

ThanhVu (Vu) Nguyen

Curriculum Vitae

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Research Interests

Program verification and analysis: invariant generation using static and dynamic analyses, program synthesis and repair using constraint solving

Others: evolutionary computing, genetic algorithms, and agent-based optimization algorithms

Education

- 7/2014 **Ph.D., Computer Science**, *University of New Mexico*, Albuquerque, NM.
Qualifier Exam '09 Advised by Stephanie Forrest and Deepak Kapur
Graduation '14 (with distinction) Dissertation: Automating Program Verification and Repair Using Invariant Analysis and Test-input Generation
- 12/2006 **M.S., Computer Science**, *The Pennsylvania State University*, Middletown, PA.
Advised by Thang Bui
Thesis: On the Graph Coloring Problem and Its Generalizations
- 5/2003 **B.S., Computer Science**, *The Pennsylvania State University*, University Park, PA.

Experience

- 8/2016 – present **Assistant Professor**, *University of Nebraska, Computer Science and Engineering*, Lincoln, NE.
- 8/2014 – 8/2016 **Postdoc**, *University of Maryland, Computer Science*, College Park, MD.
Developed lightweight dynamic analysis techniques to discover a system's configuration space, i.e., how configuration option settings affect a system's behavior. Advised by Jeff Foster.
- 8/2007 – 7/2014 **Research Assistant**, *University of New Mexico, Computer Science*, Albuquerque, NM.
Researched on program verification and analysis. Applied dynamic and static analyses to generate program invariants and synthesize program repairs.
- 7/2012 – 2/2013 **Internship**, *Naval Research Laboratory, Information Technology Division*, Washington, DC.
Developed KTP, a general-purpose theorem prover that is based on k -induction and uses modern SMT solving technologies. Implemented SCRLAB, a toolkit that integrates with KTP to verify the correctness of Software Cost Reduction (SCR) program specifications. Worked on algorithms to statically generate invariants for SCR programs.
- 7/2004 – 12/2004, **Co-op**, *Naval Research Laboratory, Tactical Electronic Warfare Division*, Washington, DC.
1/2006 – 6/2006 Researched on various areas in evolutionary computing and genetic programming. Developed and optimized algorithms for Unmanned Aerial Vehicles' missions planning. Produced 12 conference and journal publications for these projects.
- 2/2007 – 8/2007 **Internship**, *Lockheed Martin, Advanced Technology Laboratories*, Cherry Hill, NJ.
Studied chromosome linkage structure in genetic algorithms. Developed reconfigurable architectures for live object/image recognition.

Honors / Awards

Academia/Work

- 2013 **Sigma Xi's Excellence in Graduate Research Award**, UNM.
Voted on by the faculty of the College of Engineering. Awarded annually to one student with outstanding research record
- 2012 – 2013 **Dean's Dissertation Fellowship**, UNM.
Voted on by the faculty. Awarded annually to two graduating students based on academic achievements
- Summer 2009 **Walter Karplus Research Grant**, IEEE Computational Intelligence Society.
Summer scholarship funding for graduate students with promising research project
- 2008 – 2009 **Space Grant Fellowship**, NASA.
- 2006 **Nominated for the Penn State Co-op Student of the Year Award**, PSU.
- 2005 **Navy Incentive Award**, Naval Research Laboratory.
- 1999 – 2000 **Hall Foundation Excellence Scholarship**.
- 1999 **Computer Science Knowledge Award**, Harrisburg Community College Regional Competition.

Research

- 2012 **ACM Distinguished Paper**, *International Conference on Software Engineering*.
- 2012 **Featured Article**, *IEEE Transactions on Software Engineering*.
- 2010 **Research Highlight**, *Communication of ACM*.
- 2009 **ACM Distinguished Paper**, *International Conference on Software Engineering*.
- 2009 **IFIP TC2 Manfred Paul Award for Excellence in Software: Theory and Practice**, *International Conference on Software Engineering*.
- 2009 **Best Paper**, *Genetic and Evolutionary Computation Conference, Ant Colony Optimization & Swarm Intelligence Track*.
- 2009 **Best Paper**, *Genetic and Evolutionary Computation Conference, Genetic Programming Track*.
- 2009 **Gold**, *ACM SIGEVO "Hummies" for Human-Competitive Results Produced by Genetic and Evolutionary Computation*.
- 2009 **Best Short Paper, Best Presentation**, *Workshop on Search-Based Software Testing*.
- 2007 **Outstanding Submission**, *High Performance Embedded Computing Workshop*.
- 2006 **Best Paper**, *International Conference on Informatics in Control Automation and Robotics*.

Miscs

Travel Grants/Student Volunteers, ICSE '14 '12 '09, FSE '10, GECCO '09 '06.

Teaching

- Spring '17 **Instructor**, *CSCE 428/828: Automata, Computation, and Formal Languages*, UNL.
- Fall '16, '17 **Instructor**, *CSCE 990: Software Verification*, UNL.
- 2014 **Guest Lecturer**, *CS 430: Introduction to Compilers*, UMD.
- 2013 **Organizer, Seminar**, *Topics in Software Engineer and Programming Language*, UNM.
- 2011 **Guest Lecturer**, *CS 550: Programming Languages and Analysis*, UNM.
- 2006 **Teaching Assistant**, *COMP 432: Object-Oriented Programming*, PSU.
- 2006 **Teaching Assistant**, *COMP 406: Computer Graphics Algorithms*, PSU.
- 2010 **Judge**, *Middle Schools Science Fairs*, Albuquerque, NM.
- 1999 – 2000 **Mentor**, PSU York.
Mentored and assisted low-income, fist-generation college, and underrepresented minority students.
- 2000, 2010 **Founding Member**, *Badminton Clubs*, PSU York and UNM.
Positions held: Treasurer and Webmaster.

Service

- Editor Board**, *Journal of Systems and Software* '17 –.
- Program Committee**, *FSE '18*, *MEMOCODE '18 – '15*.
- External Review Committee**, *PLDI '18*.
- Artifact Evaluation Committee**, *POPL '15*.
- Reviewer**, *Journals, Conferences, and Grant Proposals*.
Journal of Symbolic Computation, *Journal of Evolutionary Intelligence*, *Transactions on Evolutionary Computation*, *GECCO*, *ICSE*, *PLDI*, *POPL*

Miscellaneous

Citizenship **U.S. citizen**, *Department of Defense Secret clearance.*

Language **English, Vietnamese**, *Fluent in written and spoken.*

References

- Postdoc Mentor **Jeff Foster**, *Prof., Computer Science*, University of Maryland, College Park, MD.
jfooster@cs.umd.edu, +(301) 405 2751, <http://www.cs.umd.edu/~jfooster>
- PhD Thesis Advisor **Stephanie Forrest**, *Prof., Computer Science*, University of New Mexico, Albuquerque, NM.
forrest@cs.unm.edu, +(505) 277 7104, <http://www.cs.unm.edu/~forrest>
- PhD Thesis Advisor **Deepak Kapur**, *Prof., Computer Science*, University of New Mexico, Albuquerque, NM.
kapur@cs.unm.edu, +(505) 277 3112, <http://www.cs.unm.edu/~kapur>
- Thesis Committee Member **Westley Weimer**, *Prof., Computer Science*, University of Virginia, Charlottesville, VA.
weimer@cs.virginia.edu, +(434) 924 1021, <http://www.cs.virginia.edu/~weimer>

Publications

Refereed Conference Publications

- ASE '17 T. Nguyen, M. Dwyer, and W. Visser. SymInfer: Inferring Program Invariants using Symbolic States. In *Automated Software Engineering (ASE)*, page to appear. IEEE, 2017.
- FSE '17 T. Nguyen, T. Antopoulos, A. Ruef, and M. Hicks. A Counterexample-guided Approach to Finding Numerical Invariants. In *Foundations of Software Engineering (FSE)*, pages 605–615. ACM, 2017.
- TACAS '17 T. Nguyen, D. Kapur, W. Weimer, and S. Forrest. Connecting Program Synthesis and Reachability: Automatic Program Repair using Test-Input Generation. In *Tools and Algorithms for the Construction and Analysis of Systems (TACAS)*, pages 301–318. Springer, 2017.
- FSE '16 T. Nguyen, U. Koc, J. Cheng, J. S. Foster, and A. A. Porter. iGen: Dynamic Interaction Inference for Configurable Software. In *Foundations of Software Engineering (FSE)*, pages 655–665. ACM, 2016.
- ICSE '14 T. Nguyen, D. Kapur, W. Weimer, and S. Forrest. Using Dynamic Analysis to Generate Disjunctive Invariants. In *International Conference on Software Engineering (ICSE)*, pages 608–619. IEEE, 2014.
- ICSE '12 T. Nguyen, D. Kapur, W. Weimer, and S. Forrest. Using Dynamic Analysis to Discover Polynomial and Array Invariants. In *International Conference on Software Engineering (ICSE)*, pages 683–693. IEEE, 2012.
Distinguished Paper
- ICSE '09 W. Weimer, T. Nguyen, C. Le Goues, and S. Forrest. Automatically Finding Patches Using Genetic Programming. In *International Conference on Software Engineering (ICSE)*, pages 364–367. IEEE, 2009.
Distinguished Paper
Manfred Paul Award
- GECCO '09 T. Bui, T. Nguyen, and J. Rizzo Jr. Parallel Shared Memory Strategies For Ant-based Optimization Algorithms. In *Conference on Genetic and Evolutionary Computation (GECCO)*, pages 1–8. ACM, 2009.
Best Paper
- GECCO '09 S. Forrest, W. Weimer, T. Nguyen, and C. Le Goues. A Genetic Programming Approach to Automated Software Repair. In *Conference on Genetic and Evolutionary Computation (GECCO)*, pages 947–954. ACM, 2009.
Best Paper
- SPIE '07 J. Smith, III and T. Nguyen. Fuzzy Decision Trees for Planning and Autonomous Control of a Coordinated Team of UAVs. In *International Society for Optical Engineering*. SPIE, May 2007
- SPIE '07 J. Smith, III and T. Nguyen. Genetic Program based Data Mining of Fuzzy Decision Trees and Methods of Improving Convergence and Reducing Bloat. In *International Society for Optical Engineering*. SPIE, 2007
- GECCO '06 T. Bui and T. Nguyen. An Agent-based Algorithm for Generalized Graph Colorings. In *Conference on Genetic and Evolutionary Computation (GECCO)*, pages 19–26. ACM, 2006.
- IDEAL '06 J. Smith, III and T. Nguyen. Guiding Genetic Program Based Data Mining Using Fuzzy Rules. In *Intelligent Data Engineering and Automated Learning (IDEAL)*, pages 1337–1345. Springer, 2006
- ICINCO '06 J. Smith, III and T. Nguyen. Evolutionary Data Mining Approach to Creating Digital Logic. In *International Conference on Informatics in Control Automation and Robotics (ICINCO)*, pages 107–113. Springer, 2006
- ICINCO '06 J. Smith, III and T. Nguyen. Fuzzy Logic Based UAV Allocation and Coordination. In *International Conference on Informatics in Control Automation and Robotics (ICINCO)*, pages 81–94. Springer, 2006.
Best Paper

- NAFIPS '06 J. Smith, III and T. Nguyen. Fuzzy Logic Based Resource Manager for a Team of UAVs. In *Annual Meeting of the North American Fuzzy Information Processing Society (NAFIPS)*, pages 463–470. IEEE, 2006
- NAFIPS '06 J. Smith, III and T. Nguyen. Creating Fuzzy Decision Algorithms Using Genetic Program Based Data Mining Program. In *Annual Meeting of the North American Fuzzy Information Processing Society (NAFIPS)*, pages 471–477. IEEE, 2006
- SPIE '06 J. Smith, III and T. Nguyen. Resource Manager for an Autonomous Coordinated Team of UAVs. In *International Society for Optical Engineering*, pages 118–129. SPIE, 2006
- SPIE '06 J. Smith, III and T. Nguyen. Genetic Program based Data Mining to Reverse Engineer Digital Logic. In *International Society for Optical Engineering*, pages 24–35. SPIE, 2006
- SPIE '05 J. Smith, III and T. Nguyen. Distributed Autonomous Systems: Resource Management, Planning, and Control Algorithms. In *International Society for Optical Engineering*, pages 65–76. SPIE, 2005
- SPIE' 05 J. Smith, III and T. Nguyen. Data Mining based Automated Reverse Engineering and Defect Discovery. In *International Society for Optical Engineering*, pages 232–242. SPIE, 2005

Refereed Journal Articles

- TOSEM '14 T. Nguyen, D. Kapur, W. Weimer, and S. Forrest. DIG: A Dynamic Invariant Generator for Polynomial and Array Invariants. *Transactions on Software Engineering Methodology (TOSEM)*, 23(4):30:1–30:30, 2014
- Featured Article** TSE '12 C. Le Goues, T. Nguyen, S. Forrest, and W. Weimer. GenProg: A Generic Method for Automated Software Repair. *Transactions on Software Engineering (TSE)*, 38(1):54–72, 2012
- Research Highlight** CACM '10 W. Weimer, S. Forrest, C. Le Goues, and T. Nguyen. Automatic Program Repair with Evolutionary Computation. *Communications of the ACM (CACM)*, 53(5):109–116, 2010
- DAM '08 T. Bui, T. Nguyen, C. Patel, and K.-A. Phan. An Ant-based Algorithm for Coloring Graphs. *Discrete Applied Mathematics*, 156(2):190–200, 2008
- ICAE '07 J. Smith, III and T. Nguyen. Autonomous and Cooperative Robotic Behavior Based on Fuzzy Logic and Genetic Programming. *Integrated Computer-Aided Engineering*, 14(2):141–159, 2007

Refereed Workshop Publications

- Best Short Paper**
Best Presentation SBST '09 T. Nguyen, W. Weimer, C. Le Goues, and S. Forrest. Using Execution Paths to Evolve Software Patches. In *International Conference on Software Testing, Verification and Validation Workshops (ICST)*, pages 152–153. IEEE, 2009
- Outstanding**
Submission HPEC '07 G. Viamontes, M. Amduka, J. Russo, C. M, and T. Nguyen. Efficient Memoization Strategies for Object Recognition with a Multi-Core Architecture. In *Annual High Performance Embedded Computing Workshop (HPEC)*. IEEE, 2007

Book Chapters

- D. Kapur, Z. Zhang, M. Horbach, H. Zhao, Q. Lu, and T. Nguyen. Geometric Quantifier Elimination Heuristics for Automatically Generating Octagonal and Max-plus Invariants. In *Automated Reasoning and Mathematics: Essays in Memory of William W. McCune*, volume 7788, pages 189–228. Springer, 2013

Thesis

T. Nguyen. *Automating Program Verification and Repair Using Invariant Analysis and Test-input Generation*. PhD thesis, University of New Mexico, August 2014

T. Nguyen. On the Graph Coloring Problem and Its Generalizations. Master's thesis, The Pennsylvania State University, December 2006