My research interest mainly lies in the application of Machine Learning techniques in the field of security.

Education

Indian Institute of Technology (Indian School of Mines), Dhanbad **Dhanbad**
M. Tech. in Computer Science and Engineering, OGPA - 9.7/10 *July 2014–June 2016*
Received M. Tech. with *Distinction* and secured *3rd* place from the department.

Institute of Engineering and Management (under WBUT) **Kolkata**
B. Tech. in Computer Science and Engineering, DGPA - 8.88/10 *August 2009–May 2013*

Hindu School (under WBCHSE) **Kolkata**
Higher Secondary Examination (10+2), Overall - 92.6% *July 2007–May 2009*
Secured *13th* place in all over West Bengal. Scored 100% in Mathematics.

Modern School (under WBBSE) **Kolkata**
Secondary Examination (10), Overall - 89.37% *May 2007*

Internship Experience

Nanyang Technological University, Singapore

Title: *Lightweight Assessment of Malware for Embedded Architectures.*

Supervisor: Dr. Siew-Kei Lam.

Description: Worked in a team and developed a light-weight application to detect and prevent Malware for embedded platforms based on statistical $t-test$. The prototype of the application are implemented for both x86 and ARM processors.

Duration: August 2017 - January 2018.

Academic Projects

M. Tech. Thesis

Title: *A Novel Parallel Search Technique for Multi-Objective Optimization.*

Supervisor: Dr. Haider Banka.

Description: Developed a new Parallel Search Technique to deal with various Multi-Objective Optimization Problems. With binary encoding scheme this novel technique performs better than most of the existing multi-objective optimization algorithms like NSGA-II, and MOPS.

Duration: July 2015 - April 2016.

B. Tech. Dissertation

Title: *Web Sentiment Analysis.*

Supervisor: Dr. Satyajit Chakraborty.

Description: Designed a web tool which allows visitors to assess the web sentiment on any subject. For each topic a pie chart expresses the current real-time sentiment along with a list of the latest news headlines associated with the subject. The pie chart and the headlines allow seeing what issues or events drive the sentiment in a positive or negative way.

Duration: August 2012 - July 2013.

Competitions

HOST: Hardware Demo **2018**
IEEE International Symposium on Hardware Oriented Security and Trust (HOST) *Washington DC*
Designed a lightweight malware detection methodology for embedded platforms along with a fast ransomware detection techniques using Hardware Performance Counters. Reached Final round in the competition from all over the world.

Cyber Security Awareness Week - Embedded Security Challenge in India **2016**
Indian Institute of Technology Kanpur *Kanpur*
Designed a novel hardware mitigation technique for memory corruption and control flow integrity attacks in embedded systems. Secured 2nd place in the competition from all over India.

International Championship for Artificial Intelligence & Networking **2015**
Indian Institute of Technology Bombay *Mumbai*
Designed a cost effective prototype of a carom playing bot from scrap materials. Secured 2nd place in the competition from all over India. Demonstration can be found on the following link. (https://www.youtube.com/watch?v=18IkxVzs_Zk).

National Round of Indo-US Robo League **2015**
Indian Institute of Technology Bombay *Mumbai*
Reached Pre-Final round for designing a cost effective Line Follower Robot.

Invited Talks

- Workshop on Advanced Side Channel Evaluation of Hardware Security (ASCEHS), Indian Institute of Technology Kharagpur, July 2018.
- ACM Summer School on Fundamentals for Cryptology Research, Indian Statistical Institute Kolkata, June 2018.

Achievements

- Finalist of Qualcomm Innovation Fellowship India 2017.
- National Merit-cum-Means Scholarship awarded by WBMDFC from 2009 to 2013.
- Certificate of Excellence on ERP – Essentials from Research Software Solutions (P) Ltd. (Microsoft Gold Certified Partner), April 2010.
- National Merit Scholarship awarded by Govt. of India for Higher Secondary Board Examination in 2009.
- **Sub-Reviewer of Journals**: *WIDM*
- **Sub-Reviewer of Conferences**: *COSADE '18*, *DAC '18*

Teaching Assistance

Computer Programming Lab: Autumn, 2015 and Spring, 2016 *IIT(ISM) Dhanbad*
Data Structures Lab: Autumn, 2015 *IIT(ISM) Dhanbad*
Algorithm Design & Analysis Lab: Spring, 2016 *IIT(ISM) Dhanbad*
Programming and Data Structures Lab: Spring, 2017 *IIT Kharagpur*

Foundation of Algorithm Design and Machine Learning: Spring, 2018 *IIT Kharagpur*

Cryptography and Network Security: Autumn, 2018 *IIT Kharagpur*

Extra-Curricular Activities

- Awards and Positions in inter-school sit-and-draw competitions.
- Participated and secured 3rd Prize in a Mathematics Competition at FESTRONIX 2011 held at Institute of Engineering and Management, Kolkata, February 2011.

Personal Details

Date of Birth: 11th February, 1991.

Gender: Male.

Languages Known: English, Bengali, Hindi.

Nationality: Indian.

Journals

[j1] Debapriya Basu Roy, **Manaar Alam**, Sarani Bhattacharya, Vidya Govindan, Francesco Regazzoni, Rajat Subhra Chakraborty, and Debdeep Mukhopadhyay. Customized Instructions for Protection Against Memory Integrity Attacks. In *IEEE Embedded Systems Letters (ESL), Volume: 10, Issue: 3, September 2018*, pages 91–94. DOI: 10.1109/LES.2018.2828506.

Submitted Journals

[sj4] **Manaar Alam**, Sarani Bhattacharya, Swastika Dutta, Sayan Sinha, Debdeep Mukhopadhyay, and Anupam Chattopadhyay. RAPPER: Ransomware Prevention using Hardware Performance Counters and LSTM-based Autoencoder. In *IEEE Transactions on Information Forensics and Security (TIFS)*. [**Under Review**]

[sj3] **Manaar Alam**, Sarani Bhattacharya, Sayan Sinha, Chester Rebeiro, and Debdeep Mukhopadhyay. IPA: An Instruction Profiling based Micro-Architectural Side-Channel Attack on Block Ciphers In *Journal of Hardware and Systems Security (HASS)*. [**Under Review**]

[sj2] **Manaar Alam**, Sarani Bhattacharya, Debdeep Mukhopadhyay, and Sourangshu Bhattacharya. Victims can be Saviors: A Machine Learning based detection for Micro-Architectural Side-Channel Attacks In *ACM Transactions on Privacy and Security (TOPS)*. [**Under Review**]

[sj1] Sai Praveen Kadiyala, **Manaar Alam**, Yash Shrivastava, Sikhar Patranabis, Muhamed Fauzi Bin Abbas, Arnab Biswas, Debdeep Mukhopadhyay, Siew-Kei Lam, and Thambipillai Srikanthan. LAMBDA: Lightweight Assessment of Malware for emBeddeD Architectures. In *IEEE Transactions on Information Forensics and Security (TIFS)*. [**First Revision Submitted**]

Conferences

[c6] Nimesh Kirit Shah, **Manaar Alam**, Durga Prasad Sahoo, Debdeep Mukhopadhyay and Arindam Basu. A 0.16pJ/bit Recurrent Neural Network Based PUF for Enhanced Machine Learning Attack Resistance. In *24th Asia and South Pacific Design Automation Conference, ASP-DAC 2019, Tokyo, Japan, January 21-24, 2019*. [**Accepted**]

[c5] **Manaar Alam**, Sayan Sinha, Sarani Bhattacharya, Swastika Dutta, Debdeep Mukhopadhyay and Anupam Chattopadhyay. RAPPER: Ransomware Prevention via Performance Counters. In *Australian Workshop on Offensive Cryptography, Kangacrypt 2018, Adelaide, Australia, December 7–8, 2018*. [**Accepted**]

[c4] **Manaar Alam**, Debdeep Mukhopadhyay, Sai Praveen Kadiyala, Siew-Kei Lam, and Thambipillai Srikanthan. Side-Channel Assisted Malware Classifier with Gradient Descent Correction for Embedded Platforms. In *7th International Workshop on Security Proofs for Embedded Systems, PROOFS@CHES 2018, Amsterdam, Netherlands, September 13, 2018*, pages 1–15. DOI: 10.29007/5sdj

[c3] **Manaar Alam**, Sarani Bhattacharya, and Debdeep Mukhopadhyay. Tackling the Time-Defence: An Instruction Count Based Micro-architectural Side-Channel Attack on Block Ciphers. In *Security, Privacy, and Applied Cryptography Engineering - 7th International Conference, SPACE 2017, Goa, India, December 13-17, 2017*, pages 30–52. DOI: 10.1007/978-3-319-71501-8_3.

[c2] **Manaar Alam**, Debapriya Basu Roy, Sarani Bhattacharya, Vidya Govindan, Rajat Subhra Chakraborty, and Debdeep Mukhopadhyay. SmashClean: A hardware level mitigation to stack smashing attacks in OpenRISC. In *ACM/IEEE International Conference on Formal Methods and Models for System Design, MEMOCODE 2016, Kanpur, India, November 18-20, 2016*, pages 1–4. DOI: 10.1109/MEMCOD.2016.7797764.

[c1] **Manaar Alam**, Soumyajit Chatterjee, and Haider Banka. A novel parallel search technique for optimization. In *3rd International Conference on Recent Advances in Information Technology, RAIT 2016, Dhanbad, India, March 3-5, 2016*, pages 259–263. DOI: 10.1109/RAIT.2016.7507912.

Patents Filed

[pt1] **Manaar Alam**, Sarani Bhattacharya, Debdeep Mukhopadhyay, and Anupam Chattopadhyay. RAPPER: Ransomware Prevention via Performance Counters. [**Submitted Indian Patent**. ID: 21398]

Poster Presentations

[p3] **Manaar Alam**, Sarani Bhattacharya, Debdeep Mukhopadhyay, and Anupam Chattopadhyay. Detecting Malware and Ransomware using Hardware Performance Counters. *POSTER: IEEE International Symposium on Hardware Oriented Security and Trust (HOST)*, May 2018.

[p2] Sai Praveen Kadiyala, Muhamed Fauzi Bin Abbas, Yash Shrivastava, Sikhar Patranabis, **Manaar Alam**, Debdeep Mukhopadhyay, Siew-Kei Lam, and Thambipillai Srikanthan. LAMBDA: Lightweight Assesment of Malware for emBeddeD Architectures. *POSTER: Singapore International Cyber Week (SICW)*, September 2017.

[p1] **Manaar Alam**, Debapriya Basu Roy, Sarani Bhattacharya, Vidya Govindan, Rajat Subhra Chakraborty, and Debdeep Mukhopadhyay. SmashClean: A Hardware level mitigation to stack smashing attacks in OpenRISC. *POSTER: Cyber Security Awareness Week (CSAW)*, November 2016.

Archive Papers

[w2] **Manaar Alam**, Sarani Bhattacharya, Debdeep Mukhopadhyay, and Anupam Chattopadhyay. RAPPER: Ransomware Prevention via Performance Counters. In *arXiv, CoRR, abs/1802.03909*, February 2018.

[w1] **Manaar Alam**, Sarani Bhattacharya, Debdeep Mukhopadhyay, and Sourangshu Bhattacharya. Performance Counters to Rescue: A Machine Learning based safeguard against Micro-architectural Side-Channel-Attacks. In *Cryptology ePrint Archive, Report 2017/564*, July 2017.

References

- **Dr. Debdeep Mukhopadhyay**, Professor, Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, debdeep@cse.iitkgp.ernet.in

- **Dr. Sourangshu Bhattacharya**, Assistant Professor, Department of Computer Science and Engineering, Indian Institute of Technology Kharagpur, sourangshu@cse.iitkgp.ernet.in
- **Dr. Haider Banka**, Associate Professor, Department of Computer Science and Engineering, Indian Institute of Technology (Indian School of Mines) Dhanbad, banka.h.cse@ismdhanbad.ac.in