

Raffi Khatchadourian

Ph.D. Candidate

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Research Interests

Automated software evolution; Automated refactoring of legacy software; Reasoning, verification, and specification of Aspect-Oriented software.

Education

- 2005 – **Ph.D. Computer Science**, *Ohio State University*, 2011 (Expected),
Major: Software Methodology; Minors: Distributed Software Systems, Mathematics.
Major Advisor: N. Soundarajan; Minor Advisors: P. Sivilotti, T. Carlson
- Jan. 2008 – **Visiting Graduate Student in Computing**, *Lancaster University, UK*.
Sep. 2008
Advisor: A. Rashid
- 2000 – 2004 **B.S. Computer Science (cum laude)**, *Monmouth University, NJ*.
2004 Outstanding Computer Science Student, ACM Student Chapter President, Science Advisory Council Member, Lambda Sigma Tau Member, Kappa Mu Epsilon Member, Dean's list.

Research Experience

- Summer 2009 – **Graduate Research Associate**, *Ohio State University*, Advisor: A. Rountev.
present
Research in summary-based, intra-procedural points-to analysis for Java programs. On going work involves augmenting the Soot Java byte-code analysis and optimization framework (*see www.sable.mcgill.ca/soot*) to support summary-based (cached) byte-code analysis for increased performance of common analyzes, such as points-to analysis, involving reusable software libraries and frameworks. Future work entails formalization of the approach, thorough empirical evaluation, and possible integration with the Soot framework for public distribution.
- Summer 2006 – **Graduate Research**, *Ohio State University*, Advisor: N. Soundarajan.
present
Research in formal program reasoning, verification, and specification of Aspect-Oriented (AO) software. Past work has involved adaptation of approaches to reasoning about concurrent programs and how they may be applied to the AO paradigm. Specifically, adaptation of a rely-guarantee approach for specifying AO software has been explored, as well as axiomatic, trace-based specifications for combining the execution behavior of aspects and with that of the base-code to arrive at an overall system behavioral specification. Future work regarding this avenue encompasses proof of soundness, applicability to AO languages such as AspectJ, and possible tool-supported verification. Current work focuses on developing formal reasoning techniques for verifying properties of reusable aspects.
- Winter 2008 – **Graduate Research Associate**, *Aspect-Oriented Software Engineering Group, Computing Department, Lancaster University, UK*, Supervisor: A. Rashid, Mentor: P. Greenwood.
Autumn 2008
Collaborative research on traceability in Aspect-Oriented (AO) analysis and design in the context of two European Commission Framework 6 projects, namely, AOSD-Europe: European Network of Excellence on AOSD and AMPLE: Aspect-Oriented, Model-Driven Product Line Engineering. Main research focus centered on the application of software artifact traceability to support automated source code evolution of AO software, thus enabling developers to correctly maintain AO software as requirements are altered. Other work entailed development of an analysis and design framework that supports end-to-end traceability of a variety of software engineering artifacts that include AO concepts. Furthermore, reasoning techniques are have been devised to elicit and verify new trace information as the underlying software evolves.

- Autumn 2006 – **Graduate Research**, *Ohio State University*, Advisor: A. Rountev.
Autumn 2007 Research in source code refactoring of Java programs through static analysis/type inferencing to reduce manual software maintenance efforts. Projects include an automated source-to-source transformation of Java software which utilizes legacy enumeration patterns to instead utilize the Enum construct introduced in Java 1.5. Implementation realized as an Eclipse IDE plug-in with planned release with the standard distribution of Eclipse. Current work comprises augmentation of the approach to encompass grouping heuristics, analysis of reference types, etc. Also exploring issues in aspect mining and usage in regards to persistence and distribution. Future research involves refactoring of XML-based source code metadata to Java 1.5 annotations.
- Summer 2007 **Research Intern**, *Bell Laboratories, Alcatel-Lucent, Murray Hill, NJ*, Supervisor: R. Hull, Mentor: K. Namjoshi.
Research in Session Data Types (SDTs). Entailed program language design for shared experience, multi-media, multi-protocol, event-driven applications. Contributions include novel Application Programmer Interface (API) based on hierarchical finite automata and a research prototype implementation. Potential future work includes formal specification, validation, and verification of SDT client software.
- Autumn 2006 **Graduate Research Associate**, *EASE Laboratory, Ohio State University*, Advisor: F. Khan.
Joint collaboration between Computer Science and Engineering, Electrical Engineering, and Mechanical Engineering departments. Position included a research appointment at the Electrical and Applied Software Engineering Laboratory (EASE Labs). Developed new ECE/CSE 668 course to model Challenge-X hybrid SUV automobile in a component-based software architecture.

Conference Publications (peer-reviewed)

- Raffi Khatchadourian, Phil Greenwood, Awais Rashid, and Guoqing Xu. Pointcut rejuvenation: Recovering pointcut expressions in evolving aspect-oriented software. In *Proceedings of the 24th International Conference on Automated Software Engineering (ASE '09)*, Auckland, New Zealand, November 2009. IEEE/ACM. Short paper, to appear (38+33/222; 32% acceptance rate overall).
- Raffi Khatchadourian and Awais Rashid. Rejuvenate pointcut: A tool for pointcut expression recovery in evolving aspect-oriented software. In *Proceedings of the 8th International Working Conference on Source Code Analysis and Manipulation (SCAM '08)*, pages 261–262, Beijing, China, September 2008. IEEE. Short paper and tool demonstration. See tinyurl.com/scam08.
- Neelam Soundarajan, Raffi Khatchadourian, and Johan Dovland. Reasoning about the behavior of aspect-oriented programs. In J. Smith, editor, *Proceedings of the 11th IASTED International Conference on Software Engineering and Applications (SEA '07)*, Cambridge, MA, USA, November 2007. ACTA Press. See tinyurl.com/sea07.
- Raffi Khatchadourian, Jason Sawin, and Atanas Rountev. Automated refactoring of legacy Java software to enumerated types. In *Proceedings of the 23rd International Conference on Software Maintenance (ICSM '07)*, pages 224–233, Paris, France, October 2007. IEEE. (46/214; 21% acceptance rate). See tinyurl.com/icsm07enum.

Workshop Publications (peer-reviewed)

- Neelam Soundarajan and Raffi Khatchadourian. Specifying reusable aspects. In *Proceedings of the 5th Asian Workshop on Aspect-Oriented and Modular Software Development (AOAsia '09) at the 24th International Conference on Automated Software Engineering (ASE '09)*, Auckland, New Zealand, November 2009. To appear.
- Phil Greenwood, Awais Rashid, and Raffi Khatchadourian. Contributing factors to pointcut fragility. In *Proceedings of the 3rd International Workshop on Assessment of Contemporary Modularization Techniques (ACoM '09) at the 24th ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '09)*, Orlando, Florida, USA, October 2009. ACM. To appear. See tinyurl.com/wacom09.
- Raffi Khatchadourian, Phil Greenwood, and Awais Rashid. On the assessment of pointcut design in evolving aspect-oriented software. In *Proceedings of the 2nd International Workshop on Assessment of Contemporary Modularization Techniques (ACoM '08) at the 23rd ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA '08)*, pages 9–10, Nashville, Tennessee, USA, October 2008. Lancaster University, ACM. See tinyurl.com/wacom08.
- Raffi Khatchadourian, Johan Dovland, and Neelam Soundarajan. Enforcing behavioral constraints

in evolving aspect-oriented programs. In *Proceedings of the 7th International Workshop on Foundations of Aspect-Oriented Languages (FOAL '08) at the 7th International Conference on Aspect-Oriented Software Development (AOSD '08)*, pages 19–28, Brussels, Belgium, April 2008. ACM. See tinyurl.com/foal08.

Raffi Khatchadourian and Neelam Soundarajan. Rely-guarantee approach to reasoning about aspect-oriented programs. In *Proceedings of the 5th International Workshop on Software Engineering Properties of Languages and Aspect Technologies (SPLAT '07) at the 6th International Conference on Aspect-Oriented Software Development (AOSD '07)*, Vancouver, British Columbia, Canada, March 2007. ACM. See tinyurl.com/splat07.

Technical Reports

Raffi Khatchadourian, Phil Greenwood, Awais Rashid, and Guoqing Xu. Pointcut rejuvenation: Recovering pointcut expressions in evolving aspect-oriented software. Technical Report COMP-001-2008, Revised March 2009, May 2009, Lancaster University, Lancaster, UK, August 2008. See tinyurl.com/khatchad-tr08.

Raffi Khatchadourian, Jason Sawin, and Atanas Rountev. Automated refactoring of legacy Java software to enumerated types. Technical Report OSU-CISRC-4/07-TR26, Ohio State University, April 2007. See tinyurl.com/khatchad-tr07.

Project Deliverables

Jean-Claude Royer, Joost Noppen, Nicolas Anquetil, Andreas Rummler, Ralf Mitschke, André Sousa, Uira Kulesza, Raffi Khatchadourian, Phil Greenwood, Awais Rashid, and Ismênia Galvão. Software support for the traceability framework, including extension of current configuration management and product line evolution model. Technical Report AMPLE D4.2, Aspect-Oriented, Model-Driven Product Line Engineering, October 2008. See tinyurl.com/ample-d42.

Raffi Khatchadourian, Ruzanna Chitchyan, Phil Greenwood, Awais Rashid, Juan A. Valenzuela, Luis M. Fernández, Mónica Pinto, Lidia Fuentes, Andrew Jackson, and Siobhán Clarke. Overall aspect-oriented analysis and design approach. Technical Report AOSD-Europe Deliverable D132, AOSD-Europe-ULANC-49, European Network of Excellence on Aspect-Oriented Software Development, September 2008. See tinyurl.com/aosd-d132.

Mónica Pinto, Lidia Fuentes, Ruzanna Chitchyan, Awais Rashid, Andrew Jackson, Siobhán Clarke, Boris Shishkov, Bedir Tekinerdogan, Mehmet Aksit, Phil Greenwood, and Raffi Khatchadourian. Traceability framework: From requirements through architecture and design. Technical Report AOSD-Europe Deliverable D126, AOSD-Europe-ULANC-43, European Network of Excellence on Aspect-Oriented Software Development, July 2008. See tinyurl.com/aosd-d126.

Safoora Omer Rashid, Ruzanna Chitchyan, Awais Rashid, Raffi Khatchadourian, and Phil Greenwood. Approach for change impact analysis of aspectual requirements. Technical Report AOSD-Europe Deliverable D110, AOSD-Europe-ULANC-40, European Network of Excellence on Aspect-Oriented Software Development, January 2008. See tinyurl.com/aosd-d110.

Grants and Awards

- 2009 ACM SIGSOFT CAPS Program Travel Grant Recipient.
- 2008,2009 Lancaster University Faculty of Science & Technology Travel Grant Recipient.
- 2007, 2008(2), 2009 ACM SIGPLAN Professional Activities Committee (PAC) Travel Grant Recipient.
- 2008 European Network of Excellence on Aspect-Oriented Software Development Student Grant Recipient.
- 2007 Visiting Studentship in Aspect-Oriented Software Analysis and Design, Computing Department, Lancaster University, UK.
- 2004 Monmouth University Outstanding Undergraduate Computer Science Student Award Recipient.

Presentations

- March 2009 **8th International Conference on Aspect-Oriented Software Development (AOSD)**, *Charlottesville, VA*.
Invited tool demonstration of "Rejuvenate Pointcut: A Tool for Pointcut Expression Recovery in Evolving Aspect-Oriented Software."
- March 2009 **8th International Conference on Aspect-Oriented Software Development (AOSD)**, *Charlottesville, VA*.
Poster on "Enforcing Behavioral Constraints in Evolving Aspect-Oriented Programs."
- October 2008 **2nd International Workshop on Assessment of Contemporary Modularization Techniques (ACoM)**, *Nashville, Tennessee*.
Presentation on "On the Assessment of Pointcut Design in Evolving Aspect-Oriented Software."
- September 2008 **8th IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM)**, *Beijing, China*.
Tool demonstration on "Rejuvenate Pointcut: A Tool for Pointcut Expression Recovery in Evolving Aspect-Oriented Software."
- April 2008 **7th International Conference on Aspect-Oriented Software Development (AOSD)**, *Brussels, Belgium*.
Poster on "Pointcut Rejuvenation: Recovering Pointcut Expressions in Evolving Aspect-Oriented Software."
- April 2008 **7th International Workshop on Foundations of Aspect-Oriented Languages (FOAL)**, *Brussels, Belgium*.
Presentation on "Enforcing Behavioral Constraints in Evolving Aspect-Oriented Programs."
- March 2008 **Computing Department, Lancaster University**, *Lancaster, UK*.
Computing's Advanced Knowledge Extension Seminars (CAKES) presentation on "Rely, Guarantee, Enrich: An Approach to Modular Reasoning About Aspect-Oriented Programs."
- October 2007 **23rd IEEE International Conference on Software Maintenance (ICSM)**, *Paris, France*.
Presentation on "Automated Refactoring of Legacy Java Software to Enumerated Types."
- August 2007 **Bell Laboratories, Alcatel-Lucent**, *Murray Hill, NJ*.
Summer intern presentation on an "Overview of a Session Data Type (SDT) Framework Research Prototype."
- July 2007 **2nd European Summer School on Aspect-Oriented Software Development**, *Department of Informatics and Information Science (DISI), University of Genoa, Italy*.
Led group discussion and displayed a poster on current progress of "Modular Reasoning about Aspect-Oriented Programs: A Rely-Guarantee Approach."
- April 2007 **Ohio Graduate Student Symposium on Computer and Information Science & Engineering (OGSS-CISE)**, *University of Cincinnati, Cincinnati, OH*.
Presentation on "Modular Reasoning about Aspect-Oriented Programs: A Rely-Guarantee Approach."
- March 2007 **5th International Workshop on Software Engineering Properties of Languages and Aspect Technologies (SPLAT)**, *Vancouver, BC, Canada*.
Presentation on "Rely-Guarantee Approach to Reasoning about Aspect-Oriented Programs."

Professional Activities

- 2008,2009 Secondary Reviewer for the IEEE/ACM International Conference on Automated Software Engineering (ASE), *L'Aquila, Italy (2008), Auckland, New Zealand (2009)*.
- 2007,2009 Student Volunteer at the International Conference on Aspect-Oriented Software Development (AOSD), *Vancouver, BC (2007), Charlottesville, VA (2009)*.
- 2007,2009 Spring School Participant at the International Conference of Aspect-Oriented Software Development (AOSD), *Vancouver, BC (2007), Charlottesville, VA (2009)*.

- 2009 Secondary Reviewer for the 8th International Conference on Aspect-Oriented Software Development (AOSD), Charlottesville, VA.
- 2008,2009 Secondary Reviewer for the European Conference on Object-Oriented Programming (ECOOP), Paphos, Cyprus (2008), Genoa, Italy (2009).
- 2008 Secondary Reviewer for the 2nd Workshop on Assessment of Contemporary Modularization Techniques (ACoM) at the 23rd ACM SIGPLAN International Conference on Object-Oriented Programming, Systems, Languages, and Applications (OOPSLA), Nashville, Tennessee.
- 2007 Textbook Reviewer for "Programming with C++ Brief Edition," D.S. Malik, Thomson Learning, Boston, MA.
- 2007 Participant at the 2nd European Summer School on Aspect-Oriented Software Development, Genoa, Italy.
- 2007 Program Committee Member for the 2nd Ohio Graduate Student Symposium on Computer and Information Science & Engineering (OGSS-CISE), Cincinnati, OH.
- 2007 Secondary Reviewer for the 29th International Conference on Software Engineering (ICSE), Minneapolis, MI.
- 2004 President, Monmouth University ACM Student Chapter.

Teaching Experience

- Spring 2007, Autumn 2008, Autumn 2009 **Graduate Teaching Associate Lecturer**, *CS&E 202: Introduction to Programming and Algorithms for Engineers and Scientists*, Department of Computer Science & Engineering, Ohio State University.
Course Description: Introduction to computer programming and to problem solving techniques using computer programs with applications in engineering and the physical sciences; algorithm development; programming lab experience.
- Autumn 2005 – Summer 2006, Winter 2007, Autumn 2007, Winter 2009, Spring 2009 **Graduate Teaching Associate Lecturer**, *CS&E 230: Introduction to C++ Programming*, Department of Computer Science & Engineering, Ohio State University.
Course Description: Introduction to programming in C++ and Object-Oriented programming; encapsulation using classes, inheritance, etc.; data structures, introduction to search and sorting algorithms, complexity, Object-Oriented design.
- Spring 2008 **Invited Lecturer**, *Seminar in L^AT_EX Typography*, Department of Graduate Studies, Lancaster University, Lancaster, UK.
Course Description: One-day seminar to introduce L^AT_EX typography for scientific publications. Content included simple document construction, image/figure scaling and placement, and general thesis writing. Material was also comprised of automated table of contents management, indexes, bibliography, etc.
- 2003 – 2004 **Mathematics Tutor**, *Mathematics Learning Center*, Department of Mathematics, Monmouth University, West Long Branch, NJ.
Tutored college-level courses such as College Algebra, Probability and Statistics, Discrete Math, Pre-calculus, and Calculus for Business and Finance.

Open Source Software

- 2008 – **REJUVENATE POINTCUT**.
AspectJ source code refactoring plug-in for the Eclipse open source Integrated Development Environment, providing tool support for pointcut expression recovery in evolving Aspect-Oriented software. See code.google.com/p/rejuvenate-pc.
- 2007 – **CONVERT CONSTANTS TO ENUM**.
Java™ source code refactoring plug-in for the Eclipse open source Integrated Development Environment. Planned for release in the 2008 standard distribution of Eclipse. See code.google.com/p/constants-to-enum-eclipse-plugin.

Professional Affiliations

- ACM Student Member, Association for Computing Machinery.
SIGPLAN Student Member, ACM Special Interest Group for Programming Languages.
IEEE-CS Student Member, IEEE Computer Society.
ACM/IEEE Professional Member, ACM/IEEE Princeton, NJ Chapter.

Industrial Experience

- February 2004 – **Software Development Specialist**, *NJ Office of Information Technology*, Trenton, NJ.
September 2005 Developed J2EE architecture and infrastructure for the New Jersey Insurance Surcharge System.
- June 2003 – **UNIX Systems Administrator**, *Integrated Medical Care*, Toms River, NJ.
February 2004 Created and administered network composed of servers and clients devoted to web authoring.

Computer Skills

programming	JAVA S/EE, AspectJ, C#, C/C++	scripting	PHP, Bash, Perl
building	ant, make	rules	JBoss Drools, Prolog
OS	Linux, UNIX, Mac OS X	administration	Apache, Samba, iptables
IDE	Eclipse, Visual Studio .NET, Vim	typography	ℒ _T ℒ _X
web	XHTML, CSS, JSF, JBoss Seam	database	Postgresql, MySQL, Oracle

Languages

English	Native	
Armenian	Conversational	<i>Language of heritage.</i>
Spanish	Elementary	<i>1-year college course, 2-year high school course.</i>