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

Education

7/2014 **Ph.D., Computer Science**, *University of New Mexico*, Albuquerque, NM.
Qualifier Exam '09
Graduation '14 (with distinction)
Advised by Stephanie Forrest and Deepak Kapur
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**, *Computer Science and Engineering, University of Nebraska*, Lincoln, NE.

8/2014 – 8/2016 **Postdoc**, *Computer Science, University of Maryland*, 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**, *Computer Science, University of New Mexico*, 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**, *Information Technology Division, Naval Research Laboratory*, 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, 1/2006 – 6/2006 **Co-op**, *Tactical Electronic Warfare Division, Naval Research Laboratory*, Washington, DC.
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**, *Advanced Technology Laboratories, Lockheed Martin*, 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

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*, $1024.

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*, $10000.

2009 **Best Short Paper, Best Presentation**, *Workshop on Search-Based Software Testing*, $270.

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.

Services

Profesional Services

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, Transactions on Software Engineering and Methodology, GECCO, ICSE, PLDI, POPL

University and Departmental Services

CSE Graduate Recruitment Committee, *'17 – present.*

CSE Admission Committee, *'16 – present.*

UNL Research Development Fellows Program, *'16-'17.*

Grants

Summer 2018 **Summer Salary**, UMD, $10000.
Direct appointment through UMD to work on invariant generation for a summer month

2012 – 2013 **Dean's Dissertation Fellowship**, UNM, $8000.
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, $2300.
Summer scholarship funding for graduate students with promising research project

2008 – 2009 **Space Grant Fellowship**, NASA, $15000.

Students

Guolong Zheng, *Ph.D. student*, since 2017 –.

Miscellaneous

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

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

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)*, pages 804–814. 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 **Distinguished Paper** 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.

ICSE '09 **Distinguished Paper** **Manfred Paul Award** 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.

GECCO '09 **Best Paper** 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.

GECCO '09 **Best Paper** 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.

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 **Best Paper** 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

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

TSE '12 **Featured Article** 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

CACM '10 **Research Highlight** 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

SBST '09 **Best Short Paper** **Best Presentation** 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

HPEC '07 **Outstanding Submission** 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