Michele Pasqua

Academic Curriculum Vitæ

Assistant Professor (non-tenured)

Department of Computer Science - University of Verona, Italy

Education

2015–2018 **PhD in Computer Science**, *University of Verona*, Italy.
Scholarship holder

2013–2015 **MSc in Computer Science and Engineering**, *University of Verona*, Italy, *110/110 cum laude*.
Curriculum: Software Engineering and Security

2009–2013 **BSc in Computer Science**, *University of Verona*, Italy, *97/110*.
Curriculum: General Computer Science

PhD Thesis

Title *"Hyper Static Analysis of Programs – An Abstract Interpretation-Based Framework for Hyperproperties Verification"*

Supervisor Prof. Isabella Mastroeni

Referees Prof. Antoine Miné, Prof. David A. Naumann

Description In my PhD I have developed a methodology to verify, trough static analysis, hyperproperties of computer programs. In particular, the focus is on information-flow hyperproperties, which are very pervasive in systems security. The approach is based on abstract interpretation, a very powerful formal framework for the approximation of programs' semantics. My thesis represents the first systematic approach leveraging abstract interpretation to hyperproperties verification.

Masters Thesis

Title *"A semantic approach to Software Watermarking – A general model based on Abstract Interpretation"*, Original: "Approccio semantico al Software Watermarking – Un modello generale basato su Interpretazione Astratta"

Supervisor Prof. Mila Dalla Preda

Description The thesis gives a semantic formulation of software watermarking. In particular, the thesis presents a general mathematical definition for watermarking systems, based on abstract interpretation. With this latter, it is possible to measure the features (*e.g.,* resilience, secrecy, accuracy) of existing watermarking techniques and to perform comparisons between different watermarking techniques.

PhD Schools

2018 **Midlands Graduate School in the Foundations of Computing Science (MGS18)**, *University of Nottingham*, UK.

2017 **Italian Summer School of Logic**, *The University of Milan*, Italy.

2016 **Security and Trust of Next Generation Enterprise Information Systems**, *FBK – Bruno Kessler Foundation*, Italy.

2014 **International Summer School on Information Security and Protection (ISSISP14)**, *University of Verona*, Italy.

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Teaching and Supervising

Teaching

2021/2022 - 2023/2024 **Professor (Course Coordinator)**, *University of Verona*, Italy, Course: "Informatics and multimedia production" (INF/01).
MSc in Publishing and Journalism

2023/2024 **Professor**, *University of Verona*, Italy, Course: "Cyber-security for IoT" (INF/01).
MSc in Computer Engineering for Robotics and Smart Industry

2020 - 2023 **Lecturer and Instructor**, *University of Verona*, Italy, "Training program in cybersecurity".
CyberChallenge.IT

2017/2018 **Teaching Assistant**, *University of Verona*, Italy, Course: "Logic" (INF/01).
BSc in Computer Science

2016/2017 **Teaching Assistant**, *University of Verona*, Italy, Course: "Programming for Bioinformatics" (INF/01).
BSc in Bioinformatics

2015/2016 **Teaching Assistant**, *University of Padova*, Italy, Course: "Automata and Formal Languages" (INF/01).
BSc in Computer Science

Supervising

2023 **MSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Zeno Montolli.
Reinforcement Learning per la generazione automatica di casi di test per REST API
Supervisor: Prof. Mariano Ceccato

2023 **MSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Matteo Cavaliere.
A Black-Box Approach for Automated Inference and Refinement of REST API Specifications
Supervisor: Prof. Mariano Ceccato

2023 **MSc Thesis Supervisor**, *University of Verona*, Italy, Student: Stefano Addis.
I Large Language Models per la scrittura di contenuti editoriali: Potenzialità e pericoli delle nuove applicazioni dell'Intelligenza Artificiale

2023 **MSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Matteo Grella.
Generazione Automatizzata di Casi di Test per Vulnerabilità Mass Assignment su REST API
Supervisor: Prof. Mariano Ceccato

2022 **MSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Nicolò Lutteri.
Automatic black-box test casegeneration for access controlvulnerabilities in RESTful APIs
Supervisor: Prof. Mariano Ceccato

2022 **BSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Alessandro Marconcini.
Progettazione e prototipazione di un servizio REST di pubblica utilità
Supervisor: Prof. Mariano Ceccato

2022 **BSc Thesis Co-Supervisor**, *University of Udine*, Italy, Student: Alvise Bruniera.
Il calcolo AbU: analisi delle performance di una implementazione in Golang
Supervisor: Prof. Marino Miculan

2022 **MSc Thesis Co-Supervisor**, *University of Udine*, Italy, Student: Massimo Comuzzo.
Implementation of an ECA rules language with attribute-based distributed communications
Supervisor: Prof. Marino Miculan

2020/2021 **Projects Supervisor**, *University of Udine*, Italy, Course: "Distributed Systems" (INF/01).
MSc in Computer Science

2020/2021 **Projects Supervisor**, *University of Verona*, Italy, Course: "Cyber-Security for IoT" (INF/01).
MSc in Computer Engineering for Robotics and Smart Industry

2018 **BSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Jenny Bonato.
Model Checking for Security – Extending Temporal Logic in Order to Deal with Information Flows
Supervisor: Prof. Isabella Mastroeni

2018 **BSc Thesis Co-Supervisor**, *University of Verona*, Italy, Student: Michele Pasetto.
Secure Multi-Execution – An Elegant Enforcement Mechanism for Information Flow Security
Supervisor: Prof. Isabella Mastroeni

Research

My main research interests are in the field of formal methods for security and programming languages; with particular attention to program verification and semantics, code protection, malware detection, compilation, distributed systems and functional testing. Some keywords:

- abstract interpretation
- property and hyperproperty verification
- system semantics
- (modular) static analysis
- language-based security
- type systems
- process algebra
- bisimulation theory
- IoT and CPS security
- software watermarking and obfuscation
- metamorphic malware
- event-driven architecture
- attribute-based communication
- distributed systems
- REST APIs
- black-box testing
- security testing
- statistical model-checking

Actually, I am exploring new research topics, such as the security/correctness of blockchain-based programs (smart-contracts) and the verification of quantum programming languages.

Indicators

Total citations **192** (Scholar) :: **114** (Scopus) :: **154** (Research Gate)

H-index **8** (Scholar) :: **8** (Scopus) :: **8** (Research Gate)

Past positions

2021 **Postdoctoral Researcher**, *University of Udine*, Italy, Department of Mathematics, Computer Science and Physics.
Prof. Marino Miculan

2019 – 2020 **Postdoctoral Researcher**, *University of Verona*, Italy, Department of Computer Science.
Prof. Massimo Merro

Participation in Research Projects

2022-2023 **Principal Investigator**, *SNSF project "Metamorphic Hyperproperty Testing" (2022-2023)*, Funded by "Swiss National Science Foundation", Coordinator: Prof. Paolo Tonella.

2021 **Research assistant**, *Joint project "Build Trust Proof of Concept" (2021)*, Funded by "University of Verona and Build Trust Srl", Coordinator: Prof. Franco Fummi.

2020–2022 **Research assistant**, *PRIN project "IT MATTERS - Methods and Tools for Trustworthy Smart Systems" (2019-2022)*, Funded by "Ministry of Education, University and Research (Italy)", Coordinator: Prof. Rocco De Nicola.

2019–2022 **Research assistant**, *PRIN project "ASPRA - Analysis of Program Analyses" (2019-2022)*, Funded by "Ministry of Education, University and Research (Italy)", Coordinator: Prof. Roberto Giacobazzi.

2018–2020 **Research assistant**, *Joint project "SAINTS - Security Static Analysis for Android Things" (2018-2020)*, Funded by "University of Verona and JuliaSoft Srl", Coordinator: Prof. Massimo Merro.

2018–2020 **Research assistant**, *Project "ARES - Analyzing Modern Software Security" (2018-2020)*, Funded by "University of Verona", Coordinator: Prof. Isabella Mastroeni.

2016–2017 **Research assistant**, *MIUR project "FACE - Formal Avenue for Chasing malwarE" (2014-2018)*, Funded by "FIRB - Futuro in ricerca 2013", Coordinator: Dr. Mila Dalla Preda.

Research Visits

2022-2023 **Università della Svizzera Italiana**, *SNSF project "Metamorphic Hyperproperty Testing" (2022-2023)*, Funded by "Swiss National Science Foundation", Coordinator: Prof. Paolo Tonella.

2018 **Sorbonne Université**, *ERC project "MOPSA: Modular Open Platform for Static Analysis" (2016-2021)*, Funded by "European Research Council (Consolidator Grant Agreement 68139)", Coordinator: Prof. Antoine Miné.

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Committees and Reviewing

2023 **Program Committee Member**, *46th IEEE/ACM International Conference on Software Engineering (ICSE 2024) – Demonstrations Track*, April 12-21, 2024.
Lisbon, PT

2023 **Program Co-Chair**, *23rd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2023) – New Ideas and Emerging Results Track*, October 2-3, 2023.
Bogotà, CO

2023 **Program Committee Member**, *26th European Conference on Artificial Intelligence (ECAI 2023)*, October 1-6, 2023.
Kraków, PL

2023 **Reviewer**, *Transactions on Information Forensics and Security*, Journal, IEEE.

2022-2023 **Reviewer**, *Journal of Systems and Software*, Journal, Elsevier.

2022-2023 **Reviewer**, *Transactions on Software Engineering*, Journal, IEEE.

2022-2023 **Reviewer**, *Transactions on Software Engineering and Methodology*, Journal, ACM.

2022 **Program Committee Member**, *22nd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2022)*, Research Track, October 3-4, 2022.
Limassol, CY

2022 **Proceedings and Local Chair**, *22nd IEEE International Working Conference on Source Code Analysis and Manipulation (SCAM 2022)*, Research Track, October 3-4, 2022.
Limassol, CY

2022 **Reviewer**, *Automated Software Engineering*, Journal, Springer.

2022 **Reviewer**, *Security and Communication Networks*, Journal, Wiley and Hindawi.

2019 **Program Co-Chair**, *11th International Conference on Advances in System Testing and Validation Lifecycle (VALID 2019) – Formal Methods for Software Analysis and Verification Special Track*, November 26, 2019.
Valencia, ES

2019 **Reviewer**, *Transactions on Information Forensics and Security*, Journal, IEEE.

Publications

Articles in International Journals with Referee

TCS23 AbU: A Calculus for Distributed Event-driven Programming with Attribute-based Interaction – *Pasqua M. and Miculan, M.* – In: Theoretical Computer Science (pp. 1–40), Elsevier, 2023

JSS23 Enhancing Ethereum smart-contracts static analysis by computing a precise Control-Flow Graph of Ethereum bytecode – *Pasqua M., Benini A., Contro F., Crosara M., Dalla Preda M. and Ceccato M.* – In: Journal of Systems and Software (pp. 1–18), Elsevier, 2023

ACCESS23 The AbU Language: IoT Distributed Programming Made Easy – *Pasqua, M., Comuzzo, M. and Miculan, M.* – In: IEEE Access (pp. 1–14), IEEE, 2023 (to appear)

STVR22 Automated Black-Box Testing of Nominal and Error Scenarios in RESTful APIs – *Corradini, D., Zampieri, A., Pasqua M., Viglianisi, E., Dallago, M. and Ceccato, M.* – In: Software Testing, Verification and Reliability (pp. 1–33), John Wiley & Sons, 2022

TOPS21 Friendly Fire: Cross-App Interactions in IoT Platforms – *Balliu, M., Merro, M., Pasqua M. and Shcherbakov, M.* – In: ACM Trans. on Privacy and Security (pp. 1–40), ACM Press, 2021

MSCS19 Semantics-based Software Watermarking by Abstract Interpretation – *Dalla Preda, M. and Pasqua, M.* – In: Mathematical Structures in Computer Science (pp. 339–388), Cambridge University Press, 2019

Articles in International Conferences with Referee

SAS23 Domain Precision in Galois Connection-less Abstract Interpretation – *Mastroeni, I. and Pasqua, M.* – In: Proceedings of the 30th Static Analysis International Symposium (pp. 1–25), Springer, 2023 (to appear)

ISSTA23 Enhancing REST API Testing with NLP Techniques – *Kim, M., Corradini, D., Pasqua, M., Ceccato, M., Orso, A., Sinha, S. and Tzoref-Brill, R.* – In: Proceedings of the 32nd International Symposium on Software Testing and Analysis (pp. 1232–1243), ACM, 2023

ICSE23 Automated Black-box Testing of Mass Assignment Vulnerabilities – *Corradini, D., Pasqua, M. and Ceccato, M.* – In: Proceedings of the 45th International Conference on Software Engineering (pp. 2553–2564), IEEE, 2023

ICSME22 RestTestGen: An Extensible Framework for Automated Black-box Testing of RESTful APIs – *Corradini, D., Zampieri, A., Pasqua, M. and Ceccato, M.* – In: Proceedings of the 38th International Conference on Software Maintenance and Evolution (pp. 504–508), IEEE, 2022

IECON22 Integrating Smart Contracts in Manufacturing for Automated Assessment of Production Quality – *Gaiardelli, S., Spellini, S., Pasqua, M., Ceccato, M. and Fummi, F.* – In: Proceedings of the 48th Annual Conference of the IEEE Industrial Electronics Society (pp. 1–6), IEEE, 2022

SAC22 Verifying Opacity by Abstract Interpretation – *Mastroeni, I. and Pasqua, M.* – In: Proceedings of the 37th ACM/SIGAPP Symposium On Applied Computing (pp. 1817–1826), ACM, 2022

SEFM21 On the Security and Safety of AbU Systems – *Pasqua, M. and Marino, M.* – In: Proceedings of the 19th International Conference on Software Engineering and Formal Methods (pp. 178–198), Springer, 2021

SCAM21 Empirical Comparison of Black-box Test Case Generation Tools for RESTful APIs – *Corradini, D., Zampieri, A., Pasqua, M. and Ceccato, M.* – In: Proceedings of the 21st International Working Conference on Source Code Analysis and Manipulation (pp. 226–236), IEEE, 2021

ICSME21 Restats: A Test Coverage Tool for RESTful APIs – *Corradini, D., Zampieri, A., Pasqua, M. and Ceccato, M.* – In: Proceedings of the 37th International Conference on Software Maintenance and Evolution (pp. 594–598), IEEE, 2021

ICTAC21 A Calculus for Attribute-based Memory Updates – *Miculan, M. and Pasqua, M.* – In: Proceedings of the 18th International Colloquium on Theoretical Aspects of Computing (pp. 366–385), Springer, 2021

FormaliSE20 Impact Analysis of Cyber-Physical Attacks on a Water Tank System via Statistical Model Checking – *Munteanu, A., Merro, M. and Pasqua, M.* – In: Proceedings of the 8th International Conference on Formal Methods in Software Engineering (pp. 34–43), ACM, 2020

CSF19 Securing Cross-App Interactions in IoT Platforms – *Balliu, M., Merro, M. and Pasqua, M.* – In: Proc. of the 32th Computer Security Foundations Symposium (pp. 319–334), IEEE, 2019

SAC19 Statically Analyzing Information Flows: An Abstract Interpretation-based Hyperanalysis for Non-Interference – *Mastroeni, I. and Pasqua, M.* – In: Proceedings of the 34th ACM/SIGAPP Symposium On Applied Computing (pp. 2215–2223), ACM, 2019

SAS18 Verifying Bounded Subset-Closed Hyperproperties – *Mastroeni, I. and Pasqua, M.* – In: Proc. of the 25th Static Analysis International Symposium (pp. 263–283), Springer, 2018

SAS17 Hyperhierarchy of Semantics: A Formal Framework for Hyperproperties Verification – *Mastroeni, I. and Pasqua, M.* – In: Proceedings of the 24th Static Analysis International Symposium (pp. 232–252), Springer, 2017

ICTCS17 On topologies for (hyper)properties – *Pasqua, M. and Mastroeni, I.* – In: Proceedings of the 18th Italian Conference on Theoretical Computer Science (pp. 1–12), CEUR-WS, 2017

Articles in International Workshops with Referee

FMSAV19 Chameleon: The Gist of Dynamic Programming Languages – *Buro, S. and Pasqua, M.* – In: Proceedings of VALID 2019 - Special track: Formal Methods for Software Analysis and Verification (pp. 1–5), IARIA, 2019

FMW19 An abstract domain for objects in dynamic programming languages – *Arceri, V., Pasqua, M. and Mastroeni, I.* – In: Proceedings of the Formal Methods 2019 International Workshops (pp. 136–151), Springer, 2019

NSAD16 Software Watermarking: A Semantics-based Approach – *Dalla Preda, M. and Pasqua, M.* – In: Proceedings of the 6th Workshop on Numerical and Symbolic Abstract Domains (pp. 71–85), Elsevier, 2016

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Extended Abstracts and Technical Reports

ICTCS22 Distributed Programming of Smart Systems with Event-Condition-Action Rules (Short Paper) – *Miculan, M. and Pasqua, M.* – In: 23rd Italian Conference on Theoretical Computer Science (pp. 1–6), CEUR-WS, 2022

ITASEC22 Security and Safety of IoT Systems Based on ECA Rules (Extended Abstract) – *Pasqua, M. and Miculan, M.* – In: 6th Italian Conference on CyberSecurity (pp. 1–12), 2022

TR21b On the Security and Safety of AbU Systems (supplementary material) – *Pasqua, M. and Miculan, M.* – Technical Report: Zenodo October/2021, `https://doi.org/10.5281/zenodo.5570332`, 2021

TR21a A Calculus for Attribute-based Memory Updates (supplementary material) – *Miculan, M. and Pasqua, M.* – Technical Report: Zenodo July/2021, `https://doi.org/10.5281/zenodo.5057165`, 2021

ITASEC20 Friendly Fire: Cross-App Interactions in IoT Platforms (Extended Abstract) – *Balliu, M., Merro, M. and Pasqua, M.* – In: 4th Italian Conference on CyberSecurity (pp. 1–12), 2020

TR16 A semantics-based approach to software watermarking by abstract interpretation – *Dalla Preda, M. and Pasqua, M.* – Technical Report: RR 98/2016 - University of Verona, 2016

Public Talks

Invited Talks

May 25, 2023 **Static Analysis Properties as Program Hyperproperties**, *2nd Symposium on Challenges of Software Verification*, Venice, Italy.

Conference Presentations

Oct. 22, 2023 **Domain Precision in Galois Connection-less Abstract Interpretation**, *30th Static Analysis International Symposium*, Cascais, PT.

Sep. 9, 2022 **Distributed Programming of Smart Systems with Event-Condition-Action Rules**, *23rd Italian Conference on Theoretical Computer Science*, Rome, IT.

Dec. 8, 2021 **On the Security and Safety of AbU Systems**, *19th International Conference on Software Engineering and Formal Methods*, (virtual).

Sep. 10, 2021 **A Calculus for Attribute-based Memory Updates**, *18th International Colloquium on Theoretical Aspects of Computing*, Nur-Sultan, KZ (virtual).

Feb. 6, 2020 **Friendly Fire: Cross-App Interactions in IoT Platforms**, *4th Italian Conference on CyberSecurity*, Ancona, IT.

Oct. 8, 2019 **An abstract domain for objects in dynamic programming languages**, *8th International Workshop on Numerical and Symbolic Abstract Domains*, Porto, PT.

Jun. 27, 2019 **Securing Cross-App Interactions in IoT Platforms**, *32th IEEE Computer Security Foundations Symposium*, Hoboken, USA.

Apr. 10, 2019 **Abstract Interpretation of Information Flows: A Sound Static Analyzer for Non-Interference**, *34th ACM/SIGAPP Symposium On Applied Computing*, Limassol, CY.

Aug. 30, 2018 **Verifying Bounded Subset-Closed Hyperproperties**, *25th Static Analysis International Symposium*, Freiburg im Breisgau, DE.

Sep. 27, 2017 **On topologies for (hyper)properties**, *18th Italian Conference on Theoretical Computer Science*, Naples, Italy.

Sep. 1, 2017 **Hyperhierarchy of Semantics: A Formal Framework for Hyperproperties Verification**, *24th Static Analysis International Symposium*, New York, USA.

Aug. 29, 2016 **Software Watermarking: A Semantics-based Approach**, *7th International Workshop on Numerical and Symbolic Abstract Domains*, Edinburgh, UK.

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Seminars

Seo 21, 2022 **A gentle introduction to hyperproperties**, *Università della Svizzera Italiana*, Switzerland.
Invited talk

Nov. 11, 2019 **Semantics-based Software Watermarking by Abstract Interpretation**, *University of Verona*, Italy.
MSc course "Software Security"

May 3, 2019 **Semantics-based Software Watermarking by Abstract Interpretation**, *University of Verona*, Italy.
MSc course "Software Security"

May 2, 2018 **Hyperproperties and their verification**, *Sorbonne University*, France.
Invited talk

Mar. 15, 2018 **Hyperproperties and Temporal Logics**, *University of Verona*, Italy.
PhD course "Temporal Logic"

Nov. 22, 2017 **Semantics-based Software Watermarking by Abstract Interpretation**, *University of Verona*, Italy.
MSc course "Software Security"

Dec. 21, 2016 **Semantics-based Software Watermarking by Abstract Interpretation**, *University of Verona*, Italy.
MSc course "Software Security"

May 27, 2016 **Measurements in Quantum Computing**, *University of Verona*, Italy.
PhD course "Quantum Computing"

Languages

Italian **Mothertongue**

English **Advanced** *CEFR B2 Certificate - University of Verona*

Other

2022–Present **Member of GRIN**, *Gruppo di Informatica*.

2020–Present **Organizer of CyberChallenge.IT**, *University of Verona team*.

2019–Present **Member of ACM (SIGAPP)**, *Association for Computing Machinery*.

2019–2022 **Member of IEEE**, *Institute of Electrical and Electronic Engineers*.

2017–Present **Member of EATCS**, *European Association for Theoretical Computer Science*, Italian Chapter.

2016–2018 **Phd students representative**, *Univ. of Verona*, Council of the Dept. of Computer Science.

2015–2018 **Student member of ACM**, *Association for Computing Machinery*.

In compliance with the Italian D. Lgs. 2003/196 and the European GDPR 2016/679, I hereby authorize you to use and process my personal details contained in this document.

Verona October 19, 2023 Pasqua Michele

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