# Luong N. **Nguyen**

Georgia Tech Ph.D Graduate, Senior Software Engineer at Amazon

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## Education

**Georgia Institute of Technology** *Atlanta, Georgia USA*

Ph.D in Electrical and Computer Engineering

- Advisors: Dr. Milos Prvulovic and Dr. Alenka Zajic
- Thesis: Novel machine learning based techniques using side-channel analysis for hardware Trojan detection

**Seoul National University** *Seoul, S. Korea*

MSc in Electrical and Computer Engineering, Korean Government Scholarship Program

- Advisors: Dr. Huyk-Jae Lee and Dr. Soo-ik Chae
- Thesis: Redundancy Reduction in Interpolation Calculation for HEVC Fractional Motion Estimation

**Hanoi University of Science and Technology** *Hanoi Vietnam*

BSc in Electrical and Computer Engineering

- Advisors: Dr. Bui Viet Khoi and Dr. Ha Duyen Trung
- Honor Degree
- Ranking among top 5%

## Skills

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| **Expertise** | Distributed software design and developement, machine learning, LLM, cloud infrastructure, embedded software, hardware and software codesign, security analysis, computer vision and video compression |
| **Programming** | C, C++, Python, Scala, Java, tcl, Verilog, System Verilog, Chisel, Typescript |
| **Toolbox** | Tensorflow, OpenSearch, Hadoop, Tableau, Spark, OpenCV, AWS bedrock, EMR |

## Working Experience

Senior Software Enginner, August 2022 - Present
*Alexa Automotive Search and Navigation*, Amazon, Sunnyvale, CA, USA

- **Design and develop solutions for Alexa Automotive Search and Navigation**:
  - Develop innovative text and voice search and navigation solutions for Alexa Automotive.
  - Design and implement cloud infrastructure for large-scale search indexing, utilizing Apache Spark, Amazon EMR, and OpenSearch to enable efficient data ingestion from Amazon S3, data transformation, and indexing into OpenSearch.
  - Architect infrastructure (leveraging AWS Bedrock and Anthropic's AI models) to enable experimentation of using LLM and generative AI solutions for Alexa Auto search and navigation capabilities.
  - Spearhead projects involving the design and implementation of distributed API solutions across multiple teams for Alexa Auto search and navigation.

R&D Engineer, Senior I, July 2020 - August, 2022
*PrimeTime*, Synopsys, Sunnyvale, CA, USA

- **Design and develop EDA software products**:
  - Specific duties focus on working to develop new algorithms, flows and features for chip design closure software Prime-Time ECO.
  - Applied multiple technologies such as distributed software development, machine learning, and multi-threaded software development to improve the software QoR for multiple flows ( 20% increase), and performances ( 3-5x faster runtime), which contributed to winning multiple customer engagements and revenue increases.

Graduate Research Assistant, Aug. 2016 - May, 2020
*CompArch Lab*, School of Electrical and Computer Engineering, Georgia Institute of Technology

- **Developed novel machine learning based techniques for hardware and software security analysis**:
  - Developed novel machine learning based techniques of detecting hardware Trojan in ASIC & SoC using side-channel analysis. This is the first off-chip side channel technique capable of detecting dormant hardware Trojans as small as 0.31% of the original circuit with 100% accuracy and 0% false positives. This project has got a 5 million funding from NSF for further development.
  - Developed a novel framework that exploits electromagnetic (EM) side-channel signals to detect malicious activity on embedded and cyber-physical systems. The results show that we can detect different attacks with excellent accuracy (100% detection with less than 1% false positives) from distances up to 3 meters.
  - Developed a novel method for profiling program execution without instrumenting or otherwise affecting the profiled system.
- **Smaop**: Developed an android app called Smaop that gives recommendations by looking at the transaction history of a restaurant to see which dishes have been ordered the most in the past month. The app uses Google place API to get the exact restaurant based on user input and uses NCR transaction API to get the transaction history of the restaurant (Hackathon at Georgia Tech 2019, a team of 2).

Research Intern, May. 2019 - Aug. 2019
*PrimeTime*, Synopsys, Sunnyvale, CA, USA

- **IR drop fixing in ECO fusion in ICC2**: Developed a new flow using ICC2, PrimeTime, RedHawk to fix IR drop violations in ECO mode at the back-end of the chip physical design (using Pyhon, Tcl, and C++). Significantly reduced the number of IR drop violations in several testcases with this new flow.

Graduate Research Assistant, Sep. 2014 - June. 2016
*Computer Architecture and Parallel Processing Lab*, Seoul National University

- **Complexity reduction, hardware design and implementation** for High Efficiency Video Coding (HEVC) fractional motion estimation algorithm (FME). The work successfully reduced more than 80% of the complexity of the algorithm and got the best paper award at the 2016 SoC conference in Korea.
- **Frame memory reduction and hardware optimization and implementation on FPGA** for Real-Time Lucas-Kanade Optical Flow.
- **Building an e-recommender system for an e-commerce website** using machine learning on big data (RECSYS challenge 2015). My work ranked 50th out of thousands of teams in the 2015 RECSYS challenge.

## Notable Publications

1. **Luong N. Nguyen**, Baki Berkay, Milos Prvulovic, and Alenka Zajic, "A Novel Golden-Chip-Free Clustering Technique Using Backscattering Side Channel for Hardware Trojan Detection," (to appear) *2019 IEEE International Symposium on Hardware Oriented Security and Trust (HOST)*, Dec. 2020. (**Best Paper Award**).
2. Haider Khan, Nader Sehatbakhsh, **Luong N. Nguyen**, Milos Prvulovic, Alenka Zajic, "IDEA: Intrusion Detection through Electromagnetic Signal Analysis for Critical Embedded and Cyber-Physical Systems," *IEEE Transactions on Dependable and Secure Computing*, 2019.
3. Haider Khan, Nader Sehatbakhsh, **Luong N. Nguyen**, Milos Prvulovic, Alenka Zajic, "Malware Detection in Embedded Systems using Neural Network Model for Electromagnetic Side-Channel Signals," *Journal of Hardware and Systems Security*, 2019.
4. Chia-Lin Cheng, **Luong N. Nguyen**, Milos Prvulovic, Alenka Zajic, "Exploiting Switching of Transistors in Digital Electronics for RFID Tag Design," *12th International Conference on RFID 2018*, April 2018 (**Best Poster Award**).
5. **Luong N. Nguyen**, Tae Sung Kim, Hyuk-Jae Lee, "A Reduction of Interpolation blackundancy for Fractional Motion Estimation in HEVC," *2016 SoC Conference of Korea*, May 2016 (**Best Paper Award**).
6. **Nguyen Ngoc Luong**, Tae Sung Kim, Hyuk-Jae Lee, Soo-Ik Chae, "Advanced Decision of PU Partition and CU Depth for Fractional Motion Estimation in HEVC," *International Conference on Electronics, Information and Communication (ICEIC)*, Jan. 2016.

## Patents

1. Alenka Zajic, Chia-Lin Cheng, **Luong N. Nguyen**, Milos Prvulovic, "ANTENNA-LESS RFID TAG," Publication number: 20200160133, Filed: November 15, 2019, Status: Published, Publication date: May 21, 2020.
2. Alenka Zajic, **Luong N. Nguyen**, Chia-Lin Cheng, Milos Prvulovic, "SYSTEM AND METHOD FOR DETECTING HARDWARE TROJAN CIRCUITS,", Filed: May 2020, Status: Pending.
3. Alenka Zajic, Baki Yilmaz, **Luong N. Nguyen**, Chia-Lin Cheng, Milos Prvulovic, "RFID Trojan Detection", Submitted: December 2019, Status: Disclosure Approved.
4. Alenka Zajic, Sinan Adibelli, Prateek Juyal, **Luong N. Nguyen**, Milos Prvulovic, "Near Field Backscattering based Sensing for Hardware Trojan Detection", Submitted: June 2020, Status: Submitted.

## Honors & Awards

**TechConnect Innovation Award** — *Boston, MA, USA*
2018 TechConnect World Innovation Conference & Expo — *June 2019*

**Second best hardware demo award** — *Virginia, USA*
2019 IEEE International Symposium on Hardware Oriented Security and Trust (HOST) — *May 2019*

**Second Prize** — *Atlanta, Georgia, USA*
2018 Southeastern USA Korean Speech Contest — *April 2018*

**Korean Government Scholarship Program** — *S.Korea*
Ministry of Education, Republic of Korea — *Sep. 2013 - July. 2016*

**Certificate of merit for outstanding academic performance** — *Hanoi, Vietnam*
Hanoi University of Science and Technology — *Sep. 2011*