

Chiara F. Sironi

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Research Interests

I am a post-doctoral researcher at the Department of Advanced Computing Sciences (previously Data Science & Knowledge Engineering) at Maastricht University, where I also received my Ph.D. degree in 2019. My research focuses on Artificial General Intelligence (AGI). In particular, I am working on improving algorithms that address one of the key competences of AGI: search and planning. I am using General Game Playing (GGP) for board games and video games as main application domain to test my approaches. I addressed problems such as finding a computationally efficient way to reason on game rules, designing mechanisms for online learning of search control in Monte-Carlo Tree Search (MCTS), and devising mechanisms that automatically adapt search algorithms online to the game at hand. Evolutionary Algorithms and Reinforcement Learning are among the methods that I have applied in conjunction with MCTS to create game playing agents.

Research Experience

2019–2023 **Maastricht University** Maastricht, The Netherlands
Post-doctoral Researcher
Department of Advanced Computing Sciences

Education

2015–2019 **Ph.D. Researcher** Maastricht University, Maastricht, The Netherlands
Department of Data Science and Knowledge Engineering
Thesis title: "Monte-Carlo Tree Search for Artificial General Intelligence in Games"

2011–2014 **M.Sc. in Computer Science** University of Milano-Bicocca, Italy
Thesis title: "Agent-based Simulation Supporting Smart Grid Management"
Exchange student at Catholic University of Leuven (Belgium) for 5 months to carry out master's thesis project (2013-2014)
Erasmus exchange student at University of Antwerp for 8 months (2012)

2008–2011 **B.Sc. in Computer Science** University of Milano-Bicocca, Italy
Thesis title: "Analisi di Algoritmi di Saliienza Spaziotemporale" (Analysis of Spatiotemporal Saliency Algorithms)

2007–2008 **Mathematics** University of Milano-Bicocca, Italy

2002–2007 **Liceo Scientifico** Liceo Marie Curie, Meda, Italy
Secondary school with focus on scientific subjects

Teaching Experience

Courses

2020-2021 **Maastricht University** Maastricht, The Netherlands
Course Coordinator and Lecturer
Responsible for the organization and delivery of the lectures of the course "Reasoning Techniques"

2019 **Maastricht University** Maastricht, The Netherlands
Teaching assistant
Assisted undergraduate students during programming laboratories and graded assignments for the course "Introduction to Programming"

2019	Maastricht University <i>Teaching assistant</i> Assisted undergraduate students during programming laboratories and graded assignments for the course "Software Engineering"	Maastricht, The Netherlands
2016–2019	Maastricht University <i>Teaching assistant</i> Assisted undergraduate students during programming laboratories and graded assignments for the course "Data Structure and Algorithms"	Maastricht, The Netherlands

Student's supervision

2021	Maastricht University <i>B.Sc. thesis supervisor</i> Title: "Comparison Of Agents For General Video Game Playing On Multi-Player Games"	Maastricht, The Netherlands
2021	Maastricht University <i>B.Sc. thesis supervisor</i> Title: "Hyper agent for 2-player General Video Game Playing"	Maastricht, The Netherlands
2021	Maastricht University <i>M.Sc. thesis co-supervisor</i> Title: "Automatic subgoal discovery in MCTS"	Maastricht, The Netherlands
2017–2018	Maastricht University <i>B.Sc. thesis co-supervisor</i> Title: "Selection Strategies & Opponent Models in Monte-Carlo Tree Search for the GVG-AI 2-Player Track"	Maastricht, The Netherlands
2016	Maastricht University <i>M.Sc. thesis co-supervisor</i> Title: "Enhancements for Real-Time Monte-Carlo Tree Search in General Video Game Playing"	Maastricht, The Netherlands
2015	Maastricht University <i>M.Sc. thesis co-supervisor</i> Title: "MCTS Based Agent for General Video Games"	Maastricht, The Netherlands
2015	Maastricht University <i>B.Sc. thesis co-supervisor</i> Title: "YAPProver, a Prolog-based Reasoner Integrated in the GGP-Base"	Maastricht, The Netherlands

Student's projects

2019–2020	Maastricht University <i>M.Sc. project supervisor</i> Title: "Improved algorithm selection in the hyper-agent approach to General Video Game Playing"	Maastricht, The Netherlands
2019–2021	Maastricht University <i>B.Sc. project tutor</i> Guided small groups of student in the process of managing project work	Maastricht, The Netherlands
2019–2022	Maastricht University <i>B.Sc. project examiner</i> Evaluating outcome of student projects on multi-agent surveillance and game AI	Maastricht, The Netherlands
2021	Maastricht University <i>Project skills teacher</i> Skill straining for students: "Group Dynamics" and "Team Dynamics - evaluating the project team-work"	Maastricht, The Netherlands

2017–2020

Maastricht University

Project skills teacher

Skill straining for students: LaTeX

Maastricht, The Netherlands

Scientific Activities

Research visits and talks

2021

Southern University of Science and Technology

Shenzhen, China

Invited webinar

Talk: “Enhancing Playout Policy Adaptation for General Game Playing (extended version).”

2017

Queen Mary University of London

London, United Kingdom

Research visit to the Game AI research group

Talk: “On-line Parameters Tuning for Monte-Carlo Tree Search in General Game Playing”

2016

Reikjavik University

Reikjavik, Iceland

Research visit to the Center for Analysis and Design of Intelligent Agents

Talk: “Enhancements for Real-Time Monte-Carlo Tree Search in General Video Game Playing”

2016

Maastricht University

Maastricht, The Netherlands

Talk at the 22nd Mathematical Modelling Competition: “Introduction to General Game Playing”

2015

Maastricht University

Maastricht, The Netherlands

Talk at the SIKS/DKE colloquium: “Agent-based Simulation Supporting Smart Grid Management”

Reviewing

2015–2023

Peer reviews

Reviewer for numerous journals, conferences and workshops, such as:

- IEEE Transactions on Games (TOG)
- ICGA Journal
- International Joint Conference on Artificial Intelligence (IJCAI)
- AAAI Conference on Artificial Intelligence (AAAI)
- IEEE conference on Computational Intelligence and Games (CIG)
- IEEE conference on Games (COG)
- IEEE Congress on Evolutionary Computation (CEC)
- AAAI Conference on Artificial Intelligence and Interactive Digital Entertainment (AIIDE)
- IEEE Symposium Series on Computational Intelligence (SSCI)
- International Conference on Computers and Games (CG)
- Benelux Conference on Artificial Intelligence (BNAIC)
- Computer Games Workshop (CGW)
- General Intelligence in Game-Playing Agents Workshop (GIGA)
- Monte Carlo Search Workshop (MCS)

Scientific memberships

2021–2023

Competitions Subcommittee – IEEE Computational Intelligence Society

Committee member

2020–2023

Games Technical Committee (GTC) – IEEE Computational Intelligence Society

Committee member

2019–2023

Netherlands Research School for Information and Knowledge Systems (SIKS)

Research fellow

2019–2021

ICGA Journal

Editorial manager

- 2015–2019 **Netherlands Research School for Information and Knowledge Systems (SIKS)**
Ph.D. student member
Attended numerous courses such as:
- Research Methods and Methodology for IKS
 - Foundations of Data Science; Data and Process Mining
 - Mathematical Methods for IKS
 - Trends and Topics in Multi Agent Systems
 - Knowledge Representation and Reasoning: Foundations and Applications

Event organisation

- 2020–2021 **Special Session on Games at the IEEE Congress on Evolutionary Computation 2021** Kraków, Poland
Co-organizer
- 2017–2018 **2018 IEEE conference on Computational Intelligence and Games (CIG 2018)** Maastricht, The Netherlands
Local Arrangements Chair
- 2016 **2016 5th World Congress of the Game Theory Society (GAMES 2016)** Maastricht, The Netherlands
Volunteer Staff

Awards/Grants

- 2021 **Finalist for the Cor Baayen Young Researcher Award 2021**
European Research Consortium for Informatics and Mathematics (ERCIM)
- 2021 **Distinguished Women Scientists Fund | DWSF 2020-21**
Awarded 1500€ travel grant by the Dutch Network of Women Professor (LNVH) to visit the Southern University of Science and Technology in Shenzhen, China
- 2020 **SWOL grant for scientific projects**
Awarded 5000€ grant by the University Fund Limburg for the acquisition of computing facilities to support student projects on AI for game playing

Publications

Journal articles

Analysis of the Impact of Randomization of Search-Control Parameters in Monte-Carlo Tree Search

Sironi, C. F., Winands, M. H. M.
Journal of Artificial Intelligence Research. Vol. 72, pp. 717-757, 2021.

Self-adaptive Monte-Carlo Tree Search in General Game Playing

Sironi, C. F., Liu, J., Winands, M. H. M.
IEEE Transactions on Games. Vol. 12, No. 2, pp. 132-144, 2020.

Books

Monte-Carlo Tree Search for Artificial General Intelligence in Games

Sironi, C. F.
Ph.D. thesis. Maastricht University, Maastricht, The Netherlands. ISBN 978-94-6380-553-7. BOXPress, 2019.

Conference articles

Adaptive General Search Framework for Games and Beyond

Sironi, C. F., Winands, M. H. M.
2021 IEEE Conference on Games (COG 2021). IEEE.

Automatic Goal Discovery in Subgoal Monte Carlo Tree Search

Jeurissen, D., Winands, M.H.M., Sironi, C.F., Perez Liebana, D.
2021 IEEE Conference on Games (COG 2021). IEEE.

Self-Adaptive Rolling Horizon Evolutionary Algorithms for General Video Game Playing

Gaina, R. D., Sironi, C. F., Winands, M. H. M., Perez Liebana, D., Lucas, S.
2020 IEEE Conference on Games (COG 2020), 2020, pp. 367–374.

Ludii - The Ludemic General Game System.

Piette, E., Soemers, D. J. N. J., Stephenson, M., Sironi, C. F., Winands, M. H. M. and Browne C.
24th European Conference on Artificial Intelligence (ECAI 2020), Vol. 325 of Frontiers in Artificial Intelligence and Applications, pp. 411-418.

Comparing Randomization Strategies for Search-Control Parameters in MCTS

Sironi, C. F., and Winands, M. H. M.
2019 IEEE Conference on Games (COG 2019), 2019. **Nominated for Best Paper Award.**

Implementing Propositional Networks on FPGA

Siwek, C., Kowalski, J., Sironi, C.F., and Winands M. H. M.
T. Mitrovic, B. Xue, X. Li (Eds.), AI 2018: Advances in Artificial Intelligence, Vol. 11320 of Lecture Notes in Computer Science, pp. 133-145. Springer, Cham, 2018.

Analysis of Self-adaptive Monte Carlo Tree Search in General Video Game Playing

Sironi, C. F. and Winands, M. H. M.
2018 IEEE Conference on Computational Intelligence and Games (CIG 2018), pp. 397-400.

Self-adaptive MCTS for General Video Game Playing

Sironi, C. F., Liu, J., Perez-Liebana, D., Gaina, R. D., Bravi, I., Lucas, S. M., Winands, M. H. M.
K. Sim, & P. Kaufmann (Eds.), Applications of Evolutionary Computation, EvoApplications, Vol. 10784 of Lecture Notes in Computer Science, pp. 358-375. Springer, Cham, 2018.

Enhancements for Real-Time Monte-Carlo Tree Search in General Video Game Playing

Soemers, D. J. N. J., Sironi, C. F., Schuster, T., Winands, M. H. M.
2016 IEEE Conference on Computational Intelligence and Games (CIG 2016), pp. 436-443, 2016. **Best Student Paper Award**

Comparison of Rapid Action Value Estimation Variants for General Game Playing

Sironi, C. F., Winands, M. H. M.
2016 IEEE Conference on Computational Intelligence and Games (CIG 2016), pp. 309-316, 2016.

Workshop articles

Enhancing Playout Policy Adaptation for General Game Playing

Sironi, C. F., Cazenave, T., Winands, M. H. M.
Monte-Carlo Search 2020 (MSC 2020), IJCAI workshop.

On-line Parameters Tuning for Monte-Carlo Tree Search in General Game Playing

Sironi, C. F., Winands, M. H. M.
6th Workshop on Computer Games, CGW 2017. Vol. 818 of Communications in Computer and Information Science, pp. 75-95. Springer, Cham, 2018.

Optimizing Propositional Networks

Sironi, C. F., Winands, M. H. M.
5th Workshop on Computer Games, CGW 2016, and 5th Workshop on General Intelligence in Game-Playing Agents, GIGA 2016, Vol. 705 of Communications in Computer and Information Science, pp. 133-151. Springer, Cham, 2017.

National Conference Articles

LUDII – Le Système Ludémique de General Game Playing

Piette, E., Soemers, D. J. N. J., Stephenson, M., Sironi, C. F., Winands, M. H. M. and Browne, C.
Conférence Nationale en Intelligence Artificielle (CNIA 2019), 2019. (In French)

Abstracts

On-line Parameter Tuning for Monte-Carlo Tree Search in General Game Playing

Sironi, C. F. and Winands, M. H. M.

Proceedings of the Thirtieth Benelux Conference on Artificial Intelligence (BNAIC 2018), pp. 235-236, 2018. (Extended Abstract)

Enhancements for Real-Time Monte-Carlo Tree Search in General Video Game Playing

Soemers, D. J. N. J., Sironi, C. F., Schuster, T., Winands, M. H. M.

Proceedings of the Twenty-Eight Benelux Conference on Artificial Intelligence (BNAIC 2016), pp. 184-185, 2016. (Extended Abstract)