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Website: ducthan.net
Email: dnguye96@uic.edu
ORCID: 0000-0002-6810-897X

Duc-Than Nguyen

Research Interests

My primary research interest lies in advancing the field of provably correct software. I focus on the semantics and correctness of programs, with a particular emphasis on concurrent systems. Currently, I am working on techniques to verify the correctness of concurrent C programs using the Verified Software Toolchain (VST) and Iris. My goal is to prove the correctness of realistic concurrent systems code and to develop simpler approaches to reasoning about fine-grained concurrency.

Education

❑ **University of Illinois at Chicago, IL, USA**

- Doctor of Philosophy, Computer Science, 2021 - present
  - Advisor: Assistant Professor William Mansky

❑ **University of Melbourne, VIC, Australia**

- Master of Philosophy, Computing and Information Systems, 2018 - 2020
  - Thesis: *Foundations for Reasoning about Holistic Specifications*
  - Advisors: Associate Professor Toby Murray and Professor Benjamin Rubinstein

❑ **Vietnam National University, University of Science, HCM, Vietnam**

- Bachelor of Science (Honors Program), Information Technology, 2009 - 2013
  - Thesis: *Attacks on Low Private Exponent RSA Cryptosystems*
  - Advisors: Associate Professor Nguyen Dinh Thuc and Dr. Tran Dinh Long

Refereed Publications

Duc-Than Nguyen, Lennart Beringer, William Mansky, Shengyi Wang. *Compositional Verification of Concurrent C Programs with Search Structure Templates.* In Proceedings of the 43rd ACM SIGPLAN International Conference on Certified Programs and Proofs (CPP) 2024

Hoang-Hai Dang, Jaehwang Jung, Jaemin Choi, **Duc-Than Nguyen**, William Mansky, Jeehoon Kang, and Derek Dreyer. *Compass: Strong and Compositional Library Specifications in Relaxed Memory Separation Logic.* In Proceedings of the 43rd ACM SIGPLAN International Conference on Programming Language Design and Implementation (PLDI) 2022.

Dang, Hai-Van, Thai-Son Tran, **Duc-Than Nguyen**, Thach V. Bui, and Dinh-Thuc Nguyen. *Efficient Privacy Preserving Data Audit in Cloud.* In Advanced Computational Methods for Knowledge Engineering, pp. 185-196. Springer International Publishing, 2015.

Thuc D. Nguyen, **Than Duc Nguyen**, Long D. Tran. *Attacks on low private exponent RSA: an experimental study.* In Computational Science and Its Applications (ICCSA), 2013 13th International Conference on Computational Science and Its Applications, pp. 162-165. IEEE Computer Society, 2013.

Research Experience

❑ **Department of Computer Science**, University of Illinois at Chicago, IL, USA
Research Assistant **Jun 2021 - Present**
Advisor: Assistant Professor William Mansky

- VST & concurrency: Extended the VST soundness proof and program logic to support concurrency, atomic operations, and weak-memory reasoning.
- CCris: Built an annotation-based verification framework on top of VST using RefinedC.
- Concurrent Search Structure Templates: Implemented template-based verification techniques in VST and applied them to prove the correctness of fine-grained concurrent search structure implementations in C.
- Specifications for Relaxed Libraries in Iris: Developed stronger specifications for relaxed-memory libraries by combining logical atomicity with enriched partial-order reasoning, targeting the weaker memory model of Repaired C11 and building on top of the Iris framework.

❑ **School of Computing and Information Systems**,
Melbourne School of Engineering, University of Melbourne, VIC, Australia
Research Student **Jun 2018 - Dec 2020**
Advisor: Associate Professor Toby Murray

- Foundations for reasoning about Holistic Specifications: Formalized the theory of Holistic Specifications in Isabelle to describe correctness properties of complex programs, laying the groundwork for future verification methods based on holistic reasoning.

❑ **Programming Languages and Software Engineering Research Lab**,
Department of Computer Science, National University of Singapore, Republic of Singapore
Research Assistant **Feb 2016 - Jul 2017**
Advisor: Professor Joxan Jaffar

- Dynamic Symbolic Analysis for Security Vulnerabilities in Web Applications: Applied dynamic symbolic execution techniques to analyze JavaScript programs and detect security vulnerabilities in web applications.

❑ **Echizen Laboratory - Content Security Lab**, Digital Content and Media Sciences Research Division, National Institute of Informatics, Tokyo, Japan
Internship Student **Feb 2015 - Aug 2015**
Advisor: Professor Isao Echizen

- Lattice-based Cryptography and its Applications: Developed cryptographic applications based on hard lattice problems, focusing on the Short Integer Solution and Learning With Errors assumptions.

❑ **Dept. of Knowledge Engineering**, Faculty of Information Technology, University of Science, Vietnam National University, HCM, Vietnam
Research Assistant **Sep 2013 - Jan 2016**
Advisor: Professor Nguyen Dinh Thuc

- Co-developed auditing solutions using cryptographic hash functions and the Chinese Remainder Theorem.
- Co-organized weekly seminars for the university's cryptography group, covering topics in number theory, abstract algebra, and lattice-based cryptography.

Teaching Experience

❑ **Teaching Assistant**

- **University of Illinois at Chicago, IL, USA**
  - CS 211 - Programming Practicum (Spring 2024, Fall 2023, Spring 2023)
- **University of Melbourne, VIC, Australia**
  - COMP 90038 - Algorithms and Complexity (Graduate Coursework - Semester I, 2019)
- **National University of Singapore, Republic of Singapore**
  - CS 1010E - Programming Methodology (Spring 2017)
- **Vietnam National University, University of Science, HCM, Vietnam**

- Automata and Formal Languages (Spring 2014)
- Computer System Programming (Fall 2014)
- Data Structures and Algorithms (Fall 2015, Fall 2014)
- Introduction to Algorithms and Complexity (Fall 2015, Fall 2014, Fall 2013)
- Introduction to Cryptography (Spring 2014)
- Languages and Compiler Design I (Fall 2015, Fall 2014)

❑ Research Mentor

- **Ngo Xuan Huy**, Undergraduate - Vietnam National University, University of Science (2014)

Honors and Awards

- **SIGPLAN Programming Languages Mentoring Workshop at PLDI**
  Student Travel Grant, San Diego, CA, USA (2022)
- **Graduate Assistantship**
  University of Illinois at Chicago, IL, USA (2021)
- **Conference Travel Scholarships**
  University of Melbourne, VIC, Australia (2018)
- **Melbourne Research Scholarship**
  University of Melbourne, VIC, Australia (2018)
- **SIGPLAN Programming Languages Mentoring Workshop at ICFP**
  Student Travel Grant, Japan (2016)
- **Outstanding Achievement in Research**
  Vietnam National University, University of Science, HCM, Vietnam (2013)
- **Distinction Graduation**
  Vietnam National University, University of Science, HCM, Vietnam (2013)
- **Scholarships for Excellent Students**
  Vietnam National University, University of Science, HCM, Vietnam (2012)
- **Bronze Medal, National Creativity Contest for Teenagers**
  Vietnam Fund for Supporting Technological Creations (VIFOTEC) (2005)
- **Silver Medal, The Young Scientist Competition**
  Vietnam Ministry of Education and Training, Vietnam (2003)

Technical Skills

❑ Practical Skills

- Theorem Prover: Rocq, Isabelle
- Programming Languages: C/C++, OCaml
- Editors and IDEs: Emacs (Spacemacs), VS Code, Vim
- Version Control: Git, GitHub, Bitbucket

Activities

❑ Talks and Presentations

- *Compositional Verification of Concurrent C Programs with Search Structure Templates*
  - Oral presentation @ NJPLS (November 2023)
- *Attacks on Low Private Exponent RSA: An Experimental Study*
  - Oral presentation @ ICCSA (June 2013)

❑ Activities

- Artifact Evaluation Committee - PLDI'25, ICFP'24
- Attended NJPLS seminar - Princeton University, NJ, November 2023.

- Attended virtual conferences: POPL'21, PLDI'21, and in-person conference PLDI'22.
- Attended in-person conference ICCSA'13 in Vietnam, and ICFP'16 in Japan.
- Participated in the South East Asian Mathematical Society (SEAMS) School 2015.
- Founded/Administered the online mathematics forum (mathfriend.org) from 2005 to 2007.