Yongjin Han

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RESEARCH INTERESTS

I am interested in programming language (formal verification, program synthesis, and compiler optimization), constraint programming, machine learning (fairness, unsupervised learning, deep clustering), and cyber security for reliable and secure software.

EDUCATION

University of California, Davis *Master's Degree* Expected Mar 2024

Dongguk University *Bachelor's degree* Feb 2021

I took a leave of absence to fulfill my military service duties in Korea from 2017 to 2019.

PROFESSIONAL EXPERIENCE

Ian Davidson's AI/ML Lab at UC Davis | *Research Member* Jul 2022 - Present

- Study fairness in machine learning (clustering, unsupervised learning) and constraint programming

Korean Graduate Student Association at UC Davis | *Vice President* Sep 2022 - Present

- Organize events for Korean graduate students (ms, phd, post-doc, visiting scholar)
- Get sponsorship from various organizations

Programming Language and Secure Software Lab at Dongguk University | *Research Assistant* Jul 2019 - Feb 2021

- Research programming language (program synthesis, compiler, VM, program analysis, etc) and secure software

Boan Farm, Computer Security Club at Dongguk University | *President* Mar 2020 - Feb 2021

- Lead a security group focusing on system hacking, pwnable

CERT (Computer Emergency Response Team) at Republic of Korea, Army | *Team Member* Aug 2017 - May 2019

- Monitor traffic, intrusion detection logs such as DDOS, spoofing, and viruses
- Deal with computer emergent accidents
- Audit other soldiers (from staff sergeant to lieutenant colonel) whether they consistently comply with security rules or not

RESEARCH AND PROJECT

Research about teaching deep learning model to be fair Jul 2022 - Present

- Enforce a notion of fairness to a deep clustering model to make it fair using an ILP solver, GurobiPy
  - Formulate a group fidelity (predictive parity) into ILP formula
  - Encode ILP formula as a fairness signal for a deep learning model
- Finetune parameters for training a model implemented with PyTorch

Automated Debugging with Program Synthesis and Fault Localization Mar 2020 - Feb 2021

- Manage the project and team as a leader
- Implement a program synthesizer from scratch to fix a localized bug code using an SMT solver, Scalar Z3
  - Design a turing complete DSL
  - Convert a code into first order logic (FOL) formula following Hoare logic
  - Find a fixed code snippet from program space by verifying the FOL formula with Scalar Z3

Distributed Virtual Machine and the Intelligence Offloading Method for A Smart Edge Computing Mar 2020 - Feb 2021

- Study a structure of VM and an offloading method
- Propose an idea about an optimization method
  - Use lazy evaluation for an asynchronous system to postpone unnecessary evaluations

Smart Community Policing system Mar 2020 - Feb 2021

- Develop predictive policing system with Epidemic Type Aftershock Sequence (ETAS) model and machine learning
- Design a crime magnitude scoring model with open data from LAPD by considering crime events as earthquake events

Reduction in test case to evaluate and improve performance of static analyzer Mar 2020 - Feb 2021

- Study how released static analyzers detect vulnerabilities (CWE120, 134)

PAPER AND PRESENTATION

Yongjin Han, Soo-Lyn Choi, Sun-Young Ihm, and Yunsik Son, "A Predictive Policing with Epidemic Type Aftershock Sequence Model," In Proceedings of the 2nd International Conference on SMART Policing Convergence, Seoul, Oct 22, 2020.

Yongjin Han, Soo-Lyn Choi, JoongYeon Lim, Sun-Young Ihm. “A Research on the Prediction of Outside Accident of the Troops based on Earthquake Analysis Model.” Korean Journal of Military Art and Science. Vol 76.3. pp 119-144. 2020.

(Best Paper), **Yongjin Han**, Seokmin Chang, Yunsik Son. “A Study on the Virtual Machine Performance Optimization Using Lazy Evaluation.” Korea Multimedia Society Conference. Aug 11, 2020.

BOOK TRANSLATION

Fred Nwanganga, Mike Chapple. (2024) [KOR] Practial Machine Learning in R.(Jinho Lee, Andrew Lee, **Yongjin Han**, Donghee Lee, Yeoreum Lee, Trans.). Acorn Publishing Co.(Original work published 2020)

Jack Widman. (2024). [KOR] Learning Functional Programming. (Jinho Lee, **Yongjin Han**, Trans.). Acorn Publishing Co. (Original work published 2023)

HONORS & SCHOLARSHIP

Senior scholarship | *Introduction to the Capstone Design Course 1 at Dongguk University* 2020

Best paper | *Summer Conference, Korea Multi Media Society, Korea Federation of Information Technology Societies* 2020

Silver prize | *Programming Contest at Dongguk University* 2017

Bronze prize | *Programming Contest at Dept of CSE, Dongguk University* 2016

PATENT

Dongguk University Industry-Academic Cooperation Foundation (2020). KR Patent No. 1020200176727. Korea Intellectual Property Right Information System.

TEACHING EXPERIENCE

Class Tutor | *Compiler Construction* Sep 2020 - Dec 2020

Class Tutor | *Programming Language and Theory* Sep 2020 - Dec 2020

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Industrial engineer information secuirty | *Korea Internet & Security Agency* 2016