Curriculum Vitae of Lorenzo Carlucci - Ai fini della pubblicazione

Decreto Rettore Università di Roma La Sapienza D.R. n. 771/2018 del 15.03.2018

General Information

Full Name Lorenzo Carlucci

Date of Birth 20/04/1976

Spoken Languages Italian, French (fluent), English (fluent), German (intermediate)

Education

Ph.D. in Computer Science, May 2006, Dept. of Computer and Information Sciences, University of Delaware, Newark, DE, U.S.A. Title: *Cognitively-motivated results in Algorithmic Learning Theory*, Advisor: Prof. John Case.

Ph.D. in Mathematical Logic and Theoretical Computer Science, February 2006, Dept. of Mathematics, University of Siena, Siena, Italy. Title: *Some results on unprovable theorems*. Advisor: Prof. Franco Montagna. External Referees: Prof. Lev Beklemishev, Prof. Herman R. Jervell. Distinction: Excellent.

Diplome in Philosophical Disciplines, *Summa Cum Laude*, January 2000, Scuola Normale Superiore di Pisa, Pisa, Italy.Title: *Ennio De Giorgi's theories for the Foundations of Mathematics*. Advisors: Prof. Marco Forti, Prof. Ettore Casari.

Laurea in Philosophy (quadriennale), *Summa Cum Laude*, November 1999, Pisa University, Pisa, Italy. Title: *Independence proofs of Kirby-Paris' Hydra Theorem from Peano Arithmetic*. Advisors: Prof. Marco Forti (Dept. of Mathematics, University of Pisa), Prof. Enrico Moriconi (Dept. of Philosophy, University of Pisa).

Habilitation

2014: Habilitation to Associate Professor in Mathematical Logic (Abilitazione Scientifica Nazionale Professore di II Fascia 01/A1)

Appointments

from January 2009: **Assistant Professor** (Ricercatore), University of Rome La Sapienza, Computer Science Department.

2007–2008: **Post-Doc** (Assegnista di Ricerca), University of Rome La Sapienza, Computer Science Department.

2007–2008: **Research Fellow** of the Scuola Normale Superiore di Pisa.

Spring 2003–Spring 2005: **Research Assistant** and **Teaching Assistant**, University of Delaware, Dept. of Computer and Information Sciences, Newark, DE, U.S.A.

Research Summary

I work mostly in two areas: **proof theory of arithmetic and analysis** and **computability-theoretic learning theory**. In the first area I have worked on Reverse Mathematics and independence results from systems of arithmetic and analysis, and on the connection between classical combinatorics (e.g., Ramsey Theory, well-quasi-ordering theory, Braid groups, Banach Space Theory, Hindman's Theorem) and unprovability results. In the second area I worked on a number of

new learning paradigms in the context of inductive learning theory with a special emphasis on non-monotonic learning and on models featuring the use of notations for transfinite ordinal numbers. I also have an interest in Propositional Proof Complexity.

My work on the proof-theoretic and computational strength of combinatorial theorems has appeared in the **Proceedings of the American Mathematical Society**, **Proceedings of the London Mathematical Society**, the **Journal of Combinatorial Theory Series A**, and the **Journal of Symbolic Logic**. My work in learning theory has appeared in the **Journal of Symbolic Logic**, the **Journal of Computer and Systems Science**, **Information and Computation**, and has been presented at the major conferences of the field such as **COLT** and **ALT**. My only paper in Complexity Theory so far (joint with Galesi and Lauria) appeared in 2011 in the reference conference **CCC** and a journal version in the **ACM Transactions on Computational Logic**. I collaborated with prominent researchers in my research areas such as, e.g., Andreas Weiermann (University of Ghent), Patrick Dehornoy (University of Caen), Sanjay Jain, and Frank Stephan (University of Singapore).

Teaching Experience

2010-2018. *Logica Matematica per Informatica* (Graduate, taught yearly, University of Rome La Sapienza, Dept. of Computer Science).

2007-2018. TA for the following courses at the Computer Science Department of La Sapienza: *Progettazione di Algoritmi* (Undergraduate, in charge of exercises and exams), *Programmazione 2* (Undergraduate, in charge of exercises and exams)), *Introduzione agli algoritmi* (Undergraduate, in charge of exercises and exams)), *Progettazione di Sistemi digitali* (Undergraduate, in charge of exercises and exams)), *Metodi matematici per l'informatica* (Undergraduate, TA in charge of lectures and exams), *Fondamenti di Programmazione* (Undergraduate, TA in charge of lab).

2014. *Elective in Computational Learning Theory* (Graduate, Head instructor, University of Rome La Sapienza, Dept. of Computer Science).

2007. *Introduzione alla Teoria degli Insiemi* (PhD course), Scuola Normale Superiore di Pisa.

Spring 2003–Spring 2005. Teaching Assistant, University of Delaware, Dept. of Computer and Information Sciences, Newark, DE, U.S.A. *Introduction to Computer Science* (CISC 181, Undergraduate), *Bioinformatics* (CISC 667, Graduate), *Data Structures* (CISC 220, Undergraduate).

Awards and Honors

2006 Selected as one of the ten finalists for the prize *Kurt Gödel Centenary: Young Scholars' Competition*, organized by the Kurt Gödel Society. Award date: 04.28.06.

Funding Information

2008 Research Project "Shadows of Infinity" selected for full funding in the context of the invitation-only RFP "Exploring the Infinite, Phase I: Mathematics and Mathematical Logic" by the John Templeton Foundation (100 invitees worldwide, approx. 1/5 funded, of which approx. 30% funded for full amount requested).

2007 Telecom Italia "Progetto Italia" Fellowship (approx. 75.000 EU for 2 years), awarded through national competition, for research in Mathematical Logic at the Scuola Normale Superiore di Pisa.

Research Activities

July 2018 - invited talk at the *Workshop on Ramsey Theory and Computability*, University of Notre Dame Global Gateway, Rome, Italy July 913, 2018.

April 2018 - invited talk at the *Logic Seminar* of the Institute of Mathematics of the Czech Academy of Sciences, Prague.

February 2018 - invited talk at the *Workshop on Ramsey Theory of Equations and related topics*, 16th-17th February, 2018, Mathematics Department of the University of Pisa.

October 2017 - invited talk at the *Workshop on Proof Theory, Modal Logic and Reflection Principles 2017*, October 10-13, 2017, conference will be held at Steklov Mathematical Institute in Moscow, Russia.

September 2016 - invited talk at the *Workshop on Proof Theory, Modal Logic and Reflection Principles*, Tbilisi, Georgia Monday, September 5 – Friday, September 9, 2016. (declined).

January 2016 - invited talk at the conference *New Challenges in Reverse Mathematics*, 3 – 16 January 2016, National University of Singapore, Singapore. (declined).

September 2014 - invited talk at the *Proof Theory, Modal Logic and Reflection Principles*, Instituto Tecnológico Autónomo de Mexico, Mexico City, Mexico, September 29 - October 2, 2014. (declined).

July 2012 - invited talk at the *Model Theory and Proof Theory of Arithmetic*, Institute of Mathematics of the Polish Academy of Science, Bedlewo, Poland, 22-27 July, 2012. Title: *Three results related to the Paris-Harrington Theorem.*

June 2012 - invited talk at the *Latin American Symposium on Mathematical Logic*, Bogotá, Colombia (declined).

April 2012 - invited talk at the Workshop *Proof Theory and Modal Logic*, University of Barcelona, Spain. Title: *On Ramsey Theorems and Turing Jumps.*

September 2011 - Invited research stay at the Institute of Mathematical Sciences, National University of Singapore, Singapore (invited by Prof. Frank Stephan and Prof. Sanjay Jain)

March 2011 - *Paris-Harrington Tautologies*, invited talk at the Workshop *New Trends in Unprovability*, Department of Pure Mathematics and Computer Algebra, University of Ghent, Ghent, Belgium.

April 2007 - Research stay at the Department of Computer Science, University of Liverpool, Liverpool, UK (invited by Prof. A. Bovykin)

December 2007 - Research stay at the Department of Pure Mathematics and Computer Algebra, University of Ghent, Ghent, Belgium (invited by Prof. A. Weiermann).

April 2006 - *Phase transitions for old and new independence results*, invited presentation for the Gödel Centenary: Young Scholars' Competition, University of Vienna, Vienna, Austria.

November 2004 - Research stay, Dept. of Mathematics, University of Utrecht, Utrecht, The Netherlands (invited by Prof. Lev Beklemishev)

Program Committee Member Workshop on Ramsey Theory and Computability Theory will be held in Rome, Italy, July 9-13, 2018, University of Notre Dame Global Gateway, Rome

Scientific Committee Member International Conference Interactive Imagination, Rome, Italy, June 6-8, 2016, Istituto Svizzero, Rome

Organizer of the third Bertinoro workshop *Ramsey Theory in Logic, Combinatorics and Complex-*

ity, July 2018, (co-organizers: Nicola Galesi, Mauro Di Nasso, William Gasarch).

Organizer of the conference *Limits of Theorem proving* 2012, Rome 25–27 September (co-organizers: Olaf Beyersdorff, Nicola Galesi, Toniann Pitassi).

Organizer of the second Bertinoro workshop *Ramsey Theory in Logic, Combinatorics and Complexity* 2011 (co-organizers: Nicola Galesi, Pavel Pudlàk, Vojtech Rödl, Matteo Viale, Andreas Weiermann).

Organizer of the first Bertinoro Workshop *Ramsey Theory in Logic, Combinatorics and Complexity* 2009. (co-organizers: Nicola Galesi, Pavel Pudlàk, Andreas Weiermann).

Organizer of an Oberwolfach miniworkshop (0648b) *Logic, Combinatorics and Independence Results* (26.11.06–02.12.06).

Other Professional Activities

Reviewer for **Mathematical Reviews**, and for **Zentralblatt**.

Referee for **Journal of Computer and Systems Science**, **Bulletin of Symbolic Logic**, **Archive for Mathematical Logic**, **Logical Methods in Computer Science**, **Annals of Pure and Applied Logic**, **Logic Journal of the IGLP**, **Theoretical Computer Science**, **Journal of Symbolic Logic**, and conferences **SAT**, **CCC**, **TAMC** and **CiE**.

External Referee for the Ph.D. thesis of Michiel De Smet, *Unprovability and phase transitions in Ramsey Theory*, discussed June 2011, Department of Pure Mathematics and Computer Algebra, University of Ghent, Belgium.

External Referee for the Ph.D. thesis of Florian Pelupessy, *Connecting the provable with the unprovable*, November 2012, Department of Pure Mathematics and Computer Algebra, University of Ghent, Belgium.

Supervisor for the MS Thesis in Computer Science of Marcello Stanisci, *Sulla complessità dei teoremi Thin-Set e Free-Set di Friedman*, September 2013, La Sapienza.

Supervisor for the MA Thesis in Philosophy of Giandomenico Laviola, *Complessità computazionale e definibilità logica*, March 2013, University of Rome III.

Supervisor for the BS Thesis in Computer Science of Francesco Lepore, *The effective content and logical strength of Hindman's Finite Sums Theorem*, discussed December 2016, La Sapienza.

Supervisor for the MS Thesis in Computer Science of Leonardo Mainardi, *The Ordinal Analysis of* $\mathbf{RCA}_0 + \mathrm{WO}(\varepsilon_0)$, discussed March 20 2018, La Sapienza.

Supervisor for Honors students project of Vincenzo Botta, Giovanni Varricchione, and for "Attività formativa complementare" (Extra curricular activity) for Manuel Mauro, Roberto Ruccia, Daniele Tavernelli.

Summary of Scientific Achievements

Papers: 23 (2003-2018, 15 in International Journals, 8 in International Conference Proceedings)

Total Impact Factor 14,5

Total Citations 89 (Scopus)

Average Citations per Product 3.8 (Scopus)

H-index 6 (Scopus)

Publications Selected for the Evalution

1. L. Carlucci and J. Case, *On the necessity of U-shaped learning*, Invited paper in **Topics in Cognitive Science**, 5, (2013), 56-88, Special issue on *Why Formal Learning Theory matters for Cognitive Science.*

2. L. Carlucci, K. Zdanowski, *The strength of Ramsey's Theorem for coloring relatively large sets*, **Journal of Symbolic Logic**, 79:1, (2014), 89–102.

3. L. Carlucci, N. Galesi and M. Lauria, *On the Proof Complexity of Paris-Harrington and Off-Diagonal Ramsey Tautologies*, **ACM Transactions on Computational Logic** 17(4), (2016).

4. L. Carlucci, L.A. Kołodziejczyk, F. Lepore, K. Zdanowski, *New bounds on the strength of restrictions of Hindman's Finite Sums Theorem.* In J. Kari, F. Manea, and I. Petre, (editors), **Unveiling Dynamics and Complexity**, 13th Conference Computability in Europe 2017 (Turku, Finland, June 12-16, 2017), Springer, 2017, pp. 210–220.

5. L. Carlucci, *A weak variant of Hindman's Theorem stronger than Hilbert's Theorem.* **Archive for Mathematical Logic** 57 (2018), 381–389.

6. L. Carlucci, *Weak Yet Strong restrictions of Hindman's Finite Sums Theorem.* **Proceedings of the American Mathematical Society** 146 (2018), 819-829.

7. L. Carlucci, *A note on Hindman-type theorems for uncountable cardinals.* Accepted for publication in **Order** (Springer). Appeared online 24 January 2018 https://doi.org/10.1007/s11083-018-9452-9.

Complete List of Publications

1. L. Carlucci, *A new proof-theoretic proof of the independence of Kirby-Paris' Hydra Theorem*, **Theoretical Computer Science**, 300, (2003), 365–378.

2. L. Carlucci, *Worms, Gaps and Hydras*, **Mathematical Logic Quarterly**, 51:4, (2005), 342–350.

3. L. Carlucci, J. Case, S. Jain and F. Stephan, *Non U-shaped vacillatory and team learning*, Proceedings of the **Annual Conference on Algorithmic Learning Theory**, ALT 2005, *Lecture Notes in Artificial Intelligence*, n. 3734, 241–255, Springer.

4. L. Carlucci, S. Jain, E. Kinber and F. Stephan, *Variations on U-shaped learning*, in P. Auer, R. Meir (eds.), Learning Theory, Proceedings of the 18th **Annual Conference on Computational Learning Theory**, COLT 2005, *Lecture Notes in Computer Science*, n. 3559, 382–397, Springer 2005.

5. L. Carlucci, J. Case, S. Jain and F. Stephan, *Memory-Limited U-Shaped Learning*, in J. G. Carbonell, J. Siekmann (eds.), Learning Theory, Proceedings of the 19th **Annual Conference on Computational Learning Theory**, COLT 2006, *Lecture Notes in Computer Science*, n. 4005, 244–258, Springer 2006.

6. L. Carlucci, S. Jain, E. Kinber and F. Stephan, *Variations on U-shaped learning*, **Information and Computation**, 204:8, (2006), 1264–1294.

7. L. Carlucci, J. Case and S. Jain, *Learning Correction Grammars*, in N. H. Bshouty and C. Gentile (eds.), Proceedings of the 20th **Annual Conference on Computational Learning Theory**, COLT 2007, *Lecture Notes in Computer Science*, n. 4539, 203–217, Springer 2007.

8. L. Carlucci, J. Case, S. Jain and F. Stephan, *Results on memory-limited U-shaped learning*, **Information and Computation**, 205:10, (2007), 1551–1573.

9. L. Carlucci, J. Case, S. Jain and F. Stephan, *Non-U-shaped vacillatory and team learning*, in **Journal of Computer and System Sciences**, 74:4, (2008), 409–430.

10. L. Carlucci, *Incremental Learning with ordinal bounded example memory*, in R. Gavalda and G. Lugosi, T. Zeugmann, and S. Zilles, (eds.), Proceedings of the 20th **Annual Conference on Algorithmic Learning Theory**, ALT 2009, Porto, Portugal, 2009, 323–337, *Lecture Notes in Artificial Intelligence*, n. 5809, Springer Verlag, 2009.

11. L. Carlucci, J. Case and S. Jain, *Learning Correction Grammars*, **Journal of Symbolic Logic**, 74:2, (2009), 489–516.

12. L. Carlucci, G. Lee and A. Weiermann, *Classifying the phase transition threshold for regressive Ramsey numbers*, **Journal of Combinatorial Theory, Series A**, 118:2, (2011), 558–585.

13. L. Carlucci, P. Dehornoy and A. Weiermann, *Unprovability results involving braids*, **Proceedings of the London Mathematical Society**, 102:1, (2011), 159–192.

14. L. Carlucci, N. Galesi, M. Lauria *Paris-Harrington Tautologies*, in (eds.), Proceedings of **IEEE Conference on Computational Complexity** 2011, **CCC 2011**, San José, USA, 2011, 93–103.

15. L. Carlucci, K. Zdanowski, *A note on Ramsey Theorems and Turing Jumps*, In: Cooper S.B., Dawar A., Lwe B. (eds) How the World Computes. **CiE 2012**. Lecture Notes in Computer Science, vol 7318. Springer, Berlin, Heidelberg, 2012, pp. 89–95.

16. L. Carlucci, S. Jain and F. Stephan, *Learning with ordinal-bounded memory from positive data*, **Journal of Computer and System Sciences**, 78, (2012), 1623–1636.

17. L. Carlucci and J. Case, *On the necessity of U-shaped learning*, Invited paper in **Topics in Cognitive Science**, 5, (2013), 56-88, Special issue on *Why Formal Learning Theory matters for Cognitive Science.*

18. L. Carlucci, K. Zdanowski, *The strength of Ramsey's Theorem for coloring relatively large sets*, **Journal of Symbolic Logic**, 79:1, (2014), 89–102.

19. L. Carlucci, N. Galesi and M. Lauria, *On the Proof Complexity of Paris-Harrington and Off-Diagonal Ramsey Tautologies*, **ACM Transactions on Computational Logic** 17(4), (2016).

20. L. Carlucci, L.A. Kołodziejczyk, F. Lepore, K. Zdanowski, *New bounds on the strength of restrictions of Hindman's Finite Sums Theorem.* In J. Kari, F. Manea, and I. Petre, (editors), **Unveiling Dynamics and Complexity**, 13th Conference Computability in Europe 2017 (Turku, Finland, June 12-16, 2017), Springer, 2017, pp. 210–220.

21. L. Carlucci, *A weak variant of Hindman's Theorem stronger than Hilbert's Theorem.* **Archive for Mathematical Logic** 57 (2018), 381–389.

22. L. Carlucci, *Weak Yet Strong restrictions of Hindman's Finite Sums Theorem.* **Proceedings of the American Mathematical Society** 146 (2018), 819-829.

23. L. Carlucci, *A note on Hindman-type theorems for uncountable cardinals.* Accepted for publication in **Order** (Springer). Appeared online 24 January 2018 https://doi.org/10.1007/s11083-018-9452-9.