Eric Schulte

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Work Experience

GrammaTech **Ithaca, NY**
Director of Automated Software Engineering *2014 – present*
I support GrammaTech's research division building our staff, expertise, frameworks and prototypes, funding, and IT infrastructure. I research and develop tools and techniques advancing the boundaries of automated software development and reverse engineering.

- Lead government funded research and development projects in tens of millions of dollars.
- Lead technical staff including managers, scientists, software engineers, and test engineers.
- Lead GrammaTech's *Machine Programming* and *Binary Rewriting* research areas.
  Machine Programming: Programmatic analysis, transformation, and generation of source-code to automate common software engineering tasks including writing code, writing tests, refactoring, maintenance, optimization, bug repair.

  Binary Rewriting: Programmatic analysis and transformation of software binaries to improve security and efficiency giving developers and users control over their binaries.
- Leverage techniques and technologies to solve research problems.
  - Formal methods and Logic Programming for efficient search and synthesis.
  - Evolutionary Computation techniques for open-ended optimization.
  - Machine Learning to optimize search spaces and generate code.
- Maintain and grow IT infrastructure, improve engineering efficiency.
  - Helped motivate and complete company-wide transition to Git
  - Helped motivate and complete company-wide adoption of CI/CD
  - Continually refine and improve internal software engineering standards
  - Managed refactoring of multi-decade old C/C++ code base from monolith to modular
- Research and develop tools to automate software (reverse) engineering including

  GTIRB/DDisasm `https://grammatech.github.io/prj/gtirb`
  Ecosystem of binary analysis and rewriting tools

  SEL `https://github.com/grammatech/sel`
  Source code analysis and transformation `https://pypi.org/project/asts/`

  Mnemosyne : `https://grammatech.gitlab.io/Mnemosyne/docs/`
  Automated software development assistant

  MergeResolver `https://mergeresolver.github.io`
  Automated merge conflict resolution as a GitHub Action

  Structured Search Replace (SSR) `https://grammatech.github.io/prj/ssr`
  AST-aware software search and replacement and automated software refactoring

  Binary Editor `https://grammatech.github.io/prj/gtirb-vscode/`
  VSCode extension for binary analysis and interactive binary rewriting

University of New Mexico **Albuquerque, NM**
Research Assistant *2009 – 2014*

- Research and develop evolutionary techniques for software maintenance and improvement.
- Empirical and theoretical investigation of biological properties of software.

The MITRE Corporation **McLean, VA**
Senior Artificial Intelligence Engineer *2005 – 2009*

- Lead developer of the Rapid Argus Modeling for Biosurvalience Operations (RAMBO) system. RAMBO provided disease modeling and surveillance supporting ~ 50 biosecurity analysts.
- Prototype the STAT (Statistical Tracking and Analysis of Text) temporal text analysis system.
- Systems administration for production Unix/Linux systems.

International Technical Analyst *2004 – 2005*

- Research assistant, composed documentation and user manuals.

Volunteer

Planned Parenthood **Pittsburgh, PA**
Clinic Escort *2019 – present*

National Poor People's Campaign
Web Design *2020 – present*

- Nonviolent Medicaid Army `http://nonviolentmedicaidarmy.org`
- National Union of the Homeless `https://nationalunionofthehomeless.org`

GNU Emacs
Contributor *2009 – 2014*

- Developed Emacs Org-mode's facilities for embedding executable source code into documents.

Education

University of New Mexico **Albuquerque, NM**
Ph.D., Computer Science *2014*
Advisor Stephanie Forrest
Thesis Neutral Networks of Real-World Programs and their Application to Automated Software Evolution

Kenyon College **Gambier, OH**
B.A., Mathematics, Minor Philosophy *2004*

Skills

Programming languages: Lisp, Python, JavaScript, C++, OCaml, Haskell, Ruby, Prolog
Technologies: Emacs, Git, Docker, K8, Linux, SMT/SAT, AI/ML, LaTeX, HTML/CSS
Domains: Programming Languages, Software Engineering, Binary Analysis

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`.

Patent

Eric Michael Schulte and Antonio Enrique Flores Montoya. Systems and/or methods for generating reassemblable disassemblies of binaries using declarative logic, 2020. US010705814B2.

Refereed Conference Publications

Antonio Flores-Montoya and Eric Schulte. Datalog disassembly. In *29th USENIX Security Symposium (USENIX Security 20)*, 2020. Distinguished Paper.

Vineeth Kashyap, Jason Ruchti, Lucja Kot, Emma Turetsky, Rebecca Swords, David Melski, and Eric Schulte. Automated customized bug-benchmark generation. In *2019 19th International Working Conference on Source Code Analysis and Manipulation (SCAM)*, pages 103–114. IEEE, 2019. Distinguished Paper.

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*.

Paul Lehner, Charles Worrell, Chrissy Vu, Janet Mittel, Stephen Snyder, Eric Schulte, and Warren Greiff. An application of document filtering in an operational system. *Information Processing & Management*, 46(5):611–627, 2010.

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

Eric Schulte, Suan Yong, and David Melski. Inuring: Live attacker-guided repair. In *Proceedings of the 3rd ACM Workshop on Forming an Ecosystem Around Software Transformation*, pages 39–45, 2019.

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, 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.