

# Curriculum Vitæ



## Personal information

Surname(s) / First name(s)  
Address(es)  
Telephone(s)  
Email(s)  
Nationality(-ies)  
Date of birth  
Gender

### Torchiano Marco

Work: C.so Duca degli Abruzzi 24, 10129, Torino, Italia  
+39 011 090 7088  
marco.torchiano@polito.it  
Italian  
May 6, 1971  
Male

## Current position

Posizione  
From  
University  
Department  
Settore Concorsuale  
Settore Scientifico Disciplinare

Associate professor  
01/01/2012  
Politecnico di TORINO  
Computer and Control Engineering  
since 28/10/2011 09/H1 - SISTEMI DI ELABORAZIONE DELLE INFORMAZIONI  
Since 01/10/2002 ING-INF/05 - Sistemi di Elaborazione delle Informazioni

## Professional experience

From  
Position  
Employer  
From  
Position  
Employer  
From  
Position  
Employer  
From  
Position  
Employer

01/01/2004  
Assistant Professor (tenured)  
Politecnico di Torino, Italy  
01/10/2002  
Fixed Term Assistant Professor (non tenure)  
Politecnico di Torino, Italy  
15/05/2001  
Post-doc Research Fellow  
Norges Teknisk-Naturvitenskapelige Universitet - NTNU, Trondheim, Norway  
15/04/2000  
Research assistant  
Politecnico di Torino, Italy

## Education

Ph.D.  
Professional Engineer  
Master  
High School  
Mother tongue(s)  
Other languages

2000, January, Ph.D. in Computer and Control Engineering XII Ciclo (Advisor Prof. Giorgio Bruno) from Politecnico di Torino. Thesis: *"Object Oriented Modeling and Design of Distributed Software Systems"*.  
1996, November: passed the PE exam  
1996, May, five year M.Sc. in Computer Engineering from Politecnico di Torino, final mark 110/110. Tesi: *"Operational Modeling of Object-Oriented Architectures"*  
1990, July: Scientific Liceum degree from Liceo Scientifico Statale in Nizza Monferato (AT), final mark 60/60.

**Italian**

*Self-assessment  
European level<sup>(\*)</sup>*

**English**

**French**

Understanding				Speaking				Writing	
Listening		Reading		Spoken interaction		Spoken production			
C2	Proficient user	C2	Proficient user	C2	Proficient user	C2	Proficient user	C2	Proficient user
A2	Basic user	A2	Basic user	A2	Basic user	A1	Basic user	A1	Basic user

<sup>(\*)</sup> Common European Framework of Reference (CEF) level

**Academic Management**

*All the roles refer to Politecnico di Torino*

Period	13/5/2020 – present
Role	Member Teaching and Language Lab (TLLAB) Board
Period	1/3/2019 – present
Role	Education Quality Manager for Dept. of Control and Computer Engineering
Period	4/4/2018 – present
Role	Member of the IT Strategy Committee
Period	4/12/2008 – 30/04/2022
Role	Membro of the Education Board of the PhD in Computer and Control Engineering
Period	1/9/2013 – 30/08/2016 and 1/9/2016 – 30/08/2019
Role	Member of Universty Education Joint Committee
Period	1/10/2012 – 30/09/2015
Role	Education QA Delegate for the College of Computer, Mechatronics and Movie Engineering
Period	4/12/2008 – 30/04/2020
Role	Member of Ph.D. in Control and Computer Engineering Faculty Committee of Politecnico di Torino
Period	18/12/2009 – 20/07/2012
Role	Member of the Preliminary Committee of Academic Senate of Politecnico di Torino: Education Portfolio Strategy Committee
Period	01/10/2009 – 20/07/2012
Role	Elected Member of Academic Senate of Politecnico di Torino
Period	07/07/2010 – 07/09/2011
Role	Member of the Preliminary Committee of Academic Senate of Politecnico di Torino: Internal Organization Restructuring Committee
Period	31/10/2007 – 30/09/2009
Role	Member of the Preliminary Committee of Academic Senate of Politecnico di Torino: Education Portfolio Strategy Committee
Period	30/10/2007 – 30/09/2009
Role	Elected Member of Academic Senate of Politecnico di Torino

**Membership**

Senior Member	IEEE <sup>1</sup> , awarded on April 28, 2015.
Faculty Fellow	Nexa Center for Internet and Society, <a href="http://nexa.polito.it">http://nexa.polito.it</a>
Delegate	Delegate at UNINFO <sup>2</sup> for the Software Engineering area, for Politecnico di Torino since June 2016

<sup>1</sup>This professional recognition is granted to less than 9% of IEEE membership

<sup>2</sup>UNINFO is the ICT section of UNI, the Italian standardization body

## Awards

Best paper award	with M. Mecati, F. E. Cannavò and A. Vetrò for the paper "Identifying risks in datasets for automated decision-making" [159] at EGOV 2020
Best paper award	with R.Coppola and M.Morisio for the paper "Scripted UI Testing of Android Apps: A Study on Diffusion, Evolution and Fragility" [132], 13th Int. Conf. on Predictive Models and Fata Analytcs in Software Engineering, PROMISE 2017.
Best paper award	with M.Ceccato, P.Tonella, A.Basile, B.Coppens, B.De Sutter, and P.Falcarin for the paper "How Professional Hackers Understand Protected Code while Performing Attack Tasks" [130], 25th Int. Conf. on Program Comprehension, ICPC 2017.
Best paper award	with F.Tomassetti, F.Ricca, A.Tiso, G.Reggio, for the paper "Benefits from Modelling and MDD Adoption: Expectations and Achievements" [102], Experiences and Empirical Studies in Software Modelling (EESMod), Workshop at MODELS 2012.
Research award	Young researcher award, Politecnico di Torino, 2008
Best paper award	with Juan P. Carvallo, Xavier Franch, and Carme Quer, for the paper "Characterization of a Taxonomy for Business Applications and the Relationships among them" [26] presented at Third International Conference on COTS Based Software Systems (ICCBBS), Redondo Beach (CA), February 1- 4, 2004.

## Visiting Abroad

Visiting Professor	Polytechnique Montreal, 15 July-31 August 2016
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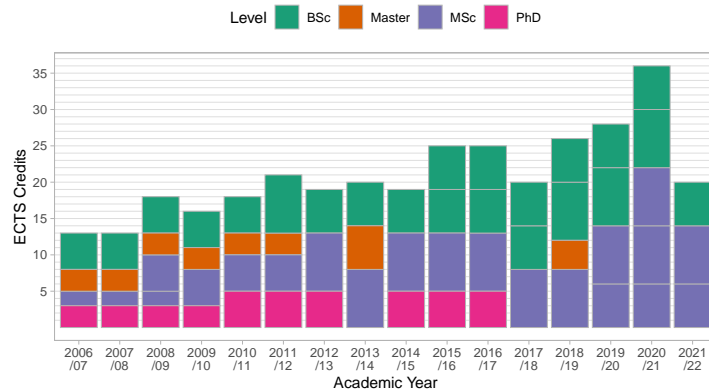
## Teaching Abroad

A.y.	2013/14
Course	Software Engineering, Tongji University, Shanghai, China
Course	Advanced Programming, Tongji University, Shanghai, China

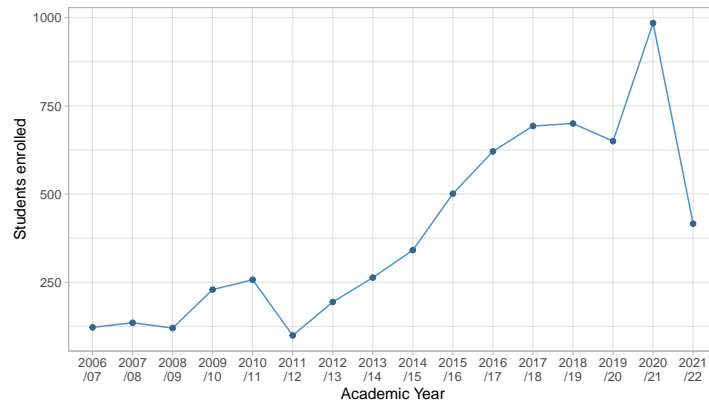
## Teaching Activity

### Summary

Since a.y. 2006/07 he has been responsible for 61 editions of 15 distinct courses BSc., MSc., Master, and PhD levels, with increasing weights in terms of ECTS credits up to a maximum of 36 credits in a.y. 2020/21. Average satisfaction for the teacher from student questionnaire: 93%. The weight in CFU credit of the courses is shown in the following diagram divided by academic level.



The total number of students enrolled every year in the courses has increased up to a maximum of 985 students in a.y. 2020/21. With an average 104 students enrolled per course edition.



Before a.y. 2006/07 he has been teaching assistant in several courses, including Software Engineering, Object-Oriented Programming, Distributed Systems Development, Formal Languages.

A.y.	2021/22
Course	Software Engineering II, MSc: Computer Engineering, 6 CFU
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management, 8 CFU
Course	Visualizzazione dell'Informazione Quantitativa, BSc: Computer Engineering, 6 CFU
A.y.	2020/21
Course	Software Engineering II, MSc: Computer Engineering, 6 CFU
Course	Sistemi Informativi Aziendali (A-K), MSc: Engineering and Management, 8 CFU
Course	Sistemi Informativi Aziendali (L-Z), MSc: Engineering and Management, 8 CFU
Course	Programmazione a Oggetti, BSc: Computer Engineering, 8 CFU
Course	Visualizzazione dell'Informazione Quantitativa, BSc: Computer Engineering, 6 CFU
A.y.	2019/20
Course	Software Engineering II, MSc: Computer Engineering, 6 CFU
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management, 8 CFU
Course	Programmazione a Oggetti, BSc: Computer Engineering, 8 CFU
Course	Visualizzazione dell'Informazione Quantitativa, BSc: Computer Engineering, 6 CFU
A.y.	2018/19
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management, 8 CFU
Course	Programmazione a Oggetti, BSc: Computer Engineering, 8 CFU
Course	Visualizzazione dell'Informazione Quantitativa, BSc: Computer Engineering, 6 CFU

Course	Informatica di base e programmazione, Master Univ. Di I Livello In Hierarchical Open Manufacturing Per Industria 4.0, 4 CFU
A.y.	2017/18
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management
Course	Programmazione a Oggetti, BSc: Computer Engineering
Course	Visualizzazione dell'Informazione Quantitative, BSc: Computer Engineering
A.y.	2015/16
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management
Course	Object Oriented Programming, BSc: Computer Engineering (english)
Course	Visualizzazione dell'Informazione Quantitative, BSc: Computer Engineering
Course	Empirical Methods in Software Engineering, PhD: Control and Computer Engineering
A.y.	2014/15
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management
Course	Object Oriented Programming, BSc: Computer Engineering (english)
Course	Empirical Methods in Software Engineering, PhD: Control and Computer Engineering
A.y.	2013/14
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management
Course	Object Oriented Programming, BSc: Computer Engineering (inglese)
Course	Programmazione, Master: Ingegneria dei Dati
Course	Empirical Methods in Software Engineering, PhD: Control and Computer Engineering
A.y.	2012/13
Course	Sistemi Informativi Aziendali, MSc: Engineering and Management
Course	Object Oriented Programming, BSc: Computer Engineering
A.y.	2011/12
Course	Databases, BSc: Electronic and Computer Engineering
Course	Programmazione ad Oggetti, BSc: Ingegneria del Cinema e dei mezzi di comunicazione
Course	Information systems for E-business, Master: E-Business and ICT for Management
Course	Empirical Methods in Software Engineering, PhD: Control and Computer Engineering
A.y.	2010/11
Course	Databases, BSc: Electronic and Computer Engineering
Course	Ingegneria del Software, BSc: Ingegneria dell'organizzazione d'impresa
Course	Information systems for e-business, Master: E-Business and ICT for Management
Course	Empirical Methods in Software Engineering, PhD: Control and Computer Engineering
A.y.	2009/10
Course	Basi di Dati, BSc: Ingegneria Elettronica
Course	Ingegneria del Software, BSc: Ingegneria dell'organizzazione d'impresa
Course	Information systems for e-business, Master: E-Business and ICT for Management
Course	Tecniche Avanzate di Sviluppo del Software, PhD: Control and Computer Engineering
A.y.	2008/09
Course	Basi di Dati, BSc: Ingegneria Elettronica
Course	Programmazione ad Oggetti, BSc: Ingegneria Elettronica
Course	Computer Sciences: BSc: Nanotecnologie per le ICT
Course	Information systems for e-business, Master: E-Business and ICT for Management
Course	Tecniche Avanzate di Sviluppo del Software, PhD: Control and Computer Engineering

A.y. 2007/08  
 Course Basi di Dati, BSc: Ingegneria Elettronica  
 Course Computer Sciences: BSc: Nanotecnologies per le ICT  
 Course Information systems for e-business, Master: E-Business and ICT for Management  
 Course Tecniche Avanzate di Sviluppo del Software, PhD: Control and Computer Engineering

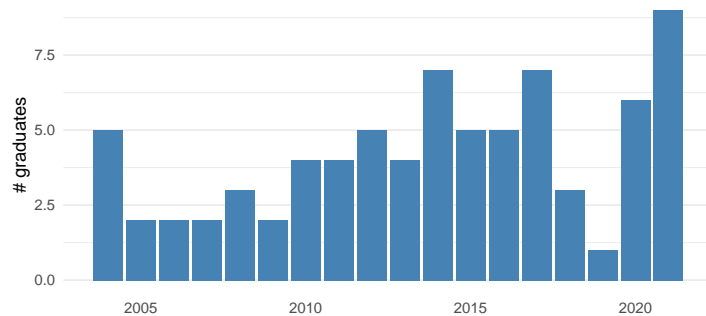
A.y. 2006/07  
 Course Basi di Dati, BSc: Ingegneria Elettronica  
 Course Computer Sciences: BSc: Nanotecnologies per le ICT  
 Course Information systems for e-business, Master: E-Business and ICT for Management  
 Course Tecniche Avanzate di Sviluppo del Software, PhD: Control and Computer Engineering

A.y. 2005/06  
 Course Complementi di Informatica, Master: Embedded Systems  
 Course Tecniche Avanzate di Sviluppo del Software, PhD: Control and Computer Engineering

A.y. 2004/05  
 Course Tecniche Avanzate di Sviluppo del Software, PhD: Control and Computer Engineering

## Alumni

Co-Supervised Ph.D. Tommaso Fulcini, 2021 –  
 Co-Supervised Ph.D. Mariachiara Mecati, 2019 –  
 Supervised Ph.D. Rifat, Rashid, 2014 – 2018  
 Supervised Ph.D. Federico Tomassetti, 2010–2014  
 Co-Supervised Ph.D. Antonio Vetro', 2009–2013  
 Co-Supervised Ph.D. Evgenia Egorova, 2006–2010  
 Supervised M.Sc. Since 2004, supervised 80 Master students, distributed along the years as follows



## Invited Talks

Invited talk "Data quality: standards and application to open-data", Brunel University, (UK) 21 February, 2018  
 Invited talk "Power Trace Analysis", Polytechnique Montreal, (Canada) 30 August, 2016  
 Invited talk "Relevance, Benefits, and Barriers of Software Modelling and Model Driven Techniques" Chalmers University, (Sweden) February 23, 2016

Invited talk	“Relevance, Benefits, and Problems of Software Modelling and Model Driven Techniques” Norwegian University of Science and Technology (NTNU), (Norway) April 9, 2015
Invited talk	“Visualization of research results: fundamentals and main issues” Technical University of Munich (TUM), (Germany) December 4, 2014
Invited talk	“Software Engineering Surveys – Taking a Snapshot of Software Development” University of Western Ontario, (Canada) July 31, 2014
Invited talk	“Relevance, Benefits, and Problems of Software Modelling and Model Driven Techniques” Universitat Politècnica de Catalunya (UPC), (Spain) April 19, 2013
Seminar	“Conducting Systematic Literature Reviews in Software Engineering”, KU Leuven, (Belgium), 17-19 April, 2012
Invited talk	“On the Effectiveness of Screen Mockups in Enhancing Use Cases” Università di Genova, (Italy) February 23, 2010

## Scientific activity

Principal Investigator	METAMORPHOS (2007-2009) - MEthods and Tools for migrAting software systeMs towards web and service Oriented aRchitectures: exPerimental evaluation, usability, and techNology transfer - National Grant PRIN 2006, Manager of the Politecnico di Torino research unit. Local unit grant: 63 K€
Project management	WISE Wireless Internet Software Engineering - EC IST-FP5 (2001-2004), Work Package Leader
Project management	ESERNET Empirical Software Engineering Research Network: EC IST-FP5 (2001-2003), Deputy Member of the Executive Management Board
Project participation	ASPIRE (2013-2016) - EC IST-FP7
Project participation	MECHEXP (2012-2014) - Regional Innovation Groups
Project participation	MoMa (2009-2012) - Intelligent HUB for Mobile Mash-up over IP, POR FESR 2007/2013
Project participation	CAL-XBS (2009-2011) - Common Application Layer - Extended Banking System, POR FESR 2007/2013
Project participation	WISE (2001-2004) - Wireless Internet Software Engineering, EC IST-FP5
Project participation	ESERNET (2001-2003) - Empirical Software Engineering Research Network, EC IST-FP5
Project participation	INCO (2001-2003) - Incremental and Component Based Development, Norwegian Research Council
Project participation	ECUA (2000-2002) - European COTS Working Group, EC IST-FP5

## Technology Transfer

Scientific Advisor	Synapta s.r.l. since November 2016 to present
Consulting	December 2019 - March 2020: Support for technical presentation of information systems, Aditus s.r.l.
Training	November 2017: Distribute application development and REST technology, CONSOB
Consulting	June 2015 - June 2016: Testing and IT Management, Gruppo Torinese Trasporti (GTT)

Training	February 2015: Introduction to Agile Software Development Practices, Fiat-Chrysler Automotive (FCA)
Research	September 2014 - July 2015: Model-Driven System Architectures, Magneti Marelli (MM)
Research	July 2013 - June 2014: Static Code Analysis Assessment and Improvement, Reale Mutua Assicurazioni (RMA)
Research	January 2010 - June 2010: Analysis, synthesis, and training on standard processes and techniques for testing and defect management of application software, Dylog S.p.A.
Training	December 2009: Standard processes and techniques for testing and defect management, Dylog S.p.A.

## Software

OSS	' <i>effsize</i> ' package for the R Statistical Package. The package contains functions to compute effect sizes both based on means difference (Cohen's d and Hedges g), dominance matrices (Cliff's Delta) and stochastic superiority (Vargha and Delaney A). The package was released on July 2013, and received over 77 000 downloads during year 2020.
OSS	' <i>ImPerm</i> ' package for the R Statistical Package. (Maintainer since 2016) The package contains the functions to linear model permutation testing, a non-parametric alternative to ANOVA. The package received over 17 000 downloads during year 2020.

## Professional Activities

Technical Committee	Member of the Technical Committee UNINFO CT504 - Software Engineering, that represents Italy in ISO/IEC JTC1/SC 7 - Software and System Engineering
Editorial board	Empirical Software Engineering Journal, since June 2021
Editorial board	IEEE Software, since April 2015
Chair	22nd International Conference on Product-Focused Software Process Improvement (PROFES), 2021 - Program Co-Chair
Chair	21st International Conference on Product-Focused Software Process Improvement (PROFES), 2020 - Program Co-Chair
Chair	24th International Conference on Evaluation and Assessment in Software Engineering (EASE), 2020 - Vision and Emerging Results Program Co-Chair
Chair	11th ACM / IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM) <sup>3</sup> , 2017 - Short Papers Program Co-Chair
Chair	8th ACM / IEEE International Symposium on Empirical Software Engineering and Measurement (ESEM) <sup>4</sup> , 2014 - Program Co-Chair
Chair	EmpiRE(Wksp on Empirical Requirements Engineering), 2011 - Organizing Committee Member
Chair	Int. Wksp. on Empirical Studies in Reverse Engineering (WESRE), 2006 - Chair
Chair	Int. Wksp. on COTS Terminology and Categories 2004 - Co-Chair

<sup>3</sup>ESEM is a tier A international conference according to the CORE classification (<http://core.edu.au>)

<sup>4</sup>ESEM is a tier A international conference according to the CORE classification (<http://core.edu.au>)



Program committee	ESEM(Int. Sym. on Empirical Software Engineering and Measurement), 2010, 2012-2014, 2016-2022: PC Member
Program committee	ICSE(Int. Conference on Software Engineering) - New Ideas and Emerging Results track: PC Member, 2021
Program committee	EASE(Int. Conf. on Empirical Assessment in Software Engineering) <sup>5</sup> , 2012 through 2017: PC Member
Program committee	PROFES(Int. Conf. on Product-Focused Software Development and Process Improvement)2013 through 2018: PC Member
Program committee	XP(Int. Conf. on Agile Software Development), 2010-2014: PC Member
Program committee	CESI(Int. Wksp. on Conducting Empirical Studies in the Industry), 2013-15: PC Member
Program committee	EmpiRE(Wksp on Empirical Requirements Engineering), 2011-2015: Chair(2011), PC Member
Program committee	GREENS(Int. Workshop on Green and Sustainable Software), 2015-2016: PC Member
Program committee	ICSR(Int. Conf. on Software Reuse) <sup>6</sup> , 2004, 2013, 2016: PC Member
Program committee	CBSE(Int. Sym. on Component Based Software Engineering) <sup>7</sup> 2009-2011: PC Member
Program committee	Eclipse-IT(Italian Workshop on Eclipse Technologies)2008,2011-2012: PC Member
Program committee	EESSMod(Int. Whsp. on Experiences and Empirical Studies in Software Modelling)2011-2012: PC Member
Program committee	ICPC(Int. Conf. on Program Comprehension)2011-2012: PC Member
Program committee	WSE(Int. Sym. on Web Site Evolution)2008-2009: PC Member
Program committee	ICCBSS(Int.Conf. on COTS Based Software Systems)2003-2008: PC Member
Program committee	CASCON(Int.Conf. Centre for Advanced Studies Research)2005-2008: PC Member
Program committee	MPEC(Int. Wksp. on Models and Processes for the Evaluation of COTS)2004-2005: PC Member
Reviewer	IEEE Software, IEEE Computer, IEEE Transactions on Software Engineering, Information and Software Technology (Elsevier), Journal of System and Software (Elsevier), Empirical Software Engineering Journal (Springer), Software Quality Journal (Springer), IET Software, IEEE Transactions on Education, Int. Journal of Software Engineering and Knowledge Engineering, The Computer Journal, Journal of Web Engineering
Other activities	Reviewer for National PRIN Programme, 2007

## Collaborations

Internazionale	Prof. Daniel Mendes, Blekinge Institute of Technology (BTH), Sweden, on research methods.
International	Soccer-lab group, Montreal, Canada, lead by Prof. Giulio Antoniol, on Software Energy consumption.
International	University of East London, Paolo Falcarin, on source code obfuscation
National	Università di Genova, Filippo Ricca, on UML diagram comprehension, Test-Driven Development, source code obfuscation, and requirement notation comprehension
National	Fondazione Bruno Kessler (ex IRST), Paolo Tonella on UML diagram comprehension, Test-Driven Development, source code obfuscation
National	Università della Basilicata, Giuseppe Scanniello, on requirement notation comprehension

<sup>5</sup>EASE is a tier A international conference according to the CORE classification (<http://core.edu.au>)

<sup>6</sup>ICSR is a tier A international conference according to the CORE classification (<http://core.edu.au>)

<sup>7</sup>CBSE is a tier A international conference according to the CORE classification (<http://core.edu.au>)

International	Software Engineering group at IDI - NTNU, Trondheim, Norway, lead by Prof. Reidar Conradi and Prof. Letizia Jaccheri, on Off-The-Shelf software development methods.
International	Hakan Erdogmus, Carnegie-Mellon University. (previously Kalemun Research Inc. and CNR-CNRC, Ottawa, Canada) on Test-Driven Development
International	GESSI group at UPC Barcelona, Spagna, led by Prof. Xavier Franch on the topics concerning Off-The-Shelf Components based development.
National	Università di Salerno, Prof. Andrea de Lucia, on software systems migration
National	Università di Bari, Prof. Filippo Lanubile, on software systems migration
National	Università del Sannio, Prof. Massimiliano Di Penta, on UML diagram comprehension, Test-Driven Development, source code obfuscation, and software systems migration
National	Università di Bergamo, Davide Brugali, object oriented development education

## Research

Software development in modern settings cannot be limited to just writing code. The complexity of software applications requires, among other, abstract software models, agile processes, testing, component-based approaches, and data quality. Within the broader area of Software Engineering I conducted research on:

- Model-Driven Software Engineering including both Model-Driven Development (MDD) and Software Modeling Notations;
- Development methods based on Off-The-Shelf (OTS) software components;
- Agile software development practices, particularly on test-driven techniques;
- Testing of mobile applications UI;
- Data quality;
- Code obfuscation;
- Green software;
- Software project management.

When facing the research topics of software engineering, three main research approaches can be identified: theoretical, engineering, and empirical. The theoretical approach aims at developing new computational models, languages, and notations. The engineering one has the goal of developing tools and techniques to solve practical problems by means of existing technology and available knowledge. Eventually the empirical approach attempts to assess, as objectively as possible, the tools, techniques, and methods used to develop software; it is based on the scientific method of hypothesis formulation and their verification and confutation. As far as I am concerned, during the initial year of my research activity I adopted an engineering approach, then I progressively embraced an empirical approach. Such activity gave rise to 150 publications on international journals, conferences, and books.

Topic

### **Model-Driven Engineering**

The possibility of developing software starting from an abstract model has been a promising path for several years. Currently the Model Driven Architecture (MDA) from OMG represents the reference standard. Before such standardization several different approaches and paradigms were investigated. One approach was investigated during my PhD studies.

The focus of the initial research has been on the development of an operational modeling environment based on colored Petri Nets [6, 2, 1, 11, 5, 4]. The modeling tools has been applied to business process modeling, simulation, and web application generation [9, 24, 10, 15].

The development of business models showed the need for using instance models in addition to the most common class models. We developed a proposal for the construction and management of such instance models and we developed the relative supporting tools [23, 20, 8].

The emergence of technologies supporting the definition and management of Domain Specific Languages (DSL) enables the automated code generation for complex software frameworks. We conducted an industrial case study and reported the lessons learned [83, 108].

The increasing industrial interests in MDD techniques prompted us to conduct an industrial survey on the state-of-the-practice of MDD development [112, 101, 102, 96]. As a parallel research thread we conducted a few studies to assess the effect of UML models on maintainability [89, 145].

Topic

### **Software Modeling Notations**

Since its introduction in 1996, the Unified Modeling Language (UML) gained wide adoption also thanks to the standardization by OMG. The main diagram used in UML is the class diagram, though special cases demand for the adoption of other kinds of diagrams, namely instance diagrams. An initial experiment with later follow-ups show how such object models significantly improve the comprehension of software systems [88, 31].

Several extension to UML have been proposed for modeling web applications, e.g. the Web Application Extension (WAE) is a widely known notation. We conducted a family of experiments aimed at assessing the effect of such notations on the software comprehension. One surprising effect is an inverse interaction with experience: the most expert maintainers benefit less from the availability of such models. In practice the complexity of the notation (and the relative cognitive burden) seem to limit the capability of retrieving useful information that an expert can most easily and quickly find directly in the source code [80, 53, 54, 51].

Topic

### **Development with Components Off-The-Shelf**

The need for cost reduction in software development brought, since the beginning of the '90s, to a rush in the adopt not Off-The-Shelf (OTS) components, led by the US DoD.

As with several other "hypes", the related literature was extremely varied. This motivated us to work first on the identification of the actual meaning of OTS; it immediately appeared the methods and problems were specific so distinct sub-categories of OTS [27, 18]. Later on we classified the OTS components with the goal of selection [17, 21]. Such an activity requires to explicitly take into account the OTS-based systems architecture in the early development phases [29].

In the selection process the attributes used to describe the OTS play a major role, therefore we focused on how they can be used for different assessment task and for building taxonomies of components [37, 26, 25, 22].

The limited industrial adoption of the academic methods, prompted us to study closed the industrial state-of-the-practice concerning OTS based development. An initial study based on a few interviews with companies led us to the identification of some thesis on OTS based development[33]. That study was the starting point for a larger European-wide investigation [49, 48, 41, 39, 40]. The final result of this activity consists in a risk mitigation model for OTS-bases software projects [61]. In addition we took a snapshot of how the European software industry typically conducts such projects and we identified some open questions [71, 38].

Topic	<p><b>Test-Driven Development and Agile Development</b></p> <p>Test-Driven Development (TDD) is a development practice – first introduced in eXtreme Programming (XP) – that shifts the focus from the pure implementation of production code to the definition of automated tests. Instead of first writing the code and then writing the relative tests, TDD prescribes of first writing the automated test code and then proceed with the implementation of the code that satisfies the tests. Originally conceived at the unit level – using the JUnit framework – it has been applied also at system and acceptance level – e.g. using the FIT tool –.</p> <p>We conducted one of the first controlled experiments to assess the quality and productivity achievable by means of TDD. The experiment revealed an indirect effect of applying TDD on the quality of the produced code independently from the skill of the developers and other possible factors [36].</p> <p>TDD advocates say that “tests speak”, that is they also play the role of documentation that is very detailed and always up-to-date, as such they ease the maintenance of the production code. We designed and conducted a series of experiments to assess this feature; in particular we used FIT: an environment to write executable acceptance tests. This investigation showed that the presence of acceptance tests improves the comprehension and maintenance of code, without any additional effort; such effect is visible for different levels of skill and experience of the maintainers [73, 65, 62, 63, 64, 56, 59].</p> <p>In agile methods, a widely used technique is Use Cases. UC are a mainly textual notation, which can be extended – in later stages of development – with user interface mockups. We conducted a series of experiments to evaluate the contribution that screen mockups provide to the comprehension of requirements [82, 81, 115, 152, 151, 153].</p>
Topic	<p><b>Mobile UI Testing</b></p> <p>Two very relevant features of mobile UIs (even more than web UIs) are the wide variety of devices they are expected to (smoothly) run on and the quick pace of (possibly minor and cosmetic) updates they undergo. They are the main causes of the <i>fragility</i> of automated UI test suites: they break with a minor UI update or when running on a different devices. We analyzed and characterized the phenomenon of UI test fragility for Android apps [125, 132, 131, 141, 151].</p> <p>A possible solution to mitigate the fragility of UI tests is represented by the concurrent use of structural and visual tests [142, 147, 158, 161, 162, 163].</p>
Topic	<p><b>Data Quality</b></p> <p>We investigated the issue of data quality assessment focusing on open-data. A research line was dedicated to define and apply a quality measurement framework to Open Government Data (OGD) and to investigate the link between data quality and different categories of data management processes [113, 128].</p> <p>A second line of research, within this topic, focused on the data quality of semantic knowledge bases. In particular we defined a high-scalable schema agnostic approach to quality assessment and as main novelty we focused on evolution in time of the knowledge bases [126, 134, 138, 143, 155].</p> <p>A more recent thread focuses on the relationship between data quality (in particular balance) and the fairness of the Automated Decision Making (ADM) systems based on such data. We observed a link between the imbalance of the data and the risk of ADM bias [159, 164, 165].</p>
Topic	<p><b>Code Obfuscation</b></p> <p>This research activity is the result of a large collaboration involving several replicated studies across different research organizations. The initial series of articles [60, 67, 114] represent the first empirical study to evaluate the effectiveness of source code obfuscation techniques with hackers.</p> <p>A follow-up series of studies, conducted in the context of the EU project ASPIRE, aimed at providing empirical evidence about effectiveness of obfuscation techniques [129, 130, 149, 160]. This work obtained the best paper award at the ICPC 2017 conference [130].</p>

Topic	<p><b>Green Software</b></p> <p>While hardware is directly responsible for energy consumption, it is software that drives that consumption: the more computations are required the higher the consumption.</p> <p>We conducted several investigations aimed at understanding which features in a software application cause most energy consumption. [104, 122, 105, 121].</p> <p>In addition we worked on the definition of frameworks to monitor and collect energy consumption [79, 139].</p> <p>We summarized our (partial) experience in an overview article [120] and provided a set of guidelines and tool [148, 157].</p>
Topic	<p><b>Software Project Management</b></p> <p>An important branch of software engineering focuses on the management of software projects, which exhibit peculiar trends not found in other kinds of projects.</p> <p>We conducted an investigation on the success factors of software projects, in particular we identified a divergence between the recommendations available in the literature the the beliefs present in the industry [78, 69, 70].</p> <p>The fundamental role of the human factor and the criticality of the maintenance phase in the software life-cycle indicate that team members turn-over is an important factor affecting project fragility. The <i>Truck Factor</i> is simple and intuitive indicator of project fragility. We studied the fragility of several different open source project using the truck-factor indicator [95, 90].</p> <p>An critical maintenance activity consists in the migration of software application towards new platforms. Such activity has been investigated in the METAMORPHOS project. We conducted a large scale industrial survey to identify the state-of-the-practice in software migration projects [77, 93, 84, 68, 66].</p>
Other topics	<p>Kotlin language: [150, 156]</p> <p>Software Polyglotism: [103, 109, 118, 117]</p> <p>Defect density: defining benchmarks[100, 116, 107, 99] and comparing desktop vs. web applications [94, 75].</p> <p>Static analysis [98, 97, 87];</p> <p>Wireless services development [44, 43, 47].</p> <p>Software Implemented Hardware Fault-Tolerance [16, 12, 7].</p> <p>Software engineering education: [74, 146]</p>
<b>Appendix</b>	<p>Publication List</p>

Last update: March 20, 2022

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