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 Dr. 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 **Guest Lecturer**, *University of Verona*, Italy, Course: "Training program in cybersecurity".
CyberChallenge.IT

2020 **Guest Lecturer**, *University of Verona*, Italy, Course: "Training program in cybersecurity".
CyberChallenge.IT

2017 – 2018 **Teaching Assistant**, *University of Verona*, Italy, Course: "Logic".
Bsc in Computer Science

2016 – 2017 **Teaching Assistant**, *University of Verona*, Italy, Course: "Programming for Bioinformatics".
Bsc in Bioinformatics

2015 – 2016 **Teaching Assistant**, *University of Padova*, Italy, Course: "Automata and Formal Languages".
Bsc in Computer Science

Supervising

2021 **Projects Supervisor**, *University of Udine*, Italy, Course: "Distributed Systems".
Msc in Computer Science

2021 **Projects Supervisor**, *University of Verona*, Italy, Course: "Cyber-Security for IOT".
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 system
- process algebra
- IoT and CPS security
- software watermarking and obfuscation
- metamorphic malware
- event-driven architecture
- attribute-based communication
- distributed systems
- REST APIs
- black-box 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.

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

Indicators

Total citations	**70** (Scholar) :: **39** (Scopus) :: **17** (Web of Science)
Average citations	**5.385** (Scholar) :: **4.875** (Scopus) :: **2.833** (Web of Science)
H-index	**5** (Scholar) :: **4** (Scopus) :: **2** (Web of Science)
Impact Factor^{2020}	**3.813** (total) :: **1.271** (average)

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Participation in Research Projects

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

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

2019–Present **Research assistant**, *PRIN project "ASPRA - Analysis of Program Analyses" (2019-2022)*, Funded by the 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 the University of Verona and JuliaSoft Srl", Coordinator: Prof. Massimo Merro.

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

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

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.

Committees and Reviewing

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

2019 **Guest Reviewer**, *IEEE Transactions on Information Forensics and Security*, Journal, IEEE Signal Processing Society.

Publications

Articles in International Journals with Referee

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. 1–27), John Wiley & Sons, 2022 (to appear)

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 Univ. Press, 2019

Articles in International Conferences with Referee

SAC21 Verifying Opacity by Abstract Interpretation – *Mastroeni, I. and Pasqua, M.* – In: Proceedings of the 36th SIGAPP Symposium On Applied Computing (pp. 1–9), ACM, 2022 (to appear)

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

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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 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

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

Conference Talks

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.

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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

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.
Quantum Computing Seminars

Languages

Italian **Mothertongue**

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

Other

2021 **Organizer of CyberChallenge.IT**, *University of Verona*.

2020 **Organizer of CyberChallenge.IT**, *University of Verona*.

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

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

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 December 13, 2021 Pasqua Michele

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