Curriculum Vitæ et Studiorum

Massimo Nocentini

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Personal data

I was born in Italy on 8 January 1986 and I live in Florence, Italy.

Education

Currently I'm a PhD student at the University of Florence, affiliated to the Dipartimento di Statistica, Informatica e Applicazioni (DiSIA [1]), supervised by prof *Donatella Merlini* [2]; in the past,

- Master Laurea degree in Computer Science, thesis title *Patterns in Riordan arrays*, supervised by prof. Donatella Merlini, University of Florence, 2015.
- Laurea degree in Computer Science, thesis title *Analysis of metabolic networks based on connection properties*, supervised by prof. Pierluigi Crescenzi, University of Florence, 2012.
- Maturity exam on Computer Science, Meucci Technical Institute, ABACUS project, Florence, 2005.

[1] https://www.disia.unifi.it/

[2] http://local.disia.unifi.it/merlini/

Scientific activity

His research activity concerns (i) the study of *formal methods and their applications* to the analysis of algorithms and data structures, (ii) supporting them with *software abstractions* implemented using functional programming languages, (iii) toward the field of *mechanized mathematics*. A solid base for such methods comes from the field of analytic combinatorics, which comprises tools such as generating functions, Riordan arrays and the symbolic method. Many interesting books by Flajolet and Sedgewick[3], Knuth[4] and Graham et al. [5] exist on those topics; moreover, see Harrison[6], Friedman and Felleisen [7] and Byrd et al.[8] for implementation aspects.

He desires to have a solid grasp of such powerful techniques in order to think about combinatorial *interpretations* of analytic results about classes of abstract objects in order to show *combinatorial meanings* and, possibly, characterizations in terms of lattice paths, urn models, bracelet configurations, boards tiling and so on, in the spirit of Benjamin and Quinn [9] and Stanley[10].

He believes that abstract and formal contexts should be paired up with sounding computer programs that show their beauty and elegance; this parallel path allows him to code in Lisp, Python, OCaml and Haskell during his daily work.

[3] Flajolet and Sedgewick. *Analytic Combinatorics*, Cambridge University Press, 2009.

[4] Knuth. *The Art of Computer Programming*, vol. 1-3, Addison-Wesley, 1973.

[5] Graham, Knuth and Patashnik. *Concrete Mathematics: A Foundation for Computer Science*, Addison-Wesley, 1994.

[6] Harrison. *Handbook of Practical Logic and Automated Reasoning*, Cambridge University Press, 2009; and *The HOL Light theorem prover*, User manual, 2017.

[7] Friedman and Felleisen. *The Little Schemer* and *The Seasoned Schemer* and *The Little MLer*, MIT Press.

[8] Byrd, Friedman and Kiselyov. *The Reasoned Schemer*, MIT Press.

[9] Benjamin and Quinn. *Proofs that really counts*, Mathematical Association of America, 2003.

[10] Stanley. *Enumerative combinatorics. Vol. 1&2*, Cambridge University Press.

Currently, he is supervised and collaborates with prof *Donatella Merlini* on advanced topic about *Riordan arrays*, in particular on binary words avoiding patterns, lattice paths enumeration problems and transformations of infinite sequences of numbers; he would deepen his understanding of those concepts in order to make them central in his PhD thesis.

Moreover, he is collaborating with prof *Marco Maggesi* [11] to enhance the HOL Light theorem prover with an extension of the goals and tactics mechanism to support the relational paradigm, in the spirit of µkanren[12].

[11] http://web.math.unifi.it/users/maggesi/

[12] Hemann and Friedman. µ*Kanren: a Minimal Functional Core for Relational Programming*, Scheme2013, Alexandria.

Papers

- Donatella Merlini, Massimo Nocentini. *Functions and Jordan canonical forms of Riordan matrices*, currently under review by the journal *Linear Algebra and its Applications*, 2018.
- Donatella Merlini, Massimo Nocentini. *Algebraic generating functions for languages avoiding Riordan patterns*, in *Journal of Integer Sequences*, Volume 21, Article 18.1.3, 2018.
- Donatella Merlini, Massimo Nocentini. *Colouring Catalan triangle*.

Conferences

- *ESUG*, September 2018, Cagliari, Italy [13]: volunteer student and contributed the talk *Relational Programming in Smalltalk* [14].
- *ICFP*, September 2017, Oxford, UK [15]: volunteer student.
- *EuroPython*, July 2017, Rimini, Italy [16]: participant.
- *ECOOP*, July 2016, Rome, Italy [17]: volunteer student.
- *Second International Symposium on Riordan Arrays and Related Topics*, July 2015 Lecco, Italy [18]: contributed a talk about modular Catalan triangle $\mathcal{C}_{\equiv_2}$.

[13] https://esug.github.io/2018-Conference/conf2018.html

[14] https://github.com/massimo-nocentini/microkanrenst/releases/download/v1.0/esug.pdf

[15] https://conf.researchr.org/home/icfp-2017

[16] https://ep2017.europython.eu/

[17] http://2016.ecoop.org/

[18] https://www.mate.polimi.it/RART2015/

Seminars and Schools

- *Logic and Relational Programming* at Logic Department, University of Florence [19].
- *summary of 2nd year* PhD activities, University of Florence [20].
- *Algebraic gf avoiding Riordan patterns* at AORC Open School, Sungkyunkwan University [21].
- *EOIS tools* at AORC Open School, Sungkyunkwan University [22].
- *summary of 1st year* PhD activities, University of Florence [23].

[19] http://massimo-nocentini.github.io/PhD/mkpy/talk.html#

[20] http://massimo-nocentini.github.io/PhD/second-year-summary/talk.html#

[21] http://shb.skku.edu/_custom/skk/_common/board/download.jsp?attach_no=29038

[22] http://massimo-nocentini.github.io/PhD/skku-aorc-2017/oeistools.html#

[23] http://massimo-nocentini.github.io/PhD/first-year-summary/talk.html#

Teaching

He did two classes about *SymPy* to introduce symbolic manipulations on top of the Python language, within a course on *Analysis of Algorithms* taught by Donatella Merlini at the University of Florence; in addition, he translated lab sessions code from Maple to Python collected in notebooks available online [24].

[24] https://github.com/massimo-nocentini/pacc/tree/master/paa-course

Github

Working activity

During his studies he worked in middle-sized software houses [25] developing mainly client-server applications using industrial-strength languages such as Java and C#, for about eight years, part-time relationships in parallel with his studies.

[25] https://www.commitsoftware.it/ and http://www.negens.com/site/home.html