

# Daniel Williams

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## Objective

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I am interested in leveraging my knowledge of software development to create new software systems with improved application performance and security. Further, I am interested transferring cutting-edge compiler tools and run-time systems into practical products that improve development environments and allow developers to create more secure and innovative products.

## Education

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- **Ph.D. University of Virginia, 2010 (Expected).**  
Dissertation Title: Integrating Program Metadata Across The Software Development Toolchain  
Thesis Adviser: Jack Davidson
- **M.C.S. University of Virginia, 2005.**  
Master's Project: Threaded Software Dynamic Translation
- **B.A. University of Wisconsin, Eau Claire, 2002.**  
Major: Computer Science

## Research

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### Research Interests

My research is focused on improving software development by increasing interaction between tools in the software development toolchain and runtime systems. Increasing communication between software tools allows for more sophisticated runtime security measures and program optimizations.

### Research Projects

- **Metaman:** Metaman is a compilation system developed to increase access and availability of program metadata within the software development toolchain. Currently, this research is focused on using Metaman to develop techniques for effectively using program metadata to improve dynamic translation.
- **Strata:** Strata is a software dynamic translation (SDT) framework used for security, optimization, profiling, and overhead reduction research. While maintaining Strata, I improved program transparency and investigated the causes of translation overhead. For my Master's project, I implemented transparent thread handling within Strata, and evaluated the benefits of threaded speculative fragment creation.

### Journal Papers

- *Security through Diversity: Leveraging Virtual Machine Technology* by Daniel Williams, Wei Hu, Jack W. Davidson, Jason D. Hiser, John C. Knight, Anh Nguyen-Tuong, IEEE Security and Privacy, vol. 7, no. 1, pp. 26-33, Jan./Feb. 2009
- *Compile-time planning for overhead reduction in software dynamic translators* by Naveen Kumar, Bruce R. Childers, Daniel Williams, Jack W. Davidson, and Mary Lou Soffa published in the International Journal of Parallel Programming, June 2005.

### Conference Papers

- *A Cross-Layer Approach to Heterogeneity and Reliability* by Daniel Williams, Aprotim Sanyal, Dan Upton, Jason Mars, Sudeep Ghosh, and Kim Hazelwood published in the Proceedings of the Seventh ACM-IEEE International Conference on Formal Methods and Models for Codesign (MEMOCODE), July 2009.
- *Evaluating Indirect Branch Handling Mechanisms in Software Dynamic Translation Systems* by Jason D. Hiser, Daniel Williams, Wei Hu, Jason Mars, Bruce R. Childers, and Jack W. Davidson published in Proceedings of the International Symposium on Code Generation and Optimization (CGO), 2007.

- *Secure and practical defense against code-injection attacks using software dynamic translation* by Wei Hu, Jason Hiser, Dan Williams, Adrian Filipi, Jack W. Davidson, David Evans, John C. Knight, Anh Nguyen-Tuong, and Jonathan Rowanhill published in the Proceedings of the Second International conference on Virtual Execution Environments (VEE), 2006.
- *Evaluating Fragment Construction Policies for SDT Systems* by Jason D. Hiser, Daniel Williams, Adrian Filipi, Jack W. Davidson, and Bruce R. Childers published in the Proceedings of the Second International conference on Virtual Execution Environments (VEE), 2006.

### Workshop Papers

- *Metaman: System-wide Metadata Management* by Daniel Williams and Jack W. Davidson to appear in the Workshop on Binary Instrumentation and Applications (WBIA '09), December 2009.
- *Using Program Metadata to Support SDT in Object-Oriented Applications* by Daniel Williams, Jason D. Hiser, and Jack W. Davidson published in Proceedings of the 4th workshop on the Implementation, Compilation, Optimization of Object-Oriented Languages and Programming Systems (ICOOOLPS), July 2009.
- *A Reactive Unobtrusive Prefetcher for Multicore and Manycore Architectures* by Jason Mars, Daniel Williams, Dan Upton, Sudeep Ghosh, and Kim Hazelwood published in Workshop on Software and Hardware Challenges of Manycore Platforms, 2008.

### Teaching

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- **CS4620 : Compilers**  
My duties included lecturing on intermediate formats, grading, and moderating “Compiler Wars.”
- **CS4630 : Defense Against the Dark Arts**  
My duties for this class include lecturing on virtual machines, password cracking and virus detection, as well as grading exams.

### Work History

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- Research Assistant, University of Virginia, 2003 - Present  
As a research assistant I investigated causes of software dynamic translation overhead and developed techniques to reduce overhead and increase performance.
- Software Engineering Intern, IBM, 2002-2003  
I worked with the iSeries Optimizing Translator (OX) team, where my projects included toolchain automation, as well as developing and improving disassembly tools.
- Math Tutor, UW Eau Claire Math Dept., 1998-2001  
As a math tutor, I explained mathematical concepts to students taking college math through Calc I.

### Skills

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- **Languages:** Python, C, ASM (x86, SPARC), Java, C++, Scheme, Perl
- **Tools:** GCC, GDB, Binutils, SCons, strace, Pin, Emacs, Eclipse, SVN, Mercurial, L<sup>A</sup>T<sub>E</sub>X
- **Operating Systems:** Linux (RH, Ubuntu, Gentoo), UNIX, Windows, Mac OSX, OS/400

### Service

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- Steering Committee, CS Graduate Student Group, University of Virginia, 2005-2006
- Graduate Student Mentor, University of Virginia, 2004-2007
- Vice President, Student Chapter of the ACM, University of Wisconsin, Eau Claire, 2002.

References available upon request.