

Eric Schulte | Director of Automated Software Engineering

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Work

GrammaTech

Ithaca, NY

Director of Automated Software Engineering

2018 – Present

- Responsible for GrammaTech's *Binary Rewriting* and *Program Synthesis* research areas:
 - Program Synthesis:** Programmatic analysis and rewriting of software source-code to automate common software engineering tasks including refactoring, maintenance, optimization, bug repair, and bug injection
 - Binary Rewriting:** Analysis and rewriting of stripped COTS binaries, without access to source-code, to improve their security and efficiency
- Propose, plan, and lead government funded research and development projects exceeding \$4M annually
- Maintain and grow technical infrastructure, incorporate research results and support commercial products
- Manage technical staff including software engineers and senior scientists
- At GrammaTech I have been responsible for the following research projects:
 - Debloat** I lead GrammaTech's effort to develop robust binary rewriting for the purpose of removing unwanted functionality from legacy binaries to reduce attack surface and improve efficiency. This effort includes the creation of novel binary analysis and rewriting techniques and representations. This effort also entails the development and productization of aggressive software optimization techniques.
 - Bug-Injector** I lead GrammaTech's development of a tool for the automated injection of bugs into software source code. Host programs in multiple languages including C/C++ and JavaScript are supported, and arbitrary bugs may be injected through user-defined bug templates. This produces benchmarks which are useful in the evaluation of static and dynamic software analysis tools.
 - Resolve** I lead GrammaTech's development of practical tools for the improved difference and resolution of divergent branches of software systems. This project seeks to provide improved views of software differences to developers and to automate the arduous task of merge conflict resolution.
 - BRASS** I supervise GrammaTech's effort to build tools to automate software maintenance. Automated tasks include upgrading software to use newer versions of third-party dependencies, and performing large scale syntax-aware search and replace operations.
 - BED** I led a research effort into the use of evolutionary techniques to evolve *exact* C decompilation of stripped COTS binaries. The evolved C source code would recompile to a new binary that is byte-for-byte identical to the target binary.
 - GenPatcher** I led and was the sole engineer in the development of a tool for the automated repair of flaws in binary executables. This research focused on embedded ARM IoT (internet of things) devices.

Senior Scientist

2014 – 2018

- Write research proposals in static analysis, binary rewriting, and the application of evolutionary techniques to software maintenance and reverse engineering.
- Principal investigator, proposer, consultant, and technical contributor for multiple research projects covering the static analysis, rewriting, and synthesis of software at the level of source code, assembly code, and binary executables.

University of New Mexico

Albuquerque, NM

Research Assistant

2009 – 2014

- Research and developed of evolutionary techniques for software maintenance and improvement.
 - Bug repair
 - Optimization
- Empirical and theoretical investigation of biological properties of software.
 - My thesis explored the surprising robustness of software representation to random perturbation.

GNU Emacs

Contributor

2009 – 2014

- Author and maintainer of Emacs Org-mode's facilities for embedding executable source code into documents. Support for references between source code blocks in multiple languages as well as document structures including lists, tables, and graphics.

Free Software Foundation

Google Summer of Code Mentor

2012

- Advised an undergraduate software engineer developing Emacs extensions for Org-mode.

Counsyl

Open Source Software Consultant

Palo Alto, CA

2010 – 2011

- Consultation and development in application of open-source software to automated technical document generation.

The MITRE Corporation

Senior Artificial Intelligence Engineer

McLean, VA

2005 – 2009

- Lead developer of the RAMBO (Rapid Argus Modeling for Biosurvalience Operations) system. disease modeling and surveillance. RAMBO ran Bayesian models over text media statistics collected from across the world to identify emerging epidemics. RAMBO was used daily by roughly 50 biosecurity analysis at Georgetown University to identify emerging epidemics.
- Prototype the STAT (Statistical Tracking and Analysis of Text) system for temporal analysis of multilingual text. STAT performed temporal analysis of multilingual text media, providing daily updates, automated alerts, and theme identification and tracking for news analysts.
- Systems administration for production Unix/Linux systems.

International Technical Analyst

2004–2005

- Research assistant, composed documentation and user's manuals.

Education

University of New Mexico

Ph.D., Computer Science

Albuquerque, NM

2009 – 2014

Advisor Stephanie Forrest

Thesis Neutral Networks of Real-World Programs and their Application to Automated Software Evolution

University of Washington

Undergraduate and graduate course work in computer science

Seattle, WA

2007

George Mason University

Undergraduate course work in computer science

Fairfax, VA

2006 – 2007

Kenyon College

B.A., Mathematics, Minor Philosophy

Gambier, OH

2000 – 2004

Budapest Semester in Mathematics

Coursework in Combinatorics and Abstract Mathematics

Budapest, Hungary

2003

Publications

Doctoral Thesis

Eric Schulte. *Neutral Networks of Real-World Programs and their Application to Automated Software Evolution*. PhD thesis, University of New Mexico, Albuquerque, USA, July 2014. <https://cs.unm.edu/eschulte/dissertation>.

Refereed Conference Publications

Vineeth Kashyap, Jason Ruchti, Lucja Kot, Emma Turetsky, Rebecca Swords, David Melski, and Eric Schulte. Automated customized bug-benchmark generation. *arXiv preprint arXiv:1901.02819*, January 2019.

Deborah Katz, Jason Ruchti, and Eric Schulte. Using recurrent neural networks for decompilation. In *Software Analysis, Evolution and Reengineering (SANER), 2018*. IEEE, 2018.

Eric Schulte, Jonathan Dorn, Stephen Harding, Stephanie Forrest, and Westley Weimer. Post-compiler software optimization for reducing energy. In *Proceedings of the eighteenth international conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS '14*. ACM, 2014, *Acceptance Rate: 22.6%*.

Eric Schulte, Jonathan DiLorenzo, Westley Weimer, and Stephanie Forrest. Automated repair of binary and assembly programs for cooperating embedded devices. In *Proceedings of the eighteenth international conference on Architectural Support for Programming Languages and Operating Systems, ASPLOS '13*. ACM, 2013, *Acceptance Rate: 22.8%*.

Eric Schulte, Stephanie Forrest, and Westley Weimer. Automated program repair through the evolution of assembly code. In *Proceedings of the IEEE/ACM international conference on Automated software engineering, ASE '10*, pages 313–316, New York, NY, USA, 2010. ACM, *Acceptance Rate: 17.8%*.

Refereed Journal Articles

Eric Schulte, Zachary Fry, Ethan Fast, Westley Weimer, and Stephanie Forrest. Software mutational robustness. *Genetic Programming and Evolvable Machines*, pages 1–32, 2013, *Impact Factor: 1.333*.

Eric Schulte, Dan Davison, Thomas Dye, and Carsten Dominik. A multi-language computing environment for literate programming and reproducible research. *Journal of Statistical Software*, 46(3):1–24, 1 2012, *Impact Factor: 4.910*.

Magazine Articles

Eric Schulte and Dan Davison. Active document with org-mode. *Computing in Science & Engineering*, 13(3):66–73, May/June 2011, *Impact Factor: 1.72*.

Workshop Papers

Benoit Baudry, Nicolas Harrand, Eric Schulte, Chris Timperley, Shin Hwei Tan, Marija Selakovic, and Emamurho Ugherughe. A spoonful of devops helps the gi go down. 2018.

Eric Schulte, Jason Ruchti, Matt Noonan, David Ciarletta, and Alexey Loginov. Evolving exact decompilation. In *Binary Analysis Research (BAR), 2018*, 2018.

Vineeth Kashyap, Rebecca Swords, Eric Schulte, and David Melski. Musynth: Program synthesis via code reuse and code manipulation. In *International Symposium on Search Based Software Engineering*, pages 117–123. Springer, 2017.

Eric Schulte, Westley Weimer, and Stephanie Forrest. Repairing COTS router firmware without access to source code or test suites: A case study in evolutionary software repair. In *Genetic Improvement 2015 Workshop*, pages 847–854, Madrid, 11–15 July 2015. ACM. Best Paper.