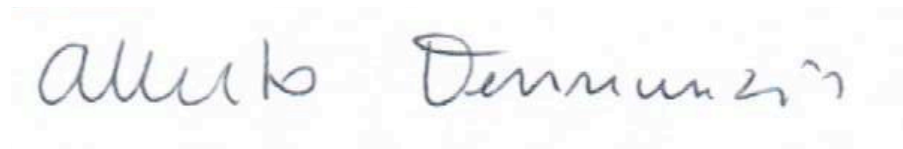# ALBERTO DENNUNZIO
CURRICULUM VITAE

DOCUMENTO REDATTO AI SENSI DEGLI ARTT. 76, 46 E 47 DEL D.P.R. 28 DICEMBRE 2000, N. 445 (DICHIARAZIONI SOSTITUTIVE DI CERTIFICAZIONI E DELL'ATTO DI NOTORIETÀ)

Il sottoscritto DENNUNZIO ALBERTO, Codice Fiscale DNNLRT74C28E648L, nato a Lodi (LO) il 28-03-1974, residente in Cassina De' Pecchi in via Volta n. 30, consapevole della responsabilità penale cui può andare incontro in caso di dichiarazione mendace, ai sensi degli art. 76, 46 e 47 del D.P.R. n. 445 del 28/12/2000,

DICHIARA

di aver svolto le attività e di possedere i titoli riportati nel seguente Curriculum Vitae comprendente l'Attività Scientifica, Didattica e Organizzativa.

Milano, 30 Maggio 2024

Indice

1 Personal Data and Contact Information

Dennunzio Alberto
Born in Lodi, Italy, on March 28, 1974.

Office Address:	Università degli Studi di Milano – Bicocca
	Dipartimento di Informatica, Sistemistica e Comunicazione
	viale Sarca 336, Milano, Italy
E-mail:	alberto.dennunzio@unimib.it

2 Education

1999: Laurea in Scienze dell'Informazione (Master in Computer Science), summa cum laude, Università degli Studi di Milano, Italy.

2004: PhD degree in Computer Science, Università degli Studi di Milano, Italy. Mention: excellent.

3 Academic Positions

[01/10/2016–today]
Associate Professor of Computer Science, Università degli Studi di Milano-Bicocca, Italy.

[01/09/2011-30/09/2016]
Assistant Professor (Ricercatore) of Computer Science, Università degli Studi di Milano-Bicocca, Italy.

[01/09/2010-31/08/2011]
Associate Professor (Maître de Conférences) of Computer Science, Université Nice Sophia Antipolis (now Université Côte d'Azur), France.

[01/09/2010-31/08/2011]
Chair of Computer Science, i.e., special research position at Centre National de la Recherche Scientifique (French National Centre for Scientific Research), France.

[01/01/2004-31/08/2010]
Assistant Professor (Ricercatore) of Computer Science, Università degli Studi di Milano-Bicocca, Italy.

4 Qualifications

11/09/2019: Italian National Scientific Qualification for the Academic Recruitment Field 01/B1 (Computer Science) as Full Professor.

26/07/2018: Italian National Scientific Qualification for the Academic Recruitment Field 09/H1 (Information Processing Systems) as Full Professor.

2010: French National Scientific Qualification for the Academic Recruitment Field 27 (Computer Science) as Associate Professor.

ATTIVITÀ DIDATTICA, DI DIDATTICA INTEGRATIVA E DI SERVIZIO AGLI STUDENTI

5 International and National Teaching Activities

5.1 Teaching activities for PhD students

A.A.[1] 2023-2024 PhD Course on Cellular Automata at University of Trieste, 24 hours (h), 3 ECTS

The same course is included in the PhD teaching program for A.A. 2024-2025

In each of the A.A. 2008-09 (10 h), 2009-10 (10 h), 2011-12 (6 h), 2012-13 (5 h), 2013-14 (5 h), and 2014-2015 (8 h): course on Discrete Dynamical Systems/Cellular Automata for PhD students[2] at Université Nice Sophia Antipolis (now Université Côte d'Azur) as Erasmus teacher.

Legend

B=Bachelor in Computer Science, M=Master in Computer Science, BS Bachelor in Materials/Environmental Science
L= Lecture, E=practice Exercise, EL=Laboratory Exercise

5.2 Abroad Teaching Activities for Bachelor and Master Programs

5.2.1 [A.A. 2010–2011] as Associate Professor at UNIVERSITÉ NICE SOPHIA ANTIPOLIS, FRANCE (due to the research chair position at CNRS, as honor, the teaching schedule has been limited to one-third)

Undergruaduate and Graduate Courses in Computer Science

A.A. 2010-2011

– Formal Tools for Computer Science , B, 36h (E)
– Simulation of Discrete Models, B, 9h (L) + 9h (EL), **Responsible**
– Complex Artificial Systems, M, 4h (L) + 4h (EL)

each hour (h) of Lecture is weighted with coefficient 1.5

5.2.2 Past teaching activities as Contract Professor at Université Nice Sophia Antipolis, France

In each of the A.A. 2006-2007, 2007-2008, and 2009-2010 teaching modules on Cellular Automata, course Complex Artificial Systems, M, 2h (L) + 2h (EL)

5.2.3 Past teaching activities as Erasmus Teacher Université Nice Sophia Antipolis, France

In each of the A.A. 2007-08, 2008-09, 2009-10, 2011-12, 2012-13, 2013-14, 2014-2015, and 2015-16 minicourse/seminar cycle of at least 5 hours on Discrete Dynamical Systems/Cellular Automata for Master students (and in several cases for PhD students, too, see Section 5.1).

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[1]A.A.= Anno Accademico (academic year)
[2]also for Master students except in the A.A. 2014-15

5.3 [2004–today] Teaching Activities for Bachelor and Master Programs at Università degli Studi di Milano-Bicocca

Undergraduate courses on the following topics:

- Computer Programming – Bachelor in Computer Science, 1st year

- Algorithms and Data Structures (Introduction and Advanced) – Bachelor in Computer Science, 1st and 3rd year

- Systems Theory – Bachelor in Computer Science, 3rd year

- Computer Science – Bachelor in Materials Science/Environmental Science, 1st year

Graduate courses on the following topics:

- complex systems, discrete dynamical systems and cellular automata

Details

B=Bachelor in Computer Science, M=Master in Computer Science, BS Bachelor in Materials/Environmental Science
L= Lecture, E=practice Exercise, EL=Laboratory Exercise

A.A. 2023-2024

- Algorithms and Data Structures (Advanced), B, 10 ECTS (L+E+EL), **Responsible**
- Complex and Uncertain Systems, M, 3 ECTS (L+E), **Responsible**

A.A. 2022-2023

- Algorithms and Data Structures (Advanced), B, 10 ECTS (L+E+EL), **Responsible**
  Evaluation by students (range [0,10]): Efficacia Didattica 8.68, Soddisfazione Complessiva 8.57
- Complex and Uncertain Systems, M, 3 ECTS (L+E), **Responsible**
  Evaluation by students: not available due to a low number of questionnaires

A.A. 2021-2022

- Algorithms and Data Structures (Introduction), B, 4 ECTS (L) **Responsible**
  Evaluation by students (range [0,10]): Efficacia Didattica 8.7, Soddisfazione Complessiva 8.77
- Algorithms and Data Structures (Advanced), B, 6 ECTS (E+EL)
- Complex and Uncertain Systems, M, 3 ECTS (L+E), **Responsible**
  Evaluation by students: not available due to a low number of questionnaires

A.A. 2020-2021

- Algorithms and Data Structures (Introduction), B, 4 ECTS (L) **Responsible**
  Evaluation by students (range [0,10]): Efficacia Didattica 8.64, Soddisfazione Complessiva 8.61
- Algorithms and Data Structures (Advanced), B, 6 ECTS (E+EL)
  Evaluation by students (range [0,10]): Efficacia Didattica 9.14, Soddisfazione Complessiva 8.87
- Complex and Uncertain Systems, M, 3 ECTS (L+E), **Responsible**
  Evaluation by students: not available due to a low number of questionnaires

A.A. 2019-2020

- Algorithms and Data Structures (Introduction), B, 4 ECTS (L)
  Evaluation by students (range [0,10]): Efficacia Didattica 8.5, Soddisfazione Complessiva 9.17
- Algorithms and Data Structures (Advanced), B, 6 ECTS (E+EL)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**
  Evaluation by students: not available due to a low number of questionnaires

A.A. 2018-2019

- Computer Programming 1, B, 6 ECTS (E+EL)
  Evaluation by students (range [0,3]): Efficacia Didattica 2.66, Soddisfazione Complessiva 2.56
- Algorithms and Data Structures (Advanced), B, 2 ECTS (EL)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**
  Evaluation by students (range [0,3]): Efficacia Didattica 2.94, Soddisfazione Complessiva 2

A.A. 2017-2018

- Computer Programming 1, B, 6 ECTS (E+EL)
- Algorithms and Data Structures (Advanced), B, 2 ECTS (EL)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**
  Evaluation by students: not available due to a low number of questionnaires

A.A. 2016-2017

- Algorithms and Data Structures (Introduction), B, 2 ECTS (EL)
- Computer Programming 1, B, 4 ECTS (E)
- Algorithms and Data Structures (Advanced), B, 2 ECTS (E)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**
  Evaluation by students (range [0,3]): Efficacia Didattica 2.42, Soddisfazione Complessiva 2.13

A.A. 2015-2016

- Algorithms and Data Structures (Advanced), B, 2 ECTS (E)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**
  Evaluation by students: not available due to a low number of questionnaires

A.A. 2014-2015

- Algorithms and Data Structures (Advanced), B, 4 ECTS (E)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**

A.A. 2013-2014

- Algorithms and Data Structures (Advanced), B, 4 ECTS (E)
- Complex and Uncertain Systems, M, 4 ECTS (L), **Responsible**

A.A. 2012-2013

- Algorithms and Data Structures (Introduction), B, 4 ECTS (EL)
- Systems Theory, B, 4 ECTS: 3 ECTS (L) + 1 ECTS (E), **Responsible**

A.A. 2011-2012

- Algorithms and Data Structures (Advanced), B, 3 ECTS: 2 ECTS (L) + 1 ECTS (E)
- Systems Theory, B, 4 ECTS: 3 ECTS (L) + 1 ECTS (E), **Responsible**

A.A. 2010-2011 year spent at Université Nice Sophia Antipolis (see 5.2).

A.A. 2009-2010

- Algorithms and Data Structures (Advanced), B, 4 ECTS: 2 ECTS (L) + 2 ECTS (E)
- Systems Theory, B, 4 ECTS: 3 ECTS (L) + 1 ECTS (E), **Responsible**

A.A. 2008-2009

- Algorithms and Data Structures (Introduction), B, 2 ECTS (E)
- Algorithms and Data Structures (Advanced), B, 2 ECTS (E)
- Systems Theory, B, 4 ECTS: 3 ECTS (L) + 1 ECTS (E), **Responsible**

A.A. 2007-2008

- Algorithms and Data Structures (Introduction), B, 2 ECTS (E)
- Algorithms and Data Structures (Advanced), B, 2 ECTS (E)
- Systems Theory, B, 5 ECTS: 4 ECTS (L) + 1 ECTS (E)

A.A. 2006-2007

- Algorithms and Data Structures (Introduction), B, 2 ECTS (E)
- Systems Theory, B, 5 ECTS: 4 ECTS (L) + 1 ECTS (E)

A.A. 2005-2006

- Computer Science, BS, 4 ECTS (L), **Responsible**
- Algorithms and Data Structures (Introduction), B, 2 ECTS (E)
- Systems Theory, B, 6 ECTS: 4 ECTS (L) + 2 ECTS (E)

A.A. 2004-2005

- Computer Science, BS, 4 ECTS (L), **Responsible**
- Algorithms and Data Structures (Introduction), B, 2 ECTS (E)
- Systems Theory, B, 5 ECTS: 4 ECTS (L) + 1 ECTS (E)

A.A. 2003-2004

- Systems Theory (Advanced), M, 5 ECTS: 4 ECTS (L) + 1 ECTS (E)
- Systems Theory, B, 6 ECTS: 4 ECTS (L) + 2 ECTS (E)

5.4   Past Teaching Activities

A.A. 2001-2002 and 2002-2003: Systems Theory and Advanced System Theory (Advanced), B, Instructor (E), *Università degli Studi di Milano-Bicocca*

A.A. 2001-2002, 2002-2003 and 2003-2004: **Teaching Tutor** at I and V Engineering Faculty, *Politecnico di Milano* (70h E+ 26h E+ 60h E).

5.5 Further Seminars

He held seminars also attended by PhD and Master students, see Sections 16.3.

6 Certificates of participation in specialization courses regarding innovative teaching methods in University

He attended the Workshop "Large Classroom Teaching" in 2018 (organized by Università degli Studi di Milano-Bicocca). A personal **open badge** certifies the acquired knowledge, skills, and abilities.

7 Thesis works with a highly qualifying profile

He supervised 2 Master thesis inside the Double Master Degree Program with Université Nice Sophia Antipolis (2018/2019 and 2021/2022).

8 Ph.D./Post-doc Supervision and Tutoring Activities

8.1 Bachelor and Master Thesis

He supervised 8 Master thesis (5 as "Relatore" and 3 as "Correlatore") and at least 13 Bachelor Thesis/Bachelor final stage (as "Relatore" or "Correlatore" or University Tutor).

Two among the master theses were inside the Double Master Degree Program with Université Nice Sophia Antipolis (2018/2019 and 2021/2022).

He also **co-supervised the research stage** of a Master student coming from University of Lyon (Julien Provillard, one month in 2008). This stage gave rise to new collaborations. The scientific results [69] were the basis for the subject of the Provillard's Ph.D. thesis which produced several joint publications (see Section 8.3).

8.2 International Ph.D. Co-tutorship Agreement

2019/2020–2021/2022 Sara Riva, Ph.D student on the subject "Factorization of Discrete Dynamical Systems", Ph.D. co-tutorship between Université Cote d'Azur (France) and Università degli Studi di Milano-Bicocca
Ph.D Thesis Co-supervisor
He was invited to join the Jury of the Ph.D. thesis defense of Sara Riva held in Nice in November 2022
Sara Riva is now Associate Professor (Maître de Conférences) at University of Lille (France)

8.3 International and Italian Ph.D./Post-doc Supervision and Collaborations

Most relevant collaborations where he gave a supervision contribution of the research activities:

09/2008-08/2009 Michael Weiss (Post-doc at Università degli Studi di Milano-Bicocca), on the subject "Computability of Tiling and Cellular Automata"
Co-supervisor Resulting joint publications: [68]

02/2007-07/2007 Benoit Masson (Post-doc at Università degli Studi di Milano-Bicocca), on the subject "Topological Properties of Sand Automata"
Supervisor Resulting joint publications: [40][71][73]

09/2010-12/2012 Julien Provillard (Ph.D at Université Nice Sophia Antipolis), on "Non-uniform Cellular Automata" (subject of his Ph.D. thesis).
He was invited to join the Jury of the PhD thesis defense of Julien Provillard
Resulting joint publications: [23][26][33][62][63]
Julien Provillard is now Associate Professor (Maître de Conférences) at Université de Lorraine (France).

03/2014-03/2018 Luca Manzoni (Post-doc at Università degli Studi di Milano-Bicocca), on the subjects "Cellular Automata" , "Reaction Systems", and "Discrete Dynamical Systems".
Informal Supervision Resulting joint publications: [15][16][17][19][20][56][57][58][59]

11/2009-02/2013 Luca Manzoni (Ph.D. at Università degli Studi di Milano-Bicocca), on "Asynchronous Cellular Automata" (which was the subject of a part of his Ph.D. thesis).
Informal Supervision Resulting joint publications: [24][29][35] [64][67]
Luca Manzoni is now Associate Professor at University of Trieste (Italy)

09/2009-08/2010 Michael Weiss (Post-doc at Université Nice Sophia Antipolis), on the subject "Computability of Tiling and Cellular Automata".
Informal Supervision Resulting joint publications: [22], see also Section 12 (awards and honors).

It has been formally scheduled that he will supervise **two 1-year post-docs** on the subject "Cellular Automata" (funded by PRIN PNRR "CASCA", see Section 9.2) starting from September/October 2024.

8.4 Tutoring for Students (including PhD)

A.A. 2023/2024-today Tutor of the PhD student Francesca Maccarone (at Università degli Studi di Milano-Bicocca)

A.A. 2001-2002, 2002-2003 and 2003-2004:
Teaching Tutor at I and V Engineering Faculty for Bachelor students, *Politecnico di Milano* (70h E+ 26h E+ 60h E).

See also 5.4.

ATTIVITÀ DI RICERCA SCIENTIFICA E PUBBLICAZIONI

9 Research Projects

9.1 International Projects

- **(48 months) Project Coordinator (i.e., Principal Investigator/Responsible)** of

    Marie Sklodowska-Curie Action MSCA, Horizon Europe, typology Staff Exchange "ACANCOS" ("Application-driven Challenges for Automata Networks and Complex Systems"),
    Project number 101131549, call HORIZON-MSCA-2022-SE, 437000 EUR
    Project selected for funding on 26/05/2023
    Subjects: Automata Networks (including Cellular Automata), Complex Systems, Applications
    Consortium Partners: Centro de Modelamiento Matematico (Universidad de Chile, Santiago, Chile), Instituto Presbiteriano Mackenzie (Sao Paulo, Brazil), University of Turku (Turku, Finland), CNRS (France), Université d'Aix-Marseille (Marseille, France), Università degli Studi di Trieste, Università degli Studi di Milano-Bicocca.

- **(48 months) Leader of the Work Package** "Coordination and Management" of the
    Marie Sklodowska-Curie Action MSCA, Horizon Europe, "ACANCOS" (see above)

- **(58 months)** I played the role of **Italian Coordinator** of

    International Project Interlink/MIUR 2006-2008 (extended to 2010), type C, "Cellular Automata: Topological Properties, Chaos and Associated Formal Languages". Partners: École Normale Superieure de Lyon, Université Paris-Est Marne-La Valleé, Université Nice Sophia Antipolis, Université de Provence (Marseille), Università degli Studi di Milano-Bicocca, Università degli Studi di Bologna.

    Main overall result of the project:
    a solid Italian-French Network for scientific collaborations which is still active today.

- **(12 months) Member** of

    International Project 2008 "Automates Cellulaires, Dynamique Symbolique et Décidabilité" of international scientific cooperation funded by the region Provence-Alpes-Cotes d'Azur (Francia). Partners: Université Nice Sophia Antipolis and Università degli Studi di Milano-Bicocca.

9.2 National Projects

- **(24 months) Unit Coordinator/Responsible** of

    PRIN PNRR "CASCA" ("Cellular Automata Synthesis for Cryptography Applications").
    Project number P2022MPFRT
    Project selected for funding on 28/07/2023
    Partners: Università degli Studi di Trieste, Università degli Studi di Milano-Bicocca

- **(24 months) Leader of the Work Package** "Theoretical study of the cryptographic properties of CA" of
    PRIN PNRR "CASCA" (see above).

Member of the following projects

- **Project** PON SmartCal 2017 per il potenziamento dell'offerta turistica italiana sulla base dell'integrazione delle nuove tecnologie e dei principi del turismo "Smart".

- **(36 months)**
  National Italian Project PRIN/MIUR 2010-2011 "Automata and Formal Languages: Mathematical and Applicative Aspects".

- **Project PON** Ricerca e Competitività 2007-2013 PON01_01286 "eJRM (electronic Justice Relationship Management)"

- **Project** "NEDD (Network Enabled Drug Design)" ID14546A Rif SAL-7 funded by Fondo per la Promozione di Accordi Istituzionali Regione Lombardia

- **(24 months)**
  National Italian Project PRIN/MIUR 2007-2009 "Mathematical Aspects and Emerging Applications of Automata and Formal languages".

- **(24 months)**
  National Italian Project PRIN/MIUR 2005-2007 "Automata and Formal languages: mathematical and application driven studies"

- **(24 months)**
  National Italian Project MIUR/COFIN 2003-2005 "Formal languages and Automata: Methods, Models and Applications".

- **(12 months)**
  Project "Cellulari Automata for simulation of two-phase fluid dynamics systems" (2002) funded by Università degli Studi di Milano-Bicocca (research funding for young researchers).

- **(24 mesi)**
  National Italian Project MIUR/COFIN 2001-2003 "Formal Languages and Automata: Theory and Applications".

9.3 Projects funded by privates Companies

Member of the following projects

- **(12 months)**
  Project funded by Enitecnologie (Italy) "Simulations of two-phase flows by Cellular Automata approach" (2001).

- **(12 months)**
  Project funded by Elf-Aquitaine (France) "Potential evaluation of the new representation methods of the dynamics of gas and liquid flow in the distillation or absorption columns" (01/2000–01/2001).

10 National and International Research Centre/Group Membership/Direction

<u>National</u>:

[11/2009–today] Co-Responsible/Responsible of a Research Laboratory at DISCo (Dipartimento di Informatica, Sistemistica e Comunicazione), Università degli Studi di Milano-Bicocca:
- **Co-Responsible (unique Responsible since 2017)** of the Laboratory "Complex and Uncertain Systems"
- Since 2020 **unique Responsible** of the Laboratory "Complex Systems"

[2019–today] Member of the AIIS "Artificial Intelligence and Intelligent Systems National Laboratory", CINI (National Interuniversity Consortium for Informatics).

<u>International</u>:

[2019–today] Member of the I3S Laboratory (= Department) of CNRS (Centre National de la Recherche Scientifique, French National Centre for Scientific Research), Sophia Antipolis, France, as external collaborator.

[2016–today] Member of the IFIP Working Group 1.5 "Cellular Automata and Discrete Complex Systems" of Technical Committee 1 "Foundations of Computer Science", IFIP (International Federation for Information Processing).

11 Editorial Activity

• **(Associate) Editor of International Journals**

04/2019–today Theoretical Computer Science, Elsevier
      https://www.journals.elsevier.com/theoretical-computer-science/editorial-board

08/2016–today Natural Computing (NaCo), Springer
      https://www.springer.com/journal/11047/editors

• **Guest Editor** of the following journals for special issues (see Section 15 for details)

- Information and Computation (1 issue)

- Natural Computing NaCo (5 issues)

- Fundamenta Informaticae (3 issues)

- International Journal of Foundations of Computer Science (1 issue)

• **Editor of 4** Volumes of the series Lecture Notes in Computer Science (LNCS) publishing **Conference Proceedings** (see Section 15.3 for details).

12   International Awards and Honors

2024 **Official Individual Nominator for the VinFuture Prize** consisting in identifying and nominating exceptional worldwide researchers and inventors in science, engineering & technology, to the four annual Prizes (Grand Prize of US\$ 3 million + three Special Prizes of US\$ 500,000)[3].

Besides institutional nominators (such as universities, see the note by CRUI, the Conference of Italian University Rectors https://crui.it/home-ri/vinfuture-prize-2022.html), there are individual nominators who are invited to become such by the VinFuture Prize Council on the basis their scientific career and contributions.

2023 **Marie Sklodowska-Curie Action MSCA grant as project coordinator**, see Section 9 devoted to research projects

2015 **The article**
"A. Dennunzio, E. Formenti, M. Weiss. Multidimensional cellular automata: closing property, quasi-expansivity, and (un)decidability issues. *Theoretical Computer Science*, 516: 40–59, 2014"
already published in 2014 has been selected for publication on the Special Issue of the journal Theoretical Computer Science (TCS) prepared in 2015 on the occasion of the 40th anniversary of its founding in order to give recognition to the most influential scientific production that has been published by TCS throughout the years 1975–2014. For every year since 1975, one paper has been selected.

A.A. 2010/11 **CNRS Chair**[4] , i.e., special position at French National Centre for Scientific Research providing

- research funding (10K euro per year)
- teaching schedule limited to one-third of the hours at Université Nice Sophia Antipolis.

A.A. 2010/11 **"Prime d'Excellence Scientifique" (Scientific Excellence Prize)** at CNRS–Université Nice Sophia Antipolis, France. Remunerated prize (5,5K euro).

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[3]As an example, before their Nobel Prize acknowledgment, the 2021 VinFuture Prize had honored Dr. Karikó and Prof. Weissman for their research on mRNA, enabling the development of effective COVID-19 vaccines

[4]In 2010, 73 Chairs were on the whole assigned in France, 6 out of them in the field of Computer Science/Computer Engineering.

13 Invited Speaker at International Conferences and Conference Participations

I attended many international conferences where the accepted conference papers had been presented, see Section 15.4 devoted to the articles published in the proceedings of peer-reviewed international conferences.

Invited Plenary Keynote Speaker et similia:

- **Invited keynote speaker** at ACRI 2024, the 16th International Conference on Cellular Automata for Research and Industry. ACRI series (with conference proceedings published in LNCS series) focuses on challenging problems and new research on Cellular Automata.

- **Invited keynote speaker** at AUTOMATA 2024, the 30th IFIP International Workshop on Cellular Automata and Discrete Complex Systems. AUTOMATA series (with conference proceedings published in LNCS series) is the official annual event of IFIP WG 1.5, the Working Group 5 (on Cellular Automata and Discrete Complex Systems), of the Technical Committee 1 (on Foundations of Computer Science), of the International Federation for Information Processing (IFIP).

- **Invited keynote speaker** at Workshop "Cellular Automata', satellite workshop of UCNC 2024, the 21st International Conference on Unconventional Computation and Natural Computation. UCNC series (with conference proceedings published in LNCS series) is mainly concerned with novel forms of computation, human-designed computation inspired by nature, and computational aspects of natural processes.

- **Invited keynote speaker** at UCNC 2025, the 22nd International Conference on Unconventional Computation and Natural Computation. UCNC series (with conference proceedings published in LNCS series) is mainly concerned with novel forms of computation, human-designed computation inspired by nature, and computational aspects of natural processes.

- **Speaker** at the conference "Complexity of Simple Dynamical Systems", 12-16 February 2024, during the thematic month on Discrete Mathematics and Computer Science held at CIRM in Marseille (by tradition, all the presented talks can be considered as sorts of **keynote lectures** previously proposed by the speakers and accepted for presentation by the scientific committee). Many leading experts in Cellular Automata theory usually attend this thematic month, especially as speakers.

14 Participation to Conference Committees and Conference Organization

Steering Committee Member of IFIP Working Conference-International Workshop "Cellular Automata and Discrete Complex Systems" (AUTOMATA), years 2017/18 and 2019/2020.

General and Program co-Chair of IFIP Working Conference-International Workshop "Cellular Automata and Discrete Complex Systems 2017" (AUTOMATA 2017), 23rd edition, Milan, June 2017.

Program co-Chair of
ACA 2018 (Int. Workshop on Asynchronous Cellular Automata and Asynchronous Discrete Models)
ACA 2016
ACA 2014
ACA 2012
ACA 2010

Program Committee (PC) member of
ACRI 2024 (Int. Conference on Cellular Automata for Research and Industry)
AUTOMATA 2024
AUTOMATA 2023
ACRI 2022
AUTOMATA 2022
AUTOMATA 2021
ACRI 2020
AUTOMATA 2019
ACRI 2018
AUTOMATA 2018
ACRI 2016
NCMA 2016 (Int. Workshop on Non-Classical Models of Automata and Applications)
UCNC 2014 (Int. Conference on Unconventional Computation and Natural Computation)
ACRI 2014
UCNC 2013
ACRI 2012
AUTOMATA 2012
ACRI 2010

Organizing Committee member of
ACRI 2022
ACRI 2018
CiE 2013 (Int. Conference on Computability in Europe)
UCNC 2013

Contribution to the Extended Stay Support Scheme for the Conferences
MCU 2024 (Int. Conference on Machines, Computations and Universality)
CMC 2024 (Int. Conference on Membrane Computing)

15 Publications

Besides many papers published in journals ranked by SJR in Q1, the list includes publications in very selective journals, as *Journal of Computer and System Sciences*, and very selective International Conferences, as *ICALP* and *MFCS*.

15.1 International Journal Articles

[1] A. Dennunzio, E. Formenti, and L. Margara. An efficient algorithm deciding chaos for linear cellular automata over $(\mathbb{Z}/m\mathbb{Z})^n$ with applications to data encryption. *Information Sciences*, 657: 119942, 2024.

[2] A. Dennunzio, E. Formenti, and L. Margara. An Easy to Check Characterization of Positive Expansivity for Additive Cellular Automata Over a Finite Abelian Group. *IEEE Access*, 11: 121246–121255, 2023.

[3] A. Dennunzio, E. Formenti, L. Margara, and S. Riva. An algorithmic pipeline for solving equations over discrete dynamical systems modelling hypothesis on real phenomena. *Journal of Computational Science*, 66: 101932, 2023.

[4] A. Dennunzio, E. Formenti, L. Manzoni, L. Margara, and G. Menara. A Topology for P-Systems with Active Membranes. *Journal of Membrane Computing*, 5: 193–204, 2023.

[5] S. Bandini, D. Briola, A. Dennunzio, F. Gasparini, M. Giltri, and G. Vizzari. Distance-based Affective States in Cellular Automata Pedestrian Simulation. *Natural Computing*, 2023. doi: 10.1007/s11047-023-09957-y

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15.2   International Book Chapters

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15.3   Editing of International Conference Proceedings

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15.4 Articles in Proceedings of (peer-reviewed) International Conferences

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15.5   Italian Publications

[81] A. Dennunzio. Formal Studies of Complex Systems: Cellular Automata Models. In Emerging Paradigms in Informatics, Systems and Communications, volume 2009-01 of *QD Quaderni*, pages 123–128. Starrylink Ed, 2009.

16 (Mainly International) Scientific Collaborations, Visiting, and Seminars

16.1 Most Relevant International Collaborations

[2019–2021] Scientific collaborations with Darij Grinberg (Drexel University, Philadelphia, USA).

[2006–today] Scientific collaborations with Université Nice Sophia Antipolis and I3S Laboratory (=Department) of CNRS, Sophia Antipolis.

[2019] Scientific collaborations with A. E. Porreca (Aix-Marseille Université, France).

[2011] Scientific collaborations with Petr Kurka (Charles University of Prague, Czech Rep.).

[2006-2010] Scientific collaborations with the French partners of the INTERLINK/MIUR project: Ecole Normale Superieure de Lyon, Université Paris-Est Marne-La Vallée, Université Nice Sophia Antipolis, Université de Provence (Marseille), Università degli Studi di Bologna.

16.2 Visiting and invitations abroad

04/2014 1 week invited at team MC3 (Models of Computation, Complexity, and Combinatorics) of the I3S Laboratory of CNRS, Sophia Antipolis, France

07/2012-08/2012 6 weeks invited at team MC3 (Models of Computation, Complexity, and Combinatorics) of the I3S Laboratory of CNRS, Sophia Antipolis, France

02/2011 1 week invited at Charles University of Prague (Czech Rep.).

2006-2010 ($\approx$ 6 months) Several periods spent in France research activity at the University partners of the international Project INTERLINK/MIUR

summer/fall 2008 3 months invited at team MC3 (Models of Computation, Complexity, and Combinatorics) of the I3S Laboratory of CNRS, Sophia Antipolis, France

16.3 Seminars

- 16/04/2014: Université Nice Sophia Antipolis, Nice, France.
- 21/02/2012 Université Nice Sophia Antipolis, Nice, France.
- 30/04/2010: I3S Laboratory of CNRS, Sophia Antipolis, France.
- 25/02/2010: LAMA Laboratory of CNRS, Le Bourget-du-Lac, France.
- 19/02/2010: during the meeting Math-Info 2010, CIRM, Marseille, France.
- 12/05/2009: Dipartimento di Scienze dell'Informazione, Universitá degli Studi di Milano.
- 02/12/2008: during the meeting of the French National Project ANR "Sycomore" on Complex Systems.
- 16/07/2008: I3S Laboratory of CNRS, Sophia Antipolis, France.

17 Evaluation Activities

- Invited to be reviewer of project proposals for the Chilean "National Fund for Scientific & Technological Development" (FONDECYT), Ministerio de Educacion, Chile (2011, 2017, 2021, and 2023(2)).

- Referee for several International Journals:

  - Information Sciences,
  - Information & Computation,
  - Theory of Computing Systems,
  - Theoretical Computer Science,
  - Fundamenta Informaticae,
  - Natural Computing,
  - Mathematics and Computer in simulation,
  - Journal of Cellular Automata
  - International Journal of Computer Mathematics

- Referee for several (peer-reviewed) International Conferences:

  - Symposium of Theoretical Aspects of Computer Science (STACS)
  - Mathematical Foundations of Computer Science (MFCS)
  - Computability in Europe (CiE)
  - Developments in Language Theory (DLT)
  - Language and Automata Theory and Applications (LATA)
  - Unconventional Computation and Natural Computation (UCNC)
  - Cellular Automata and Discrete Complex Systems (Automata)
  - Cellular Automata for Research and Industry (ACRI)
  - Developments in Computational Models (DCM)
  - European Conference on Artificial Life (ECAL)

18 Research Description

Keywords. Complex Systems, Discrete Modelling, Simulation, Cellular Automata, Collective Intelligence, Applications, Decidability and Computational Complexity Issues.

The researches conducted by Alberto Dennunzio deal with *Complex Systems*, i.e., multitudes of elementary components which cooperate and produce complex behaviors. In particular, formal models for describing and *simulating* Complex Systems are considered and studied.

A particular attention is focused on *Cellular Automata* (and several variants as asynchronous models, non-uniform models, models with higher-order memory, ..., as well as affine models as Automata *Networks*). They are models based on simple local rules that are able to exhibit complex emerging behaviors and then describe/simulate phenomena of *Collective Intelligence* and reaction-diffusion processes. For all these reasons, they are used for designing several applications in different domains (image processing, data encryption, pseudo-random number generation, simulations of biological, chemical, physical, social and economical phenomena, etc.).

Other models under consideration for describing, modelling and simulating complex systems are *Reaction Systems* and *Agent Systems*.

Research Tasks. His research tasks mainly focus on

- *Formal Studies of Complex Systems.*

  The goal is to understand the long-term behavior of formal models for Complex Systems. He pursues this aim through

    - the investigation of properties describing complex behaviors (reachability, reversibility, stability, instability, chaos, periodic behaviors, ...);
    - the study of the decidability of such properties along with the detection of decision algorithms;
    - the detection of non trivial subclasses of the model where the properties become decidable when they are not in the general case;
    - the study of the computational complexity of the decision algorithms.

- *Collective Intelligence: Emergent Behavior from Local Interactions.*

  He deals with the problem of identifying and possibly characterizing the interactions of the elementary components giving rise to a certain global behavior. The results of this research line have strong applications concerning the modelling and simulation of phenomena from the real world.

- *Applications: Simulation of real phenomena/processes*.

  He performed modelling and simulation of specific real complex phenomena:

    - predator-prey systems, including virus-cell interactions;
    - dynamic load balancing in networks;
    - fluidynamical systems;

  He is currently dealing with applications of Cellular Automata to cryptosystems for designing and improving

    - data encryption methods;
    - pseudo random number generators .

  He recently started a research line on *Agent Systems* in the field of *Affective Computing*. A particular attention concerns the modelling and simulation of the spatial interactions among human beings during the pandemic caused by the SARS-COV-2 virus.

ATTIVITÀ GESTIONALI, ORGANIZZATIVE, DI SERVIZIO E DI TERZA MISSIONE

19 Service Activities

19.1 University

A.A 2020/21–today + A.A. 2015/16 and 2016/17 (until 12/04/17)

Member of the University Orientation Committee of the University of Milano-Bicocca.
The University Orientation Committee of the University of Milano-Bicocca decides the strategies and policies of orientation (incoming, ongoing and outgoing orientation) for the entire University promoting the related initiatives.

19.2 Faculty

A.A. 2015/16 and 2016/17 (until 03/04/17)

President of the Faculty Orientation Committee of the Faculty of Science, University of Milano-Bicocca.
Main tasks of the Committee: Annual Organization of

- Open Day (3 each year) of the Bachelor Programs of the Faculty of Science;
- section devoted to the Bachelor Programs of the Faculty of Science during the University Open Day (2 each year) of the Bachelor Programs;
- section devoted to the Master Programs of the Faculty of Science during the University Open Day of the Master Programs;
- orientation initiative "Primavera in Bicocca: prova il tuo futuro. Studiare Scienze: conoscere, sperimentare e innovare" regarding the Bachelor Programs of the Faculty of Science;
- orientation meetings at high schools for presenting the Bachelor Programs of the Faculty of Science;
- preparation of the material (brochure, . . .) regarding the Bachelor and Master Programs of the Faculty of Science.

A.A. 2012/13–today

Member of the Faculty Orientation Committee of the Faculty of Science, University of Milano-Bicocca.

19.3 Department

11/2018–A.A. 2020/2021

Vice President of the Bachelor and Master Programs in Computer Science (Vicepresidente del Consiglio di Coordinamento Didattico dei Corsi di Laurea Triennale e Magistrale in Informatica) at DISCo[5].

As such, in 2019 he attended in the work concerning the periodic accountability and assessment of the Master Program in Computer Science by ANVUR held in March 2019: material preparation, preparatory meetings, auditions, etc.).

A.A. 2012/13–A.A. 2022/23

Responsible of the Orientation Committee of the Bachelor and Master Programs in Computer Science at DISCo (**member since 2009**)

Main overall results:

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[5]DISCo=Department of Informatics, Systems, and Communication, University of Milano-Bicocca

- strong increase of the number of the enrolled students at the Master in CS from 2012 (43) to 2020 (134): 43, 79, 62, 92, 108, 102, 117, 123, 134;
- strong increase of the number of candidates for the Bachelor in CS from 2013 (346) to 2019 (680);
- high mark (8/10)[6] concerning the evaluation of the Orientation activities by ANVUR during the periodic accountability and assessment of the Master in CS held in March 2019.

Main annual tasks of the Committee:

- contribution to the organization of the University Open Days and Faculty Open Days and presentation of the Bachelor Program in Computer Science during these events;
- presentations of the Bachelor Program in Computer Science at the high schools;
- organization of a meeting for promoting and presenting the Master Program in Computer Science (with the participation of ICT companies, too). Since 2017 the meeting has been replaced by the Joint Open Day of the Master's Degree Programs managed by DISCo, see below;
- (since A.A. 2014/15) organization of a meeting for presenting the elective courses of the Bachelor Program in Computer Science;
- (since A.A. 2015/16) organization of a cycle of meetings for presenting the elective courses of the Master Program in Computer Science;
- (since A.A. 2015/16) organization of meetings with ICT companies devoted to students of both the Bachelor and Master Program in Computer Science [in collaboration with the University Job Placement service];
- organization of a stage period (about a week) for students of high schools;
- (since 2015) contribution to the organization of "NERD?- Non È Roba per Donne?", initiative which also serves as incoming orientation, see Section 20;
- preparation of the orientation material (brochures, . . .) and updating of the orientation website.

A.A. 2020/21–today

Delegate of DISCo to the University Orientation Committee of the University of Milano-Bicocca
As such, he also organises (and he previously organized) the events regarding the whole Department:

- (**since 2017**) Annual Joint Open Day of the three Master's Degree Programs managed by DISCo (Computer Science, Data Science, Communication Theory and Technology);
- (**since 2014**) Lezioni Lincee di Scienze Informatiche, see Section 20.

A.A. 2015/16–A.A. 2020/21

Responsible of the teaching program quality ("Responsabile/Referente AQ") of the Bachelor in Computer Science at DISCo

2014-2017 (until 02/2017)

Designer and Responsible of an International Double Master Degree Program in Computer Science
between University of Milano-Bicocca and Université Nice Sophia Antipolis (Francia):
Definition of the Program started in 2014;
Responsible from 08/01/2016 until 02/2017.
(The agreement has been renewed later and it is still active today)

A.A. 2015/16–A.A. 2017/18

Member of the Teaching Committee ("Commissione Didattica") of DISCo.
In those years the Teaching Committee was a restricted Committee replacing CCD
(Coordination Committee of Bachelor's and Master's Degree Programs in Computer Science).

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[6]The mark of the overall evaluation of the Master was 6.2

A.A. 2013/14–today

> **Member of the Board of the PhD Program** ("Collegio Docenti del Dottorato di Ricerca") **in Computer Science** at University of Milano-Bicocca.

winter/spring 2021

> **Member of the Final Exam Board** for the PhD Program in Computer Science at University of Milano-Bicocca.

A.A. 2015/16–A.A. 2020/21

> **Member of the Committee for the teaching program quality ("Gruppo di Riesame/Gruppo AQ") of the Bachelor in Computer Science** at DISCo.

summer 2016

> **Member of the Selection Board** for admission to the PhD Program in Computer Science at DISCo.

A.A. 2012/13–A.A. 2016/17

> **Member of the Board** for admission to the Master Program in Computer Science at DISCo.

Service at I3S Laboratory (= Department) of CNRS, Sophia Antipolis, France:

22/05/2024 **Member of the Monitoring Committee (Comité de Suivi)** of the PhD student Benjelloun Kenza.

A.A. 2010/11

> **Responsible of Seminars of the team MC3 (Models of Computation, Complexity, and Combinatorics) at the I3S Laboratory of CNRS, Sophia Antipolis, France**.
> 19 Seminars organized.

20   University Third Mission

Public Engagement Activity and Collaboration with Industry

[A.A. 2014/15–today]

Organization of "Lezioni Lincee di Scienze Informatiche" in collaboration with Accademia dei Lincei
(one edition for every academic year since 2014/15[7], about 700/800 participants for each edition). The next edition is scheduled for autumn 2024.

Each edition consists of a cycle of seminars addressed to students and teachers of high schools with the goal of describing some scientific challenges of Computer Science.

[years 2015 and 2016]

Organization of the local editions 2015 and 2016 of "NERD? - Non E' Roba per Donne?" initiative by the IBM company
(about 200 participants for each local edition at the Milano-Bicocca)

Each edition consists of laboratory activities addressed to the girls of high schools for exposing them to Computer Science.

The initiative is still active today.

[2018/2019]

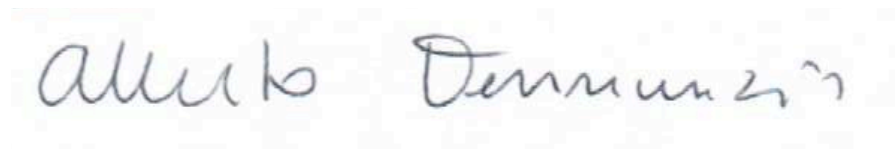**Collaboration with AIRI (Associazione Italiana Ricerca Industriale)** for the production of the Volume

"Le Innovazioni del prossimo futuro, Tecnologie prioritarie per l'industria", X Edizione – 2020, Volume 2 – Le Tecnologie Prioritarie, Agra Editrice.

See https://www.airi.it/tecnologie-prioritarie/

He is the author of the following contribution for that Report (single author, 7 pages):
"Tecnologia Prioritaria n. 4. Intelligenza Artificiale, Maching Learning e Deep Learning".

Milano, 30/05/2024

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[7]except in A.A. 2019/20, 2020/21, 2021/22, 2022/23, and 2023/24 because of the pandemic problems and their consequences