Dr. Luís Gabriel Ganchinho de Pina

CONTACT INFORMATION

Department of Computer Science
George Mason University
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RESEARCH INTERESTS

Software Systems, Programming Languages, Software Reliability and Availability, Security, Dynamic Software Updating, Multi-Version Execution, Program Analysis, Symbolic Execution, Non-blocking Algorithms, Software/Hardware Transactional Memory.

EDUCATION

Instituto Superior Técnico / University of Lisbon, Lisbon, Portugal

Ph.D., Computer Science and Engineering, January 2016
- Thesis Topic: *Practical Dynamic Software Updating*
- Advisor: Professor Luís Veiga
- Co-Advisor: Professor Michael Hicks (**University of Maryland**)
- Area of Study: Software Systems and Programming Languages

M.S., Information Systems and Computer Engineering, November 2009
- Thesis Topic: *Dynamic Software Updating for Transactional Memories*
- Advisor: Professor João Cachopo
- Area of Study: Software Systems and Software Engineering

B.S., Information Systems and Computer Engineering, September 2007

AWARDS AND HONORS

Instituto Superior Técnico / University of Lisbon
- Ph.D. Dissertation Pass with Distinction

Fundação Ciência e Tecnologia (NSF equivalent in Portugal)
- Ph.D. Scholarship *"Bolsa de Doutoramento"* (40% acceptance rate), 2010
- Introduction to Science Scholarship *"Bolsa de Iniciação Científica"*, 2008/2009

RESEARCH EXPERIENCE

George Mason University, Fairfax, VA, USA
Post-Doctoral Fellow November 2017 to present
Supervisor: Professor Jonathan Bell
- **Concolic Execution for Java (ongoing)** — Researched about the feasibility of concolic execution for Java programs on an unmodified JVM through taint-tracking via binary instrumentation.
- **CROCHET: Lightweight Checkpoint/Rollback** — Created a novel lazy heap-traversal algorithm to provide efficient, low-cost checkpoint/rollback support for Java programs running on unmodified JVMs through binary instrumentation.

Imperial College London, London, UK
Post-Doctoral Researcher March 2015 to November 2017
Supervisor: Professor Cristian Cadar
- **Varan: Multi-version execution** — Designed multi-version execution techniques for composing incompatible unmodified dynamic analyses and deploying them in production. Re-engineered a prototype for multi-version execution of Linux programs through selective binary rewriting of system calls. Designed and implemented a Domain Specific Language for matching system calls in equivalent executions.

University of Maryland, College Park, MD, USA
Research Assistant September 2012 to March 2015
Supervisors: Professor Michael Hicks and Professor Jeff Foster
- **Rubah: Dynamic Software Updating for Java** — Developed a prototype that supports efficient and general purpose dynamic software updates for Java applications on stock JVMs.
- **SymDroid: Symbolic Execution Analysis on Android** — Contributed to a symbolic execution prototype for Android that checks if apps conform to information release policies.

INESC-ID Lisboa, Lisbon, Portugal
Junior Researcher September 2009 to September 2012
Supervisor: Professor João Cachopo

- **DuSTM'M: Dynamic Updates using Software Transactional Memory** — Developed a prototype system that supports atomic dynamic updates using a Software Transactional Memory and binary translation techniques at the JVM bytecode level.
- **JVSTM: Java Versioned Software Transactional Memory** — Researched mechanisms to reduce the transaction abort rate by allowing concurrent transactions that experience benign conflicts to commit successfully.

Conference Publications

[1] Jonathan Bell and Luís Pina. Crochet: Checkpoint and rollback via lightweight heap traversal on stock JVMs. In *Proceedings of the European Conference on Object-Oriented Programming (ECOOP)*. ACM, 2018. (39.4% acceptance rate).

[2] Luís Pina, Anastasios Andronidis, and Cristian Cadar. Freeda: Deploying incompatible stock dynamic analyses in production via multi-version execution. In *Proceedings of the ACM International Conference on Computing Frontiers (CF)*. ACM, 2018. (33.8% acceptance rate).

[3] Luís Pina, Daniel Grumberg, Anastasios Andronidis, and Cristian Cadar. A DSL approach to reconcile equivalent divergent program executions. In *Proceedings of the USENIX Annual Technical Conference (ATC)*. USENIX, 2017. (22.4% acceptance rate).

[4] Luís Pina and Michael Hicks. Tedsuto: A general framework for testing dynamic software updates. In *Proceedings of the International Conference on Software Testing (ICST)*, April 2016. (26% acceptance rate).

[5] Luís Pina, Luís Veiga, and Michael Hicks. Rubah: DSU for Java on a stock JVM. In *Proceedings of the ACM Conference on Object-Oriented Programming Languages, Systems, and Applications (OOPSLA)*, October 2014. (28% acceptance rate).

Workshop Publications

[1] Luís Pina and Cristian Cadar. Towards deployment-time dynamic analysis of server applications. In *Proceedings of the 13th International Workshop on Dynamic Analysis (WODA)*, October 2015.

[2] Luís Pina and Michael Hicks. Rubah: Efficient, general-purpose dynamic software updating for Java. In *Proceedings of the Fifth Workshop on Hot Topics in Software Upgrades (HotSWUp)*, June 2013.

[3] Luís Pina and João Cachopo. Atomic dynamic upgrades using software transactional memory. In *Proceedings of the Fourth Workshop on Hot Topics in Software Upgrades (HotSWUp)*, June 2012.

[4] Luís Pina and João Cachopo. Profiling and tuning the performance of an STM-based concurrent program. In *Proceedings of the Workshop on Transitioning to Multicore (TMC)*, October 2011.

Invited and Contributed Talks

- A DSL Approach to Reconcile Equivalent Divergent Program Executions, *7th South of England Regional Programming Language Seminar (S-REPLS)*, September 2017 [contributed]
- *Deploying Incompatible Unmodified Dynamic Analyses in Production via Multi-version Execution*, INESC-ID Lisbon, May 2017 [invited]
- *Deploying Incompatible Unmodified Dynamic Analyses in Production via Multi-version Execution*, George Mason University, March 2017 [invited]
- Deploying Incompatible Analyses in Production through Multi-Version Execution, *Workshop on Introduction to Verification and Testing (INVEST)*, February 2017 [invited]
- Deploying Dynamic Analyses and Preventing Compiler Backdoors with Multi-Version Execution, *3rd South of England Regional Programming Language Seminar (S-REPLS)*, September 2016 [contributed]

- Towards Deployment-Time Dynamic Analysis of Server Applications, *Workshop on Introduction to Verification and Testing (INVEST)*, December 2015 [invited]
- *Multi-version execution for efficient dynamic analysis*, University of Maryland, November 2015 [invited]
- *Rubah: Dynamic Software Updating for Java on a Stock JVM*, Improbable, London, May 2015 [invited]
- *Rubah: Dynamic Software Updating for Java on a Stock JVM*, INESC-ID Lisbon, November 2014 [invited]
- *Rubah: Dynamic Software Updating for Java on a Stock JVM*, Imperial College London, November 2014 [invited]

ARTICLES

- Cristian Cadar and Luís Pina and John Regehr. Multi-Version Execution Defeats a Compiler-Bug-Based Backdoor. In *Embedded in Academia (John Regehr's blog)*. November 2015.

GRANTS

***NSF small* — Secure and Trustworthy Cyberspace (SaTC)**
Discovering Vulnerabilities in Large Systems Through Efficient Guided Fuzzing with TAPESTRY
Primary PI: Professor Jonathan Bell
Status: In preparation

GCHQ small
Covered costs of running and organizing SREPLS-4 — The 4th South of England Regional Programming Language Seminar
Primary PI: Professor Alastair Donaldson
Status: Funded in 2016, £2,500.00

ADVISING AND MENTORING

Graduate Students

- **Anastasios Andronidis**, PhD Student, Imperial College London **2015–present**
  Multi-version execution for the Varan project.
  Advisor: Professor Cristian Cadar
- **Karolis Mituzas**, Master's Student, Imperial College London **2017**
  Final year project on separating the system call interception from the multi-version execution implementation in the Varan project
  Advisor: Professor Cristian Cadar

Undergraduate Students

- Undergraduate Research Opportunities Program (UROP), Imperial College London
  Andrei-Octavian Brabete, 2nd year student **2017**
  Compiler-based back-doors
  Primary advisor: Professor Cristian Cadar
  Daniel Grumberg, 2nd year student **2016**
  DSL for tolerating system call divergences
  Primary advisor: Professor Cristian Cadar

TEACHING EXPERIENCE

George Mason University, Fairfax, VA, USA
Guest Lecturer, CS475, Concurrent and Distributed Systems
- Naming Services **Spring 2018**

Imperial College London, London, UK
Course Support Leader, CS440, Software Reliability **Fall 2016**
- Participated in redesigning the course contents: static program verification, bounded model checking, symbolic execution, SAT and SMT solving, concurrency testing, undefined behaviour, and safe C compilers.
- Gave five tutorial lectures
- Designed exercise sheets with model answers

Guest Lecturer, CS211, Operating Systems
- OS Linkers and Loaders **Spring 2016**

Guest Lecturer, Imperial Programming Lectures series (iPr0gram)
- The Rust Programming Language (2 lectures) **Fall 2015**

University of Maryland, College Park, MD, USA

Guest Lecturer, CMSC443, Programming Language Technologies and Paradigms

- Serialization and linearizability **Fall 2014**

SERVICE

Conference Service

- Program Committee Member: *European Conference on Object-Oriented Programming (ECOOP)*, London, UK, 2019
- External Reviewer: *Programming Language Design and Implementation (PLDI)*, Phoenix, Arizona, 2019
- External Reviewer: *International Conference on Software Engineering (ICSE)*, Gothenburg, Sweeden, 2018
- External Reviewer: *European Conference on Computer Systems (EuroSys)*, Belgrade, Serbia, 2017
- External Reviewer: *International Conference on Software Engineering (ICSE)*, Austin, TX, USA, 2016
- Artifact Evaluation Committee Member: *Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)*, Amsterdam, Netherlands, 2016
- Artifact Evaluation Committee Member: *Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)*, Pittsburgh, PA, USA, 2015
- External Reviewer: *Systems, Programming, Languages and Applications: Software for Humanity (SPLASH)*, Portland, OR, USA, 2014

Workshop Service

- Program Committee Member: *Workshop on Modern Language Runtimes, Ecosystems, and VMs (MoreVMs)*, Genova, Italy, 2019

Journal Reviewer

- *Future Generation Computer Systems*

Other

- Seminar chair for the Software Reliability Group, 2015–2017
- Organizer of SREPLS-4 — South of England Regional Programming Language Seminar, 2016 (co-organized with Professor Alastair Donaldson)

LANGUAGES SPOKEN

- Portuguese: Native
- English: Full bilingual proficiency
- Spanish: Working proficiency
- French: Beginner proficiency

REFERENCE CONTACTS

- Professor Jonathan Bell, George Mason University, VA, USA
- Professor Michael Hicks, University of Maryland, MD, USA
- Professor Cristian Cadar, Imperial College London, UK
- Professor Alastair Donaldson, Imperial College London, UK
- Professor Luís Veiga, University of Lisbon, Portugal