



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, through 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 **Professor (Course Coordinator)**, *University of Verona*, Italy, Course: "Informatics and multimedia production" (INF/01).
2023/2024 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 case generation for access control vulnerabilities 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: Alvis 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 **190** (Scholar) :: **111** (Scopus) :: **152** (Research Gate)

H-index **8** (Scholar) :: **7** (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.

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.
Bogotá, 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

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.

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*.

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Verona October 13, 2023

