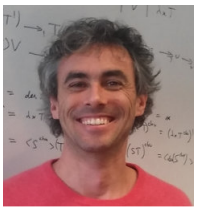
RÉSUMÉ OF MICHELE PAGANI



Date of Birth: 3rd Avril 1976

Place of Birth: Milano (Italy)

Nationality: Italian

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Interests

My research lies at the interface between computer science, logic and mathematics, particularly in various aspects of the programming languages theory based on linear logic and λ-calculus. Lately, I have been interested in programming principles for data science and machine learning, primarily in probabilistic and Bayesian programming, as well as in libraries for automatic differentiation, such as Autograd. Linear logic typing and functional programming have provided amazing new approaches to these fields in the last years.

Current position

2014 - present: full professor (professeur des universités, 1ére classe), Université Paris Cité (previously Université Paris Diderot) – IRIF, Institut de Recherche en Informatique Fondamentale (FR)

Past positions

2009 - 2014: associate professor (maître de conférences) with CNRS chair, Université Paris Nord (FR)

2008 - 2009: post-doc, Universitá di Torino (IT)

2007 - 2008: non-tenured assistant professor (ATER) and post-doc, Université Paris Diderot (FR)

2006 - 2007: post-doc, Università di Roma Tre (IT)

2003 - 2006: Ph.D. student, Université de Aix-Marseille (FR) and Università di Roma Tre (IT)

2001 - 2003: Civil service, Milan (IT)

1995 - 2000: Bachelor and master student, Università degli Studi di Milano (IT)

Studies

2013: "Habilitation à diriger des recherches" in Computer Science, Université Paris Nord

2006: Joint Ph.D. in Mathematics, Université de Aix-Marseille, and Philosophy, Università Roma Tre

2000: Bachelor and Master in Philosophy, Università degli Studi di Milano

Prizes

2021-2022: délégation CNRS

2020-2021: délégation CNRS

2009-2014: CNRS chair

1 Research Activities

Professional Service
External:

2023: member of the Program Committee "*ACM Symposium: Principles of Programming Languages* (POPL)"

2023: member of the Program Committee "*Languages for Inference Workshop* (LAFI)"

2020: member of the Program Committee "*Formal Structures in Computer Science* (FSCD)"

2017: member of the Program Committee "*ACM Symposium: Principles of Programming Languages* (POPL)"

2016: member of the Program Committee "*ACM/IEEE Symposium: Logic in Computer Science* (LICS)"

2016: member of the Organizing Committee "*Computability in Europe* (CiE)"

2015: member of the Steering Committee "*Typed Lambda Calculi and Applications* (TLCA)"

2014: member of the Program Committee "*Mathematical Foundations of Programming Semantics* (MFPS)"

Local:

from 2022: leader of the thematic team "*algebra and computation*" of the IRIF laboratory.
IRIF is structured in nine thematic teams, grouped into three research poles: algebra and computation is one of the three thematic teams of the pôle *Proofs, programs and systems* (PPS). The team has more than 20 permanent members and it focuses on the algebraic, categorical and geometrical structures arising in computation, both to develop mathematical analysis tools for programs, and to design new computational methods with applications in algebra.

from 2021: chair of the Steering Committee "*Ecole de Printemps d'Informatique Théorique* (EPIT)".
Since 1973, the EPIT organises each year an intensive school in a field of theoretical computer science. The target audience is made up of doctoral students and experienced researchers who wish to specialise in the field under consideration. See `https://epit.irif.fr/index.html` for more details.

2016 – 2021: head of the Scientific Council of the computer science department of the Université Paris Cité.
The scientific council advises the computer science department on all issues related to the scientific policies, organisation and research of the department. For instance: invitations, promotions, recruitment committees, habilitations, etc.

2016 – 2021: member of the Research Council of the Science Faculty of the Université de Paris Cité

Contracts — Principal Investigator

2020 – 2022: projet Emergence Université Paris Cité grant (32k euro)
"IDILL : Implementing differentiable programming from linear logic"

2013 – 2016: ANR Jeunes Chercheuses et Jeunes Chercheurs grant (256k euro)
"COQUAS : Computing with quantitative semantics"

2010 – 2011: Region Ile-de-France via Digiteo Consortium grant (51k euro)
"ALAL : Algebraic approaches to Lambda-calculi"

Contracts — Site leader or Team member (last 5 years)

2020 – 2024: team member of ANR Projet Collaboratif grant, PI: Thomas Ehrhard (300k euro)
"PPS : Probabilistic Programming Semantics"

2015 – 2019: team member of ANR Blanc grant, PI: Damiano Mazza
"ELICA: : Expanding logical ideas for complexity analysis"

Recruitment committees

2023: recruitment committee for three associate professors in Computer Science at Université Paris Cité;

2021: recruitment committee for two associate professors in Computer Science at Université Paris Cité;

2019: recruitment committee for full professor in Computer Science at Université de Paris Diderot;

2019: recruitment committee for associate professor in Linguistics at Université de Paris Diderot;

2018: recruitment committee for full professor position in Computer Science at Université de Paris Diderot;

2016: recruitment committee for associate professor in Computer Science at Université de Aix-Marseille;

2015: recruitment committee for two full professors in Computer Science at Université de Paris Diderot.

Ph.D. and H.D.R. committees

2019: H.D.R. de Simon Perdrix, Université de Lorraine (reviewer and jury member)

2019: Ph.D. de Mathys Rennella, Radbound University NL (reviewer)

2018: Ph.D. de Francesco Gavazzo, Università di Bologna IT (reviewer)

2016: Ph.D. de Thomas Leventis, Université de Aix-Marseille (jury member)

2014: Ph.D. de Michele Alberti, Université de Aix-Marseille (reviewer and jury member)

2014: Ph.D. de Jean-Baptiste Midez, Université de Aix-Marseille (jury member)

2011: Ph.D. de Alejandro Diaz-Caro, Université de Grenoble (jury member)

Ph.D. advising

from 2022: Giulia Giusti (Fondation CFM scholarship).
Awarded by the JP Aguillar research grant, Subject: *Foundations of Differentiable Programming.*

2015 – 2020: Gianluca Curzi (Università di Torino scholarship).
Co-advised with Roversi at Università di Torino.
Awarded by the French-Italian University research grant, Subject: *Probabilistic Programming and Computational Complexity*,
⇒ now post-doc at Birmingham University (UK)

2012 – 2015: Flavien Breuvart (ENS Cachan scholarship).
Co-advised with Bucciarelli at Université Paris Diderot.
Kleene award best paper at LICS 2014, Subject: *lambda-calculus and linear logic models*
⇒ now associate professor (maître de conférences) at Université Paris Nord

2011 – 2016: Marco Solieri (LIPN, Université Paris Nord scholarship).
Co-advised with Guerrini at Université Paris Nord.
Subject: *Geometry of interaction and computational complexity*
⇒ now research associate at the University of Modena (IT)

Post-doc advising

2015: Giulio Guerrieri, ANR Coquas project scholarship, subject: *Taylor expansion and call-by-value*
⇒ now post-doc at the University of Bath

2015: Thomas Seiller, ANR Coquas project scholarship, subject: *geometry of interaction*
⇒ now CNRS researcher at the Université Paris Nord

2014 – 2015: Andrew Polonsky, ANR Coquas project scholarship, subject: *algebraic rewriting systems*
⇒ now assistant professor at Appalachian State University (USA)

2014 – 2015: Benoit Valiron, ANR Coquas project scholarship, subject: *quantum lambda-calculus*
⇒ now associate professor at École Centrale-Supélec (FR)

2013 – 2014: Guillaume Munch-Maccagnoni, ANR Coquas project scholarship, subject: *(co)effects*
⇒ now INRIA researcher at INRIA Bretagne, Nantes (FR)

2011– 2012: Alejandro Diaz-Caro, IdF-Digiteo project scholarship, subject: *algebraic lambda-calculus*
⇒ now associate professor at Quilmes University (AR)

Workshop Organization (last 5 years)

2022: Workshop "*Differentiable Programming*", IRIF, Paris (FR)
approx. 50 participants, url: `https://lipn.univ-paris13.fr/~mazza/DiffProgWorkshop/#zheng`

2020: Workshop "*Probabilistic programming semantics*", IRIF, Paris (FR)
approx. 70 participants, url: `https://www.irif.fr/pps-pihoc-diapason2020`

2018: Workshop "*Intersection Types and Related Systems*", affiliated with FLOC2018, Oxford (UK)
approx. 25 participants, url: `https://www.irif.fr/~michele/itrs2018`

Invitations (selection, last 5 years)

2022: invited talk to the "*Workshop New challenges in programming language semantics*", Lorentz Center, Leiden, (NL)

2022: invited talk and one invited lecture to the CIRM thematic month "*Logic and Interactions*", CIRM, Marseille (FR)

2021: invited talk to the BIRS/FMCS Workshop "*Tangent Categories and their Applications*", Banff International Research Station (moved online due to COVID-19 pandemic), (CA)

2021: invited talk at Journées du "*Groupe de Recherche en Informatique Mathematique*" CNAM, Paris

2020: invited remote talk at Huawei Edinburgh Research Centre, Edinburgh (UK)

2020: one month visiting scholar, Boston University, Computer Science department, Boston (USA)
⇒ delayed due to COVID-19 pandemic

2020: invited talk at "*Annual Conference on Probabilistic Programming*", M.I.T. Boston (USA)
⇒ moved online due to COVID-19 pandemic

2018: invited talk at "*Trends in Linear Logic and Applications*", affiliated with FLOC, Oxford (UK)

Description of the 5 most significant publications

The complete publication list is in Appendix A. Authors are listed in alphabetical order.

- Damiano Mazza, Michele Pagani , "Automatic Differentiation for PCF", *Proceedings of the ACM on Programming Languages, PACML*, vol.5 (POPL), No.:28, 2021.

  We study the correctness of automatic differentiation (AD) in the context of a higher-order, Turing-complete language (PCF with real numbers), both in forward and reverse mode. Our main result is that, under mild hypotheses on the primitive functions included in the language, AD is almost everywhere correct, that is, it computes the derivative or gradient of the program under consideration *except* for a set of Lebesgue measure zero. Stated otherwise, there are inputs on which AD is incorrect, but the probability of randomly choosing one such input is zero. Our result is in fact more precise, in that the set of failure points admits a more explicit description: for example, in case the primitive functions are just constants, addition and multiplication, the set of points where AD fails is contained in a countable union of zero sets of polynomials.

- Thomas Ehrhard, Michele Pagani and Christine Tasson, "Full Abstraction for Probabilistic PCF", *Journal of the ACM*, vol 65, num. 4, ACM, 2018.

  We present a probabilistic version of PCF, a well-known simply typed universal functional language. The type hierarchy is based on a single ground type of natural numbers. We describe a denotational

semantics based on probabilistic coherence spaces, a model of classical linear logic developed in previous works. A data type A is interpreted by a collection (a base) of atomic information, and resources of type A by vectors $(m_a)_{a\in A}$ over the cone of non-negative real numbers. In case A is a ground type (booleans, integers), then $(m_a)_{a\in A}$describes a discrete probability distribution over A, but on higher-order type the interpretation is more abstract. Programs using their inputs exactly once correspond then to linear functions, while typical programs, using their inputs several times are represented by analytical functions.

We prove an adequacy and an equational full abstraction theorem showing that equality in the model coincides with a natural notion of contextual equivalence. This is the only known model giving such a tight description of the contextual equivalence in a so expressive language. The key ingredient in the proof of full abstraction is based on calculus since programs are interpreted as power series.

- Thomas Ehrhard, Michele Pagani and Christine Tasson, "Measurable cones and stable, measurable functions: a model for probabilistic higher-order programming", Proceedings of the ACM on Programming Languages, PACML, vol.2(POPL), 59:1–59:28, 2018.

  The model of probabilistic coherence spaces considered in the above mentioned paper is built on the top of countable webs, so it provides a natural interpretation of discrete data types, like booleans or integers, but not of uncountable ones, like the set of real numbers. On the contrast there is nowadays a greater and greater interest in higher-order programming languages using continuous data and distributions over real numbers, namely in the setting of the so-called "Bayesian programming".

  In this paper, we extend the category of probabilistic coherence spaces to uncountable structures, introducing the notion of stable and measurable map between cones. We prove that it forms a cpo-enriched cartesian closed category and hence a model of PCF extended with the main primitives of functional Bayesian programming, like sampling, conditioning and full recursion.

- Michele Pagani, "Visible Acyclic Differential Nets", *Annals of Pure and Applied Logic*, vol. 163, num. 3, Elsevier, 2012.

  We give a geometric condition that characterizes the differential nets having a finitary interpretation in finiteness spaces: visible acyclicity. This is based on visible paths, an extension to differential nets of a class of paths we introduced in the framework of linear logic nets. The characterization is then carried out as follows: the differential nets having no visible cycles are exactly those whose interpretation is a finitary relation. Visible acyclicity discloses a new kind of correctness for the promotion rule of linear logic, which goes beyond sequent calculus correctness.

- Michele Pagani and Lorenzo Tortora de Falco, "Strong Normalization Property for Second Order Linear Logic", *Theoretical Computer Science*, Vol. 411, Elsevier, 2010.

  The paper contains the first complete proof of strong normalization (SN) for full second order linear logic (LL): Girard's original proof uses a standardization theorem which is not proven. We introduce sliced pure structures (sps), a very general version of Girard's proof-nets, and we apply to sps Gandy's method to infer SN from weak normalization (WN). We prove a standardization theorem for sps: if WN without erasing steps holds for an sps, then it enjoys SN. A key step in our proof of standardization is a confluence theorem for sps obtained by using only a very weak form of correctness, namely acyclicity slice by slice. We conclude by showing how standardization for sps allows to prove SN of LL, using the standard technique of reducibility candidates

2 Teaching Activities

Teaching Duties

As professor at the computer science department of the Université Paris Cité (previously Université Paris Diderot), I am or have been in charge of the following courses:

- *Introduction to Deep Learning*, 2nd year Master in computer science, between 40 and 60 students, one teaching assistant.

  This course introduces to the principles of machine learning, with a special emphasis on deep learning techniques. The goal is to give students in our graduate programs in computer science the opportunity to experience the latest concepts in deep learning techniques by using popular libraries such as PyTorch and Scikit-Learn, with no advanced mathematical prerequisite.

  I built this course from scratch in 2020/2021 and the material is available at the following public git repository: `https://gaufre.informatique.univ-paris-diderot.fr/pagani/deep_learning_m2_pub`.

- *Introduction to Programming in Python*, 1st year Licence, between 250 to 300 students, between 15 to 20 teaching assistants.

  This is one of the main undergraduate courses of our department, introducing the basics of imperative and procedural programming in Python. The course is attended by students from the faculty of science (mathematics, physics, linguistics). A sibling course based on Java is offered to the computer science students.

  The material of the 2020/2021 course is available at the following url: `https://moodle.u-paris.fr/course/view.php?id=2412` (password: `AlonzoChurch`)

- *Functional Programming*, 3rd year undergraduate, between 120 to 200 students, between 5 to 10 teaching assistants.

  This course introduces to the style of functional programming by using the OCaml language. It is attended by students with different backgrounds (computer science, mathematics, biology, human and social sciences).

  In 2018/2019, I participated to a project lead by my colleague Yann Regis-Gianas and supported by the LearnOcaml foundation, consisting in implementing the exercices of the course on the online platform `https://try.ocamlpro.com`. This framework helps students to check their code by testing and automatic grading.

  The material of the 2016/2017 course is available at the following url: `https://www.irif.fr/~michele/archives_cours/PF.zip`.

- *Virtual Machines*, 3rd year undergraduate, between 30 to 40 students, one teaching assistant.

  This course is optional and it is a natural continuation of the functional programming course of the first semester. It consists in implementing a virtual machine and a compiler of a fragment of the OCaml language.

  The material of the 2016/2017 course is available at the following url: `https://www.irif.fr/~michele/archives_cours/MV.zip`.

- *Java Programming*, 1st year Master Bioinformatics, between 10 to 20 students, one teaching assistant.

  This course gives the basics of object oriented programming to the students graduated in biology and natural sciences in general and attending the master in bioinformatics at our university. The material of the 2016/2017 course is available at the following url: `https://www.irif.fr/~michele/archives_cours/JAVA.zip`.

- *Lambda Calculus and Proof-Theory*, 2nd year Master of the Department of Mathematics "*Logique mathématique et fondements de l'Informatique*", between 10 to 15 students.

  This course introduces the basics of the Curry-Howard correspondence between lambda-calculus and intuitionistic logic. The most of the students are graduated in mathematics or computer science.

- *Linear Logic*, 2nd year Master Parisien de Recherche en Informatique, between 15 to 25 students.

  This course introduces the basics of linear logic, proof nets and some of its most recent applications in the theory of programming languages, such as the design of typing systems and denotational models for probabilistic programming.

I am or have been also teaching assistant to a number of other courses, such as Computability, Compilers, Scripting Languages, Logic, Software engineering, analysis of data structures.

Pedagogic duties

from 2022: director of the first-year Master "*Fundamental and Applied Computer Science"* (M1). The master gives the main postgraduate qualification of the Department of Computer Science. The director of M1 manages the four different graduate programs of our Department of Computer Science, with a total of approximately 150 students per year.

2021 - 2023: evaluation committee of the 1st undergraduate year in Mathematics and Computer Science Applied to Human and Social Sciences (MIASHS)

2015 - 2019: evaluation committee of the 3rd undergraduate year in Computer Science

2014 - 2016: evaluation committee of the 2nd undergraduate year in Computer Science and Mathematics

A Appendix — Publication record

Articles at *Journal of the ACM*, *Annals of Pure and Applied Logic*, and in the major conferences in theoretical computer science (5 papers at *Principles of Programming Languages (POPL)* and 4 papers at *Logic in Computer Science (LICS)*). Authors are listed in alphabetical order. All publications are available at:

`https://www.irif.fr/~michele/research.html`

Publications in international peer-reviewed journals (12):

[1] Damiano Mazza, Michele Pagani , "Automatic Differentiation for PCF", *Proceedings of the ACM on Programming Languages, PACML*, vol.5 (POPL), No.:28, 2021.

[2] Alois Brunel, Damiano Mazza and Michele Pagani, "Backpropagation in the simply typed lambda-calculus with linear negation", *Proceedings of the ACM on Programming Languages, PACML*, vol.4 (POPL), 64:1–64:27, 2020.

[3] Emma Kerinec, Giulio Manzonetto and Michele Pagani, "Revisiting Call-by-value Bohm trees in light of their Taylor expansion", *Logical Methods in Computer Science*, vol. 16, num. 3, 2020.

[4] Thomas Ehrhard, Michele Pagani et Christine Tasson, "Full Abstraction for Probabilistic PCF", *Journal of the ACM*, vol 65, num. 4, ACM, 2018.

[5] Giulio Manzonetto, Michele Pagani and Simona Ronchi della Rocca, "Some Relational Models for Call-by-Value λ-calculus", *Fundamenta Informaticae*, Annales Societatis Mathematicæ Polonae, vol.170(1-3), p.241-265, 2019.

[6] Thomas Ehrhard, Michele Pagani and Christine Tasson, "Measurable cones and stable, measurable functions: a model for probabilistic higher-order programming", *Proceedings of the ACM on Programming Languages, PACML*, vol.2(POPL), 59:1–59:28, 2018.

[7] Michele Pagani and Paolo Tranquilli, "The Conservation Theorem for Differential Nets", *Mathematical Structures in Computer Science*, vol. 27, num. 6, CUP, 2017.

[8] Michele Pagani, "Visible Acyclic Differential Nets", *Annals of Pure and Applied Logic*, vol. 163, num. 3, Elsevier, 2012.

[9] Daniel de Carvalho, Michele Pagani and Lorenzo Tortora de Falco, "A Semantic Measure of the Execution Time in Linear Logic", *Girard's Festschrift, special issue Theoretical Computer Science*, vol. 412, num. 20, Elsevier, 2011.

[10] Michele Pagani and Simona Ronchi della Rocca, "Linearity, Non-determinism and Solvability", *Jerzy Tiuryn's Festschrift, special issue Fundamenta Informaticae* (invited paper), Vol. 103, num. 1-4, IOS Press, 2010.

[11] Michele Pagani and Lorenzo Tortora de Falco, "Strong Normalization Property for Second Order Linear Logic", *Theoretical Computer Science*, Vol. 411, Elsevier, 2010.

[12] Michele Pagani, "Proofs, Denotational Semantics and Observational Equivalences in Multiplicative Linear Logic", *Mathematical Structures in Computer Science*, Vol. 17, num. 2, CUP, 2007.

Editor of conference proceedings (1):

[13] Sandra Alves and Michele Pagani, *Post-proceedings of the Ninth Workshop on Intersection Types and Related Systems and the Twelfth International Workshop on Developments in Computational Models*, EPTCS 293, 2019.

Publications in peer-reviewed international conferences (19):

[14] Gianluca Curzi and Michele Pagani, "The benefit of being non-lazy in probabilistic lambda-calculus", *35th Annual ACM/IEEE Symposium on Logic in Computer Science — LICS*, Hermanns, Zhang, Kobayashi et Miller editors, ACM 2020.

[15] Thomas Leventis and Michele Pagani, "Strong Adequacy and Untyped Full-Abstraction for Probabilistic Coherence Spaces", *International Conference on Foundations of Software Science and Computation Structures — FOSSACS*, Bojanczyk et Simpson ed., LNCS 11425, Springer 2019.

[16] Simona Kasterovic and Michele Pagani, "The Discriminating Power of the Let-In Operator in the Lazy Call-by-Name Probabilistic lambda-Calculus", *International Conference on Formal Structures for Computation and Deduction — FSCD 2019*, Geuvers ed., LIPICS 2019.

[17] Thomas Ehrhard, Michele Pagani and Christine Tasson, "The Free Exponential Modality of Probabilistic Coherence Spaces", *Proceedings of the 20th International Conference on Foundations of Software Science and Computation Structures — FOSSACS 2017*, Murawski ed., ARCoSS, LNCS 2017.

[18] Michele Pagani, Christine Tasson and Lionel Vaux, "Strong Normalizability as a Finiteness Structure via the Taylor Expansion of lambda-terms", *Proceedings of the 19th International Conference on Foundations of Software Science and Computation Structures — FOSSACS 2016*, Jacobs and Lodig ed., ARCoSS, LNCS 2016.

[19] Flavien Breuvart, Michele Pagani, "Modelling Coeffects in the Relational Semantics of Linear Logic", *Proceedings of the 24th EACSL Annual Conference on Computer Science Logic — CSL 2015*, Kreutzer ed., LIPICS, 2015.

[20] Michele Pagani, Peter Selinger and Benoit Valiron, "Applying Quantitative Semantics to Higher-order Quantum Computing", *ACM SIGACT-SIGPLAN Symposium on Principles of Programming Languages — POPL 2014*, Sewell ed., ACM 2014.

[21] Thomas Ehrhard, Michele Pagani and Christine Tasson, "Probabilistic Coherence Spaces are Fully Abstract for Probabilistic PCF", *ACM SIGACT-SIGPLAN Symposium on Principles of Programming Languages — POPL 2014*, Sewell ed., ACM 2014.

[22] Pierre Boudes, Fanny He and Michele Pagani, "A Characterization of the Taylor Expansion of the Lambda-Terms", *EACSL Annual Conference on Computer Science Logic — CSL 2013*, Ronchi della Rocca ed., LIPICS, 2013.

[23] Jim Laird, Giulio Manzonetto, Guy McCusker and Michele Pagani, "Weighted Relational Models of Typed Lambda-Calculi", *Annual IEEE Symposium on Logic in Computer Science — LICS 2013*, Kupferman ed., IEEE, 2013.

[24] Alejandro Diaz-Caro, Giulio Manzonetto and Michele Pagani, "Call-by-Value Non-determinism in a Linear Logic Type Discipline", *International Symposium on Logical Foundations of Computer Science — LFCS 2013*, Artemov and Nerode ed., LNCS, 2013.

[25] Thomas Ehrhard, Michele Pagani and Christine Tasson, "The Computational Meaning of Probabilistic Coherence Spaces", *Annual IEEE Symposium on Logic in Computer Science — LICS 2011*, Grohe ed., IEEE, 2011.

[26] Giulio Manzonetto and Michele Pagani, "Böhm's Theorem for Resource Lambda Calculus through Taylor Expansion", *International Conference on Typed Lambda Calculi and Applications — TLCA 2011*, Ong ed., Springer ARCoSS, 2011.

[27] Michele Pagani and Simona Ronchi della Rocca, "Solvability in Resource Lambda-Calculus", *Foundations of Software Science and Computation Structures — FOSSACS 2010*, Ong ed., Springer LNCS 6014, 2010.

[28] Michele Pagani and Paolo Tranquilli, "Parallel Reduction in Resource Lambda-Calculus", *Asian Symposium on Programming Languages and Systems — APLAS 2009*, Hu ed., Springer LNCS 5904, 2009.

[29] Michele Pagani and Christine Tasson, "The Inverse Taylor Expansion Problem in Linear Logic", *Annual IEEE Symposium on Logic in Computer Science — LICS 2009*, Pitts ed., IEEE, 2009.

[30] Michele Pagani, "The Cut-Elimination Theorem for Differential Nets with Boxes", *International Conference on Typed Lambda Calculi and Applications — TLCA 2009*, Curien ed., Springer LNCS 5608, 2009.

[31] Damiano Mazza and Michele Pagani, "The Separation Property for Differential Interaction Nets", *International Conference on Logic for Programming Artificial Intelligence and Reasoning — LPAR 2007*, Dershowitz ed., Springer LNAI 4790, 2007.

[32] Michele Pagani, "Acyclicity and Coherence in Multiplicative Exponential Linear Logic", *EACSL Annual Conference on Computer Science Logic — CSL 2006*, Curien ed., Springer LNCS 4207, 2006.

Publications in peer-reviewed international workshops (3):

[33] Michele Pagani, "Intersection types, quantitative semantics and linear logic". *ITRS 2016: Eighth Workshop on Intersection Types and Related Systems*, workshop satellite de FSCD 2016;

[34] Michele Pagani, "A Bird's Eye View on Linear Logic Quantitative Semantics". *QAPL 2014: Quantitative Aspects of Programming Languages and Systems*, workshop satellite de ETAPS 2014;

[35] Michele Pagani and Marco Gaboardi, "Can Resource Calculus Be Resource Conscious?". *DICE 2010: Developments in Implicit Computational complExity*, workshop satellite de ETAPS 2010.

Monographs (2):

[36] Michele Pagani, *Some Advances in Linear Logic.* Habilitation à diriger des recherches, Université Paris 13, 2013.

[37] Michele Pagani, *Proof Nets and Cliques: towards the Understanding of Analytical Proofs.* Ph.D Thesis, Università di Roma Tre (Roma) and Université Aix-Marseille II (Marseille), 2006.

Submitted pre-prints (2):

[38] Thomas Ehrhard, Claudia Faggian, Michele Pagani, *The Sum-Product Algorithm for Quantitative Multiplicative Linear Logic.* Submitted.

[39] Thomas Ehrhard, Claudia Faggian, Michele Pagani, *The Variable Elimination Algorithm Wears Linear Lambda-Calculus.* Submitted.