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 in Computer Science*   Expected Mar 2024

Dongguk University *Bachelor's Degree in Computer Science and Engineering*   Feb 2021

RESEARCH AND PROJECT

Deep Fair Clustering with Integer Linear Programming   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

- Managed the project and team of 4 people as a leader
- Implemented a program synthesizer from scratch to fix a localized bug code using an SAT/SMT solver, Scalar Z3
  - Designed a Turing complete Domain Specific Language (DSL)
  - Converted a code into first-order logic (FOL) formula following Hoare logic
  - Found 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

- Studied a structure of VM and an offloading method
- Proposed an idea about an optimization method
  - Used lazy evaluation for an asynchronous system to postpone unnecessary evaluations

Smart Community Policing system   Mar 2020 - Feb 2021

- Developed predictive policing system with Epidemic Type Aftershock Sequence (ETAS) model and machine learning
- Designed 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

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

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 (+150 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

- Researched 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

- Led a security group focusing on system hacking and Pwnable

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

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

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.

SKILL

Programming language

- C/C++, Python, R, Haskell, Scala, Java

SAT/SMT and ILP solver

- Z3, Gurobi

Framework

- LLVM, PyTorch

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