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Research Interests

My research interests are in software engineering with a focus on software security, software analysis and testing, software architecture, and software maintenance and re-engineering.

Education

Ph.D., Computer Science, August 2014

*University of Southern California
Los Angeles, CA, U.S.A.*

Dissertation: A Unified Framework for Studying Architectural Decay of Software Systems

Master of Science, Computer Science, December 2008

*University of Southern California
Los Angeles, CA, U.S.A.*

Bachelor of Science in Computer Engineering and Computer Science, Minor in Philosophy, May 2006

*University of Southern California
Los Angeles, CA, U.S.A.*

Employment History

University of California, Irvine, USA

October 2016–Present

Associate Project Scientist

Institute for Software Research

University of California, Irvine, USA

July 2015–October 2016

Assistant Project Scientist

Institute for Software Research

George Mason University, Fairfax, VA, USA

July 2014–June 2015

Postdoctoral Research Fellow

Software Design and Analysis Laboratory

University of Southern California, Los Angeles, CA, USA

January 2008–June 2014

Research Assistant

Software Architecture Research Group

May 2007–August 2007

Research Assistant

Southern California Earthquake Center

May 2005–May 2006

Research Intern

Southern California Earthquake Center

NASA Jet Propulsion Laboratory, La Cañada Flintridge, CA, USA

June 2009–August 2010

Software Engineer

Xerox Special Information Systems, Monrovia, CA, USA

June 2006–August 2006

Software Development Intern

Threshold Marketing, Los Angeles, CA, USA

August 2004–April 2005

Software Development Intern

Digital Computing Systems, LLC, Van Nuys, CA, USA

May 2003–August 2003

IT Consultant

Notre Dame High School, Sherman Oaks, CA, USA
June 2001–September 2002 **Assistant Network Admin**

Toy Mandala (Collectible Items Store), Sherman Oaks, CA, USA
April 2002–August 2002 **Webmaster and Ad Designer**

Publications

Conferences

[C12] Joshua Garcia, Mahmoud Hammad, Negar Ghorbani, and Sam Malek. Automatic Generation of Inter-Component Communication Exploits for Android Applications. *In the 11th joint meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE)*, 2017. (Accepted)

[C11] Nariman Mirzaei, Joshua Garcia, Hamid Bagheri, Alireza Sadeghi, and Sam Malek. Reducing Combinatorics in GUI Testing of Android Applications. *In the 38th International Conference on Software Engineering (ICSE)*, 2016.

[C10] Duc Le, Pooyan Behnamghader, Joshua Garcia, Daniel Link, Arman Shahbazian and Nenad Medvidović. An Empirical Study of Architectural Change in Open-Source Software Systems. *In the 12th Working Conference on Mining Software Repositories (MSR)*, 2015.

[C9] Thibaud Lutellier, Devin Chollack, Joshua Garcia, Lin Tan, Derek Rayside, Nenad Medvidović and Robert Kroeger. Comparing Software Architecture Recovery Techniques Using Accurate Dependencies. *In the Software Engineering In Practice Track of The 37th International Conference on Software Engineering (ICSE)*, 2015.

[C8] Joshua Garcia, Igor Ivkovic, and Nenad Medvidović. A Comparative Analysis of Architecture Recovery Techniques. *In the Proceedings of the 28th IEEE/ACM International Conference on Automated Software Engineering (ASE)*, 2013.

[C7] Joshua Garcia, Daniel Popescu, Gholamreza Safi, William G.J. Halfond, and Nenad Medvidović. Identifying Message Flow in Distributed Event-Based Systems. *In the Proceedings of the 9th joint meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE)*, 2013.

[C6] Joshua Garcia, Ivo Krka, Chris Mattmann, and Nenad Medvidović. Obtaining Ground-Truth Software Architectures. *In the Proceedings of the 35th International Conference on Software Engineering (ICSE)*, 2013.

[C5] Daniel Popescu, Joshua Garcia, Kevin Bierhoff, and Nenad Medvidović. Impact Analysis for Distributed Event-Based Systems. *In the Proceedings of the 6th ACM International Conference on Distributed Event-Based Systems (DEBS)*, 2012.

[C4] Isela Macia Bertrán, Joshua Garcia, Daniel Popescu, Alessandro Garcia, Nenad Medvidović and Arndt Von Staa. Are Automatically-Detected Code Anomalies Relevant to Architectural Modularity? An Exploratory Analysis of Evolving Systems. *In the Proceedings of the 11th Annual International Conference on Aspect-oriented Software Development (AOSD)*, 2012.

[C3] Isela Macia, Alessandro Garcia, Arndt von Staa, Joshua Garcia, and Nenad Medvidović. On the Impact of Aspect-Oriented Code Smells on Architecture Modularity: An Exploratory Study. *In the Proceedings of the 5th Brazilian Symposium on Software Components, Architectures and Reuse (SBCARS)*, 2011.

[C2] Hossein Tajalli, Joshua Garcia, George Edwards, and Nenad Medvidović. PLASMA: A Plan-Based Layered Architecture for Software Model-Driven Adaptation. *In the Proceedings of the 25th IEEE/ACM International Conference on Automated Software Engineering (ASE)*, 2010.

[C1] Joshua Garcia, Daniel Popescu, George Edwards and Nenad Medvidović. Toward a Catalogue of Architectural Bad Smells. *In the Proceedings of the Fifth International Conference on the Quality of Software Architectures (QOSA)*, 2009.

Journals

[J8] Thibaud Lutellier, Devin Chollak, Joshua Garcia, Lin Tan, Derek Rayside, Nenad Medvidovic, and Robert Kroeger. Measuring the Impact of Code Dependencies on Software Architecture Recovery Techniques. *IEEE Transactions on Software Engineering (TSE)*, 2017.

[J7] Alireza Sadeghi, Hamid Bagheri, Joshua Garcia, and Sam Malek. A Taxonomy and Qualitative Comparison of Program Analysis Techniques for Security Assessment of the Android System. *IEEE Transactions on Software Engineering (TSE)*, 2016.

[J6] Pooyan Behnamghader, Duc Minh Le, Joshua Garcia, Daniel Link, Arman Shahbazian, and Nenad Medvidovic. A Large-Scale Study of Architectural Evolution in Open-Source Software Systems. *Empirical Software Engineering*, 2016.

[J5] Hamid Bagheri, Joshua Garcia, Alireza Sadeghi, Sam Malek, Nenad Medvidovic. Software Architectural Principles in Contemporary Mobile Software: From Conception to Practice. *Journal of Systems and Software (JSS)*, 2016.

[J4] Hamid Bagheri, Alireza Sadeghi, Joshua Garcia, and Sam Malek. COVERT: Compositional Analysis of Android Inter-App Permission Leakage. *IEEE Transactions on Software Engineering (TSE)*, 2015.

[J3] Chris A. Mattmann, Joshua Garcia, Ivo Krka, Daniel Popescu, and Nenad Medvidović. Revisiting the Anatomy and Physiology of the Grid. *Journal of Grid Computing*, 2015

[J2] Nenad Medvidović, Hossein Tajalli, Joshua Garcia, Yuriy Brun, Ivo Krka, and George Edwards. Engineering Heterogeneous Robotics Systems: A Software Architecture-Based Approach, *IEEE Computer*, 2011.

[J1] Sam Malek, George Edwards, Yuriy Brun, Hossein Tajalli, Joshua Garcia, Ivo Krka, Nenad Medvidović, Marija Mikic-Rakic, and Gaurav Sukhatme. An Architecture-Driven Software Mobility Framework. *Journal of Systems and Software (JSS), Special Issue on Software Architecture and Mobility*, 2009.

Workshops and Short Papers

[W9] Reyhaneh Jabbarvand, Alireza Sadeghi, Joshua Garcia, Sam Malek, and Paul Ammann. EcoDroid: An Approach for Energy-Based Ranking of Android Apps. *In the 4th International Workshop on Green and Sustainable Software in Conjunction with ICSE*, 2015.

[W8] Youn Kyu Lee, Jae young Bang, Joshua Garcia, and Nenad Medvidović. ViVA: A Visualization and Analysis Tool for Distributed Event-Based Systems. *Formal Demonstrations Track of the 36th International Conference on Software Engineering (ICSE)*, 2014.

[W7] Ran Mo, Joshua Garcia, Yuanfang Cai, and Nenad Medvidović. Mapping Architectural Decay Instances into Dependency Models. *In the Proceedings of the Fourth International Workshop on Managing Technical Debt in*

Conjunction with ICSE, 2013.

[W6] Joshua Garcia, Daniel Popescu, Chris Mattmann, Nenad Medvidović, and Yuanfang Cai. Enhancing Architectural Recovery Using Concerns. *In the Proceedings of the 26th IEEE/ACM International Conference on Automated Software Engineering (ASE)*, 2011.

[W5] Ivo Krka, Yuriy Brun, Daniel Popescu, Joshua Garcia, Nenad Medvidović. Using Dynamic Execution Traces and Program Invariants to Enhance Behavioral Model Inference. *In the New Ideas and Emerging Results Track of the 32nd International Conference on Software Engineering (ICSE NIER)*, 2010.

[W4] George Edwards, Joshua Garcia, Hossein Tajalli, Daniel Popescu, Nenad Medvidović, Gaurav Sukhatme, and Brad Petrus. Architecture-Driven Self-Adaptation and Self-Management in Robotics Systems. *In the Proceedings of the Workshop on Software Engineering for Adaptive and Self-Managing Systems (SEAMS)*, 2009.

[W3] Daniel Popescu, Joshua Garcia, and Nenad Medvidović. Enabling More Precise Dependency Analysis in Event-Based Systems. *In the Proceedings of the 17th International Conference on Program Comprehension (ICPC)*, 2009.

[W2] Joshua Garcia, Daniel Popescu, George Edwards and Nenad Medvidović, Identifying Architectural Bad Smells. *In the Proceedings of the 13th European Conference on Software Maintenance and Reengineering (CSMR)*, 2009.

[W1] Chris A. Mattmann, Joshua Garcia, Ivo Krka, Daniel Popescu, and Nenad Medvidović. The Anatomy and Physiology of the Grid Revisited. *In the Proceedings of the 8th Working IEEE/IFIP Conference on Software Architecture (WICSA)*, 2009.

Invited Talks

Joshua Garcia. *Lightweight, Obfuscation-Resilient Detection and Family Identification of Android Malware*. IEEE Orange County CyberSecurity Monthly Technical Talk, Sept. 2016.

Joshua Garcia. *Effective, Lightweight Analysis of Android Apps: A Security and Testing Perspective*. Aerospace Corporation, July 2016.

Joshua Garcia. *Architectural Recovery to Aid Detection of Architectural Degradation*. USC Center for Software and Systems Engineering Annual Research Review, March 2012.

Joshua Garcia. *Cataloging and Detecting Architectural Smells*. USC Center for Software and Systems Engineering Annual Research Review, March 2011.

Joshua Garcia. *Cataloging and Detecting Architectural Smells*. Ground Systems Architecture Workshop (GSAW), Architecture-Centric Evolution (ACE) Working Group, March 2011.

Hossein Tajalli, Joshua Garcia. *Model- and Plan-Based Software Architecture Adaptation*. USC Center for Software and Systems Engineering Annual Research Review, March 2010.

George Edwards, Joshua Garcia, Hossein Tajalli, Daniel Popescu, Nenad Medvidović, Gaurav Sukhatme, and Brad Petrus, *Architecture-Driven Self-Adaptation and Self-Management in Robotics Systems*. USC Center for Software and Systems Engineering Annual Research Review, March 2009.

Brian D'Souza, Joshua Garcia, Ivo Krka, Natachart Laotheppitak, Hossein Tajalli. *An Architectural Approach to Robotics Software Design, Implementation, and Deployment*. USC Center for Software and Systems Engineering

Annual Research Review, March 2008.

Service Activities

Program Committee

Innovations in Software Engineering Conference (ISEC), 2018.
Innovations in Software Engineering Conference (ISEC), 2017.
The International Conference on Software Engineering (ICSE), Demonstrations Track, 2016.

Reviewer

Computing, 2017
IEEE Software, 2017.
ACM Transactions on Software Engineering and Methodology (TOSEM), 2015-2016.
Information and Software Technology (IST), 2015-2016.
Journal of Systems and Software (JSS), 2015.
IEEE Transactions on Software Engineering (TSE), 2013-2015.
Science of Computer Programming, Special Issue: CompArch 2012.

External Reviewer

The European Conference on Software Architecture (ECSA), 2015-2017.
IEEE/ACM International Conference on Automated Software Engineering (ASE), 2013.
The Joint Meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE), 2013.
The ACM International Conference on Distributed Event-Based Systems (DEBS), 2013.
The European Conference on Software Architecture (ECSA), 2013.
The International ACM SIGSOFT Symposium on Component-Based Software Engineering (CBSE), 2013.
The International ACM SIGSOFT Symposium on Architecting Critical Systems (ISARCS), 2013.
The International Conference on Distributed Event-Based Systems (DEBS), 2012.
The International Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS), 2012.
The International Symposium on Software Engineering for Adaptive and Self-Managing Systems (SEAMS), 2011.
The Workshop on Software Engineering for Adaptive and Self-Managing Systems (SEAMS 2010), May 2010.
The First International Workshop on Quantitative Stochastic Models in the Verification and Design of Software Systems (QUOVADIS), May 2010.
The IEEE/ACM International Conference on Automated Software Engineering (ASE), 2009.
The DSN 2009 Workshop on Architecting Dependable Systems (WADS), June 29, 2009.
The International Conference on Autonomic Computing and Communications (ICAC 2009), June 2009.
The International Workshop on the Foundations of Coordination Languages and Software Architectures (FOCLASA), 2008.

Webmaster

The International ACM SIGSOFT Symposium on Component Based Software Engineering (CBSE), 2011.

Teaching Experience

Lecturer

University of California, Irvine, INF219, **Software Environments**, Spring 2016

Teaching Assistantships

University of Southern California, CSCI578, **Software Architecture**, Spring 2011

University of Southern California, CSCI499, **Introduction to Programming for Computer Scientists**, Fall 2010

University of Southern California, CSCI588, **Specification and Design of User Interface Software**, Fall 2010

University of Southern California, CSCI578, **Software Architecture**, Spring 2008

University of Southern California, CSCI101, **Fundamentals of Computer Programming**, Fall 2007

Research Grants and Contracts

[F1] National Science Foundation (NSF)

“Planning and Prototyping a Community-Wide Software Architecture Instrument”

Duration: 7/1/2016-6/30/2019

Investigators: Sam Malek (PI at UCI), Joshua Garcia (Co-PI at UCI), Nenad Medvidovic (Lead PI at USC), and Mehdi Mirakhorli (PI at RIT)

Award Amount: \$130,000

Other Contributions

2011 NSF Funding: Participated in writing grant proposal that led to funding of award 1117593.

2016 FBI Funding: Performed research tasks and participated in proposal writing that led to funding for third option year for Intelligence Community (IC) Postdoc Program.

Honors and Awards

Award, USC School of Engineering Doctoral Fellowship

Award, Best Research Assistant Award, USC Computer Science Department, 2014

Award, International Conference in Program Comprehension 2009, Best Poster Award

Award, First Place, Special Interdisciplinary Award, USC Undergraduate Symposium for Scholarly and Creative Work

Award, SIGSOFT CAPS Travel Grant for ICSE 2009

Award, SIGSOFT CAPS Travel Grant for ICSE 2013

Member, Association for Computing Machinery (ACM)

Member, ACM Special Interest Group on Software Engineering (SIGSOFT)

Member, Golden Key International Honors Society

USC Renaissance Scholar

Intelligence Community (IC) Postdoctoral Research Fellow