Andrea Mocci

curriculum vitae *updated on November 26, 2012*

32 Vassar Street
MIT CSAIL Cambridge, MA (USA)
am@csail.mit.edu
http://people.csail.mit.edu/am/

Personal

Date of birth	June 2, 1982
Place of birth	Carbonia (CI), Italy
Citizenship	Italian
Marital status	single

Current Position

October 2012 - present: **Postdoctoral Research Associate**, *Software Design Group @ MIT CSAIL*, Cambridge, MA.

Employment History

October 2011 - October 2012: **Postdoctoral Research Fellow**, *Software Design Group @ MIT CSAIL*, Cambridge, MA.

January 2011 - September 2011: **Graduate Research Assistant (Assegnista di Ricerca)**, *Politecnico di Milano, Dipartimento di Elettronica e Informazione*, Milan, Italy.

September 2008 - February 2011: **Several Teaching Assistant Positions (see Courses section for details)**, *Politecnico di Milano, Dipartimento di Elettronica e Informazione*, Milan, Italy.

Education

January 2008 - December 2010: **PhD, Computer Science**, *Politecnico di Milano, Dipartimento di Elettronica e Informazione*, Milan, Italy.
Final Mark: with Merit
Advisor: Prof. Carlo Ghezzi
PhD Thesis: "*Behavioral Modeling, Inference and Validation for Stateful Component Specifications*"

November 2007: **Professional Engineer Qualification (Abilitazione alla Professione di Ingegnere)**, *Politecnico di Milano*, Milano, Italy.
Qualification in Information Technology Engineering (Ingegneria dell'Informazione)

October 2004 - July 2007: **MSc (Laurea Specialistica DM 509/99), Computing Systems Engineering (Ingegneria Informatica - orientamento Sistemi e Applicazioni dell'Informatica)**, *Politecnico di Milano, V School of Engineering (Information Technology Engineering)*, Milano, Italy.
Final Mark: 110/110 summa cum laude
Advisors: Prof. Carlo Ghezzi
Master Thesis: "*Efficient Recovery of Algebraic Specifications for Stateful Components*"

September 2001 - October 2004: **BSc (Laurea DM 509/99), Computer Engineering (Ingegneria Informatica)**, *Politecnico di Milano, V School of Engineering (Information Technology Engineering)*, Milano, Italy.
Final Mark: 104/110

September 1996 - July 2001: **Scientific-Technical High School Degree (Diploma di superamento dell'Esame di State conclusivo del corso di studio di Liceo Scientifico Indirizzo Tecnologico Sperimentazione Brocca)**, *Liceo Scientifico Statale "E. Lussu"*, Sant'Antioco (CI), Italy.
Final Mark: 100/100

Research Interests

My research interests include in general the application of formal methods to solve both theoretically and practically relevant problems in software engineering and programming languages.

RI1 **Behavioral Software Specification, Inference and Validation**: During my PhD, I developed a technique to model, recover and validate software specifications from a behavioral point of view. In this context, the term *behavior* is referred to what a client can observe from an external point of view. I mainly contributed to the 2.5M€ ERC Grant Sms-Com (`http://www.erc-smscom.org`). In particular, I am interested on the following topics:

- **Behavioral Specification:** How is it possible to specify a piece of software in such a way that it really does not convey any possible detail about its implementation, that is, how it is possible to express its behavior through what an external client can observe? The techniques I am interested in include behavioral approaches to algebraic specification and trace assertion specifications.
- **Specification Inference:** If a piece of software is not specified, or specified informally, specification inference techniques help to automatically derive, through **static analysis** or **dynamic analysis**, formal descriptions that might help a programmer understand how to use it, or to enable its formal verification or validation (e.g., testing). Recently, I have been interested in applying such techniques to interacting components, and the application of machine learning techniques to improve inference techniques applied on software.

RI2 **Lightweight Formal Methods**: My postdoc has mainly involved working on advances of Alloy and the Alloy analyzer (`http://alloy.mit.edu/`). Alloy is a language that enables the description of structures typical of software abstractions, and comes with a tool for exploring them. It has been used in a wide range of applications, like designing telephone switching networks, identifying bugs in security mechanisms, and in general checking the correctness of a design (e.g., an object model with constraints). My work involved mainly the support for partial instances [N3], that improves and somehow enables the use of Alloy in the analysis of configuration problems. A typical configuration problem is the installation of a program. The set of programs and libraries installed on a system can be assumed as a fixed, known knowledge (logically modeled as a partial instance). Installing a new program requires determining its dependencies and eventual conflicts in the existing system; with Alloy, such constraints can be expressed in a declarative way and a solution to the configuration problem can be found by using the Alloy analyzer. Similar problems have been recently investigated in my group, and include, for example, the analysis of system configurations to find security vulnerabilities.

Publications

Ongoing Work and Submitted Papers

N1 Carlo Ghezzi and Andrea Mocci. From behavioral equivalence models to intensional specifications of software engineering artifacts. 2012. (To be submitted).

N2 Andrea Mocci and Mario Sangiorgio. Eliciting and validating component interaction through behavior model synthesis. 2012. (To be submitted).

N3 Andrea Mocci, Manuel Alcino Cunha, and Daniel Jackson. Partial instances for free! 2012. (To be submitted).

N4 Alberto Bacchelli, Anthony Cleve, Andrea Mocci, and Michele Lanza. Recovering structured data from natural language artifacts for software analysis. 2012. (Submitted to IEEE Transaction on Software Engineering).

Journal Papers

J1 Andrea Mocci and Mario Sangiorgio. Detecting component changes at run time with behavior models. *Springer Computing*, pages 1–31, 2012.

Book Chapters

BC1 Andreas Metzger, Salima Benbernou, Manuel Carro, Maha Driss, Gabor Kecskemeti, Raman Kazhamiakin, Kyriakos Kritikos, Andrea Mocci, Elisabetta Di Nitto, Branimir Wetzstein, and Fabrizio Silvestri. Analytical quality assurance. In Mike Papazoglou, Klaus Pohl, Michael Parkin, and Andreas Metzger, editors, *Service Research Challenges and Solutions for the Future Internet*, volume 6500 of *Lecture Notes in Computer Science*, pages 209–270. Springer, 2010.

Conference Papers

C1 Carlo Ghezzi, Andrea Mocci, and Mattia Monga. Synthesizing intensional behavior models by graph transformation. In *31st International Conference on Software Engineering (ICSE 2009)*, pages 430–440, 2009. Acceptance rate: 12%.

C2 Carlo Ghezzi, Andrea Mocci, and Guido Salvaneschi. Automatic cross validation of multiple specifications: A case study. In *Fundamental Approaches to Software Engineering, 13th International Conference, FASE 2010, Held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2010, Paphos, Cyprus, March 20-28, 2010. Proceedings*, pages 233–247, 2010. Acceptance rate: 25%.

C3 Luigi Cardamone, Carlo Ghezzi, and Andrea Mocci. Dynamic synthesis of program invariants using genetic programming. In *2011 IEEE Congress on Evolutionary Computation (CEC 2011)*, 2011.

C4 Alberto Bacchelli, Anthony Cleve, Michele Lanza, and Andrea Mocci. Exploiting unstructured system artifacts for structured software analysis. In *ASE 2011: 26th IEEE/ACM International Conference On Automated Software Engineering*, 2011. (short paper).

C5 C. Ghezzi and A. Mocci. Behavioral validation of jfsl specifications through model synthesis. In *34th International Conference on Software Engineering (ICSE 2012)*, pages 936 –946, june 2012. Acceptance Rate: 21.3%.

Workshop Papers

WS1 Carlo Ghezzi, Andrea Mocci, and Mattia Monga. Efficient recovery of algebraic specifications for stateful components. In *Ninth international workshop on Principles of software evolution: in conjunction with the 6th ESEC/FSE joint meeting*, IWPSE '07, pages 98–105, New York, NY, USA, 2007. ACM.

WS2 Luciano Baresi, Carlo Ghezzi, Andrea Mocci, and Mattia Monga. Using graph transformation systems to specify and verify data abstractions. In Claudia Ermel, Reiko Heckel, and Juan de Lara, editors, *Proceedings of the seventh international workshop on graph transformation and visual modeling techniques (GT-VMT 2008)*, volume X of *Electronic Communications of the EASST*, pages 277–290. EASST, European Association of Software Science and Technology, 2008.

WS3 Carlo Ghezzi and Andrea Mocci. Behavior model based component search: an initial assessment. In *Proceedings of 2010 ICSE Workshop on Search-driven Development: Users, Infrastructure, Tools and Evaluation*, SUITE '10, pages 9–12, New York, NY, USA, 2010. ACM.

WS4 Carlo Ghezzi, Andrea Mocci, and Mario Sangiorgio. Runtime monitoring of functional component changes with behavior models. In JÃűrg Kienzle, editor, *Models in Software Engineering*, volume 7167 of *Lecture Notes in Computer Science*, pages 152–166. Springer Berlin / Heidelberg, 2012. **(best paper award)**.

Demo Papers

DM1 C. Ghezzi, A. Mocci, and M. Sangiorgio. Runtime monitoring of component changes with spy@runtime. In *Software Engineering (ICSE), 2012 34th International Conference on*, pages 1403 –1406, june 2012.

Technical Reports

TR1 Salima Benbernou, Ivona Brandic, Manuel Carro, Marco Comuzzi, Elisabetta Di Nitto, Maha Driss, Julia Hielscher, Raman Kazhamiakin, Gabor Kecskemeti, Attila Kertesz, Kyriakos Kritikos, Andreas Metzger, Hassina Meziane, Andrea Mocci, Barbara Pernici, Pierluigi Plebani, Sagar Sen, Fabrizio Silvestri, and Branimir Wetzstein. Survey of quality related aspects relevant for service-based applications. In *Technical report, Deliverable PO-JRA-1.3.1, S-Cube Consortium, July 2008*, 2008.

TR2 Elisabetta Di Nitto, Valentina Mazza, and Andrea Mocci. Collection of industrial best practices, scenarios and business cases. In *Technical report, Deliverable CD-IA-2.2.2, S-Cube Consortium, May 2009*, 2009.

TR3 Andrea Mocci. Efficient code clone detection by leveraging parsing techniques. In *Technical report, Dipartimento di Elettronica e Informazione, Politecnico di Milano, November 2009*, 2009.

Other

O1 Andrea Mocci. Specification inference for black-box components. In *PhD Talk at Mining Software Archives Workshop, Ascona, Switzerland*, March 2010.

O2 Andrea Mocci. Spy: Specification recovery for data abstractions. In *Student Research Forum at 16th ACM SIGSOFT International Symposium on the Foundations of Software Engineering (FSE 2008), Atlanta (Georgia, USA)*, November 2008.

O3 Carlo Ghezzi, Andrea Mocci, and Mattia Monga. Recovering intensional behavior models of data abstractions. In *Quinto Incontro Nazionale del Gruppo di Interesse di Ingegneria del Software (GIIS 2008), L'Aquila (Italy)*, September 2008.

Teaching Activities

Courses

September 2010 - February 2011 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Algoritmi e Principi dell'Informatica (Theoretical computer Science, Algorithms and Data Structures Course for Computer Science Engineering), prof. Matteo Pradella and prof. Maristella Matera

March 2010 - July 2010 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica Teorica (Theoretical Computer Science Course for Computer Science Engineering), prof. Matteo Pradella

September 2009 - January 2010 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica 3 (Algorithms and Data Structures Course for Computer Science Engineering), prof. Maristella Matera

September 2009 - January 2010 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica B (Computer Science Course for Mechanical and Energy Engineering), prof. Paola Spoletini

March 2009 - July 2009 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica Teorica (Theoretical Computer Science Course for Computer Science Engineering), prof. Matteo Pradella

March 2009 - July 2009 — **Lab Assistant**, *Politecnico di Milano*, Milano, Italy.
Software Engineering, prof. Carlo Ghezzi

March 2009 - July 2009 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica 3 (Algorithms and Data Structures Course for Computer Science Engineering), prof. Luciano Baresi

September 2008 - January 2009 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica 3 (Algorithms and Data Structures Course for Computer Science Engineering), prof. Maristella Matera

September 2008 - January 2009 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica B (Computer Science Course for Mechanical and Energy Engineering), prof. Paola Spoletini

March 2008 - July 2008 — **Lab Assistant**, *Politecnico di Milano*, Milano, Italy.
Software Engineering, prof. Carlo Ghezzi

March 2008 - July 2008 — **Teaching Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica 2 (Hardware Architectures and Operating System Course), prof. Luciano Baresi

September 2007 - January 2008 — **Lab Assistant**, *Politecnico di Milano*, Milano, Italy.
Informatica A (Computer Science Course for Mathematical Engineering), prof. Alessandro Campi

March 2007 - July 2007 — **Lab Tutor**, *Politecnico di Milano*, Milano, Italy.
Software Engineering, prof. Carlo Ghezzi

Supervised MSc Theses

December 2007 — Guido Salvaneschi and Davide Giudici," Comparazione degli Approcci esistenti per l'estrazione automatica di una specifica: una tecnica di validazione basata su model checking (Comparing approaches for automatic specification recovery: a model-checking based validation technique)" (co-advisor). Advisor: prof. Carlo Ghezzi, Politecnico di Milano, Milano, Italy

Supervised PhD Minor Projects

January 2009 — Giorgio Orsi, " Continuous Runtime Architecture Recovery through Dynamic Behavior Analysis " (co-advisor). Advisor: prof. Carlo Ghezzi, Politecnico di Milano, Milano, Italy

November 2010 — Luigi Cardamone, " Dynamic Detection of Program Invariants using Genetic Programming " (co-advisor). Advisor: prof. Carlo Ghezzi, Politecnico di Milano, Milano, Italy

Formal Presentations

Academic Conference Presentations

June 2012 "Behavioral validation of JFSL specifications through model synthesis", 34th International Conference on Software Engineering (ICSE 2012)

May 2010 "Behavior model based component search: an initial assessment", 2nd ICSE Workshop on Search-driven Development: Users, Infrastructure, Tools and Evaluation, co-located with ICSE 2010

March 2010 "Automatic Cross Validation of Multiple Specifications: A Case Study", 13th International Conference on Fundamental Approaches to Software Engineering (FASE 2010), held as Part of the Joint European Conferences on Theory and Practice of Software, ETAPS 2010, Paphos, Cyprus

May 2009 "Synthesizing intensional behavior models by graph transformation", 31st International Conference on Software Engineering (ICSE 2009), Vancouver, Canada

March 2008 "Using graph transformation systems to specify and verify data abstractions". Proceedings of the seventh international workshop on graph transformation and visual modeling techniques (GT-VMT 2008), Budapest, Hungary

September 2007 "Efficient recovery of algebraic specifications for stateful components". Ninth international workshop on Principles of software evolution: in conjunction with the 6th ESEC/FSE joint meeting, Dubrovnik, Croatia

University and Research Institute Invited Presentations

October 4, 2010 "Behavioral Modeling, Inference and Validation for Component Specifications", at Computer Science and Artificial Intelligence Laboratory, Massachusetts Institute of Technology, Hosted by Prof. Daniel Jackson

Industry and Funding Agency Presentations

September 21, 2010 'Black-Box Specification Inference", at Workshop on Software Quality for ERC Projects, Venice, September 2011. Website: http://www.erc-smscom.org/joomla/erc-workshop/erc-workshop-home.html

Research Projects Collaborations

January 2008 - December 2008 ***EU-FP7-215483 S-Cube* - "European Network of Excellence in Software Services and Systems"**, *Politecnico di Milano*, funded by the European Union.
Technical Contributor

January 2009 - present ***IDEAS-ERC, Project 227977- SMScom* - "Self Managing Situated Computing"**, *prof. Carlo Ghezzi, Politecnico di Milano*, funded by the European Research Council.
Technical Contributor

Attended Summer Schools

August 2008 **2008 Marktoberdorf Summer School on Engineering Methods and Tools for Software Safety and Security** , *Founded by Advanced Study Institute of the NATO Science for Peace and Security Programme*, X.

July 2008 **USI - CMU Summer School on Dependable Computer Systems**, *Organized jointly by: Faculty of Informatics, University of Lugano and School of Computer Science, Carnegie Mellon University*.

Professional Service

Journal Reviewer Service

-Springer Computing, 2012

-IEEE Transactions on Software Engineering (IEEE TSE), 2012

-ACM Transactions on Software Engineering and Methodology (ACM TOSEM), 2012

-IEEE Transactions on Software Engineering (IEEE TSE), 2011

-Springer Service-oriented Computing and Applications (SOCA), 2009

-Springer Service-oriented Computing and Applications (SOCA), 2010

-Springer Service-oriented Computing and Applications (SOCA), 2009

Additional Reviewer Service

-35th International Conference on Software Engineering (ICSE 2013)

-8th joint meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2011)

-33rd International Conference on Software Engineering (ICSE 2011)

-18th International Symposium on Foundations of Software Engineering (ACM SIGSOFT 2010 - FSE 18)

-32nd International Conference on Software Engineering (ICSE 2010)

-24th International Conference on Automated Software Engineering (ASE 2009)

-7th joint meeting of the European Software Engineering Conference and the ACM SIGSOFT Symposium on the Foundations of Software Engineering (ESEC/FSE 2009)

-16th International Symposium on Foundations of Software Engineering (ACM SIGSOFT 2008 - FSE 16)

-30th International Conference on Software Engineering (ICSE'08)

Other

-Student volunteer at the 30th International Conference on Software Engineering (ICSE 2008)

Fellowships and Grants

October 2011-October 2012 — Roberto Rocca Postdoctoral Fellowship. "Enforcing the link between requirements and software behavior through model synthesis", with professors Daniel Jackson (MIT, EECS) and Carlo Ghezzi (Polimi, DEI) Website: http://web.mit.edu/progettorocca/fellowships/fellows.html

September 2007 — Student travel grant for attending the *6th joint meeting of European Software Engineering Conference and Foundations of Software Engineering*, granted by ACM SIGSOFT

Memberships

-ACM SIGSOFT Member

Languages

Italian **native**

Sardinian **native**

English **fluent**

French **beginner**

Interests

Photography

Politics
Human Rights
Philosophy
Physics