

Paul (Ngoc Luong) Nguyen

GEORGIA TECH PH.D GRADUATE, SENIOR SOFTWARE ENGINEER AT AMAZON

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Education

Georgia Institute of Technology

Atlanta, Georgia

PH.D IN ELECTRICAL AND COMPUTER ENGINEERING

Graduated in May 2020

Thesis: Novel machine learning based techniques using side-channel analysis for hardware Trojan detection

Seoul National University

Seoul, S. Korea

BSC MSC IN ELECTRICAL AND COMPUTER ENGINEERING, KOREAN GOVERNMENT SCHOLARSHIP PROGRAM

Graduated in May 2016

Thesis: Redundancy Reduction in Interpolation Calculation for HEVC Video Compression's Fractional Motion Estimation

Work Experience

Amazon, Alexa Smart Vehicle

Sunnyvale, CA

SENIOR SOFTWARE ENGINEER

August 2022 - Present

- Led the development of speech-to-speech Edge AI model fine-tuning, evaluation, and profiling infrastructure for on-device automotive voice assistants.
- Led the cross-functional integration of Generative AI into the Alexa Auto experience, contributing across the entire ML engineering stack, from model fine-tuning to scalable cloud infrastructure:
 - Fine-tuned large language models (LLMs) to elevate in-car voice assistant capabilities and enhance contextual understanding.
 - Built robust infrastructure and tooling to enable seamless deployment of GenAI features across Alexa Auto clients.
 - Orchestrated collaboration across key domain teams—including music, car control, navigation, and search—to develop automotive-specific AI experts and features using Alexa's GenAI stack.
- Led multi-team initiatives to design and deliver distributed systems powering Alexa Auto's next-generation AI experiences.
- Designed and delivered innovative voice and text-based search and navigation solutions tailored for automotive environments:
 - Implemented scalable cloud infrastructure for large-scale indexing pipelines using Apache Spark, Amazon EMR, and OpenSearch, supporting efficient data ingestion, transformation, and retrieval from Amazon S3.
 - Architected experimentation frameworks leveraging AWS Bedrock and Anthropic's models to explore LLM-powered enhancements in automotive search and navigation.

PrimeTime, Synopsys

Sunnyvale, CA

R&D ENGINEER, SENIOR I

July 2020 - August 2022

- Design and develop EDA software products:
 - Specific duties focus on working to develop new algorithms, flows and features for chip design closure software PrimeTime 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.

CompArch Lab, School of Electrical and Computer Engineering, Georgia Institute of Technology

Atlanta, GA

GRADUATE RESEARCH ASSISTANT

August 2016 - May 2020

- 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).

- 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.

Skills

Expertise	Machine learning engineering, distributed software design and development, NLU, GenAI, EdgeAI, embedded software, hardware and software codesign, security analysis, video compression
Programming	Python, Scala, Java, tcl, Typescript, C, C++, Rust, Verilog, System Verilog, Chisel
Toolbox	Tensorflow, Pytorch, HuggingFace, OpenSearch, Hadoop, Tableau, Spark, OpenCV, AWS bedrock, EMR

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 Redundancy 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.