

Meredith L. Patterson

Skills

Languages

- C/C++
- Python
- Java
- Javascript
- Haskell
- Lua
- PHP
- Objective-C
- Scala
- Lisp
- lex/yacc
- Prolog
- SQL
- XSLT/XPath

Specialized Skills

- Language-theoretic security
- Compiler design
- Formal language analysis and design
- Database deployment, tuning and migration
- Technology education
- Machine learning
- Database backend internals
- Data analysis, modeling and mining
- Bioinformatics (genomics/proteomics)
- Test-driven/Agile development

Work Experience

- October 2012–
Present **Principal NLP Engineer**, *Nuance Communications*, Ghent, Belgium.
Productization, build and release engineering, development, troubleshooting, and security analysis for a hybrid (statistical and rule-based) natural language semantics product in the medical domain, in collaboration with a team of researchers from Nuance and the IBM Thomas J. Watson Research Center.
- August 2012–
Present **Managing Partner**, *Upstanding Hackers, LLC*, Brussels, Belgium.
Co-founder. Principal architect for open-source security offerings, including Hammer, a DARPA-funded parser generator library (<https://github.com/UpstandingHackers/hammer>).
- January 2011–
August 2012 **Senior Research Scientist**, *Red Lambda*, Orlando, FL.
Worked as part of a team of eight developers to build a scale-free distributed computing platform. Wrote analysis tools for Netflow v5 and v9. Developed tools (based on Scala's parser combinators) and GUI to enable non-expert users to quickly build bespoke parsers for custom log formats, including recursive and non-greedy matching. Wrote a binary parser combinator library in Scala to parse pcaps and other binary protocol data. Audited other developers' code in Java and C++. Prototyped novel machine learning techniques and locality-sensitive hashes.
- January 2009–
January 2011 **Independent Researcher**, Leuven, Belgium.
Collaborated with academic and industry security researchers on cross-implementation X.509 vulnerabilities and generalized language-theoretic attack and defense techniques. See publications list for further details.

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1/3

- May–December 2008 **Programmer/Analyst**, *UC Berkeley Phylogenomics Group*, Berkeley, CA.
Ported a PHP web application for proteomics analysis to Python/Django. Redesigned schema for and migrated a 10GB proteomics database from MySQL to PostgreSQL. Performed technology evaluation and made recommendations. Audited web application security. Led disaster recovery efforts.
- May 2006–May 2008 **Chief Technical Officer**, *Osogato*, San Francisco, CA.
Led a team of engineers and system administrators, distributed across the US and Europe, in the development of a client application for algorithmic analysis and recommendation of music. Architected, specified, and prototyped the application in C++ and Objective-C. Prototyped and developed a web-based version of the application in Python and Javascript. Raised \$250,000 in angel funding.
- January 2006–April 2006 **Software Engineer**, *Mu Security*, Sunnyvale, CA.
Developed and extended core internals of a smart fuzzing appliance, using C++ and XML. Wrote tools to automatically generate RPC service fuzzers from RPC interfaces, using bison and XSLT. Developed and maintained Python scripts for text and packet parsing, code generation, and documentation generation. Handled assistant database administrator duties.
- June 2005–September 2005 **Summer of Code Participant**, *Google*.
Implemented a fast, templated C++ machine-learning library for various classes of support vector machines (regression, binary classification, and ranking), extensible to other machine learning methods. Extended the PostgreSQL parser and backend to learn a discriminant function from sets of tuples already present in a table, then return results based on applying the discriminant function to the rest of the table.
- August 2003–December 2005 **Bioinformatics Intern**, *Integrated DNA Technologies*, Iowa City, IA.
Developed standalone and web-based tools for DNA and RNA sequence design and site-directed mutagenesis. Audited and refactored co-workers' code. Deployed a local installation of the Ensembl genomic database.
- August 2001–December 2005 **Teaching and Research Assistant**, *University of Iowa*, Iowa City, IA.
Designed and implemented a provably secure method of validating SQL input to prevent injection attacks. Contributed to a system for biomedical named-entity disambiguation. Teaching assistant for Computational Theory, Introduction to Knowledge Discovery and Data Mining, Discrete Structures, Computer Science II and III, Programming Language Concepts, Language and Formal Reasoning, and Language and Society.

Education

- 2003–2005 **University of Iowa**, *PhD in Computer Science (unfinished)*, Iowa City, IA.
Research in data mining and its integration with database internals. Left ABD in December 2005, having finished all coursework and qualifying exams.
- 2001–2003 **University of Iowa**, *M.A. in Linguistics*, Iowa City, IA.
Concentration in Computational Linguistics.
- 1994–2001 **University of Houston**, *B.A. in English*, Houston, TX.
Concentration in Linguistics.

Selected Publications and Talks

LANGSEC 2011-2016, *CONFidence*, 2013.

Shotgun Parsers in the Crosshairs, *BruCON, ShmooCon*, 2012–2013.
With Sergey Bratus and Dan Hirsch.

Hammer: Smashing Binary Formats Into Bits, *BerlinSides, DEFCON SkyTalks*, 2012.

With Dan Hirsch.

A Patch for Postel's Robustness Principle, *IEEE Security and Privacy*, vol. 10, no. 2, March/April 2012.

With Sergey Bratus and Len Sassaman.

The Science of Insecurity, *TROOPERS 12, ShmooCon, 28th Chaos Computer Congress*, 2011–2012.

With Sergey Bratus.

Exploit Programming: from Buffer Overflows to Weird Machines and Theory of Computation, *USENIX ;login:*, December 2011.

With Sergey Bratus, Michael E. Locasto, Len Sassaman and Anna Shubina.

The Halting Problems of Network Stack Insecurity, *USENIX ;login:*, December 2011.

With Sergey Bratus, Len Sassaman and Anna Shubina.

Towards a formal theory of computer insecurity: a language-theoretic approach, *Invited lecture at Dartmouth College*, February 2011.

With Len Sassaman.

Exploiting the Forest with Trees, *Black Hat Briefings*, July 2010.

With Len Sassaman.

Exploiting Computational Slack in Protocol Grammars, *ph-neutral 0x7da*, May 2010.

With Len Sassaman.

PKI Layer Cake: New Collision Attacks Against the Global X.509 Infrastructure, *Financial Cryptography*, January 2010.

With Dan Kaminsky and Len Sassaman.

Freezing More Than Bits: Chilling Effects of the OLPC XO Security Model, *USENIX Usability, Psychology and Security, FIXME* 2008.

With David Chaum and Len Sassaman.

Subliminal Channels in the Private Information Retrieval Protocols, *28th Symposium on Information Theory in the Benelux, FIXME* 2007.

With Len Sassaman.

Some of These Things are Just Like the Others, *PostgreSQL 10th Anniversary Summit, O'Reilly Emerging Technologies, CodeCon*, 2006.

Stopping Injection Attacks with Computational Theory, *Black Hat Briefings*, July 2005.

SciTools: the grand unified web-based toolkit for genetic design and analysis, *CodeCon*, February 2005.