Sasha Rubin

Curriculum Vitae

University of Naples "Federico II"
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Personal Information

Date of Birth	16.02.76
Place of Birth	South Africa
Citizenship	New Zealand
Languages	English (first language), Italian (B1)

Academic Qualifications

1999-2004	**PhD**, *Department of Mathematics and Department of Computer Science*, University of Auckland, Prize for the **best doctoral thesis in the Faculty of Science** and Montgomery memorial prize in logic from the Department of Philosophy.
1997-1998	**MSc**, *Department of Mathematics and Department of Computer Science*, University of Auckland, First Class.
1994-1996	**BSc**, *Department of Mathematics and Department of Computer Science*, University of Cape Town, Dean's Merit List.

Academic Appointments

2017-present	**PostDoc. (Computer Science)**, *University of Naples "Federico II"*, Fellow of the ASTREA lab.
2015-2017	**PostDoc. (Computer Science)**, *University of Naples "Federico II"*, Marie Curie Fellow of INdAM "F. Severi".
2014-2015	**PostDoc. (Computer Science)**, *TU Wien and TU Graz*.
2012-2014	**PostDoc. (Computer Science)**, *TU Wien and IST Austria*.
2010-2012	**Honorary Research Fellow (Computer Science)**, *University of Auckland*.
2010-2010	**Visiting Lecturer (Mathematics)**, *University of Cape Town*.
2009-2010	**Visiting Researcher (Computer Science)**, *University of Auckland*.
2008-2009	**Visiting Assistant Professor (Mathematics)**, *Cornell University*.
2004-2008	**Honorary Research Fellow (Computer Science)**, *University of Auckland*, New Zealand Science and Technology Postdoctoral Fellowship.

Research Interests

I work in formal methods, a branch of theoretical computer science, and study the power of automata theory (broadly construed) and mathematical logic for describing, reasoning and controlling systems. In particular, I work in the following areas: Formal methods (Modeling, Verification, Synthesis) of Multi-agent Systems (including Parameterised Systems, Distributed Systems, Probabilistic Systems, Timed Systems); Logics for Games and Strategic Reasoning; Foundations of Planning; Automata Theory; Finite and Algorithmic Model Theory.

ACM Computing Classification System

Theory of Computation [Models of Computation, Logic, Formal Languages and Automata Theory]

Computing Methodologies [Artificial Intelligence: Planning and Scheduling, Knowledge Representation and Reasoning, Distributed Artificial Intelligence]

Research Accomplishments

1999-2007 During my PhD I (and my co-authors) pioneered the development of the theory of automatic structures. My most cited publications in this area are: [C26] (94 citations; all citation counts are as reported by Google Scholar) and [J4] (85 citations).

2008-2011 I published a survey and extension of the main results in my thesis in the Bulletin of Symbolic Logic [J4]. With a PhD student of Erich Grädel's (Tobias Ganzow) I solved a 12 year-old conjecture of Courcelle's [C22].

2012-2014 In the last few years, I (with my co-authors) generalised a cornerstone paper on verification of parameterised systems ("Reasoning about Rings", E.A. Emerson, K.S. Namjoshi, POPL, 1995) from ring topologies to arbitrary topologies (34 citations) [C17]. We also completed a book, published by Morgan & Claypool, surveying decidability results in parameterised verification [B1].

2014-2017 I opened the direction of formal methods for parameterised light-weight mobile agents with [C16]. Subsequently (with my co-authors) I continued this direction and published in top rated conferences [C7], [C12] and won a best-paper award [C15] (invited to JAAMAS.)

Undergraduate Teaching

During my teaching undergraduate calculus at Cornell, I sought out a number of teaching mentors, including Maria Terrell (Department of Mathematics) and David Way (associate director of the Cornell University Centre for Teaching Excellence) to discuss successful teaching strategies, both philosophical and concrete. As a result, according to my student evaluations, I was clear, organised, proactively willing to help, and motivating.

Complete Courses

2010 **Logic and Computation**, *University of Cape Town, 40 students*, Duties: Designed the course, 30 lectures, 12 tutorials, 1 class test, 1 final exam, Department of Mathematics, University of Cape Town.

2008-2009 **Calculus for Engineers**, *Department of Mathematics, Cornell University, 25-30 students, taught 5 times*, Duties: Lectures, weekly online quizzes, marking.

2001 **Pre-calculus**, *Department of Mathematics, University of Wisconsin, Madison, +-30 students, taught 4 times*, Duties: Lectures, tutorials, marking.

2007 **Discrete Structures in Mathematics and Computer Science**, *Department of Computer Science, University of Auckland*, Duties: Lectures, tutorials.

2007 **Mathematical Foundations of Software Engineering** , *Department of Computer Science, University of Auckland*, Duties: Lectures, tutorials.

2003 **Introduction to Formal Verification**, *Department of Computer Science, University of Auckland*, Duties: Lectures, tutorials.

2002 **Automata theory**, *Department of Computer Science, University of Auckland*, Duties: Lectures, tutorials.

Undergraduate Mentoring

While at Cornell I mentored six students for three months. This resulted in two publications [J3], [C20] and gave students a taste of research to help them decide if they should pursue a PhD. While at IST Austria I co-mentored one intern which resulted in [C19]. I am currently co-mentoring an undergraduate thesis at the University of Naples.

2017 **Undergraduate thesis (4 months)**, *University of Naples*, Topic: Graphical Games.

2012 **Summer undergraduate project (3 months)**, *IST Austria*, Topic: Edit-distance and Formal Languages.

2009 **Summer research experience for undergraduates (3 months)**, *Cornell University*, Topic 1: Parity Games; Topic 2: Automatic Structures with Advice.

Outreach

2010 I briefly volunteered at a secondary school in Accra, Ghana, teaching, observing and commenting on grade 5 mathematics classes.

2010 I briefly volunteered in Khayelitsha, South Africa, helping high-school students prepare for their mathematics exams.

2009 I taught two interactive lectures to non-mathematics majors at Cornell University on i) Hilbert's Hotel and Infinite Cardinals and ii) Algorithms and Termination

Esteem

Invited Workshop Talks

2017 **Verification of Multi-Agent Systems with Imperfect Information and Public Actions**, *FMAI17, Naples*.

2012 **Finite and Algorithmic Model Theory**, *Les Houches, France*.

2011 **Automata theory and Applications**, *IMS programme, Singapore*.

2008 **Computational Model Theory**, *CNRS SIG, Bordeaux, France*.

2007 **Algorithmic-Logical Theory of Infinite Structures**, *Dagstuhl, Germany*.

2006 **Finite and Algorithmic Model Theory**, *Newton Institute, England*.

2004 **Workshop on Automata, Structures and Logic**, *Auckland, New Zealand*.

Graduate and School courses

2017 **Taught 10 hour PhD mini-course**, *Games on Graphs*, University of Naples.

2009 **Taught 1 semester PhD course**, *Logical Definability and Random Graphs*, Cornell University.

2006 **Co-taught 5 day advanced course**, *Logic and Computation in Finitely Presentable Infinite Structures*, European Summer School in Logic, Language and Information (ESSLLI).

Mentoring PhD students

2015 Closely worked with PhD students of Aniello Murano, and produced [W2], [C6], [C10]

2007 Closely worked with a PhD student of Erich Gradel's and solved a 12-year open problem [C22]

Chairs, Organisation, Committees

2017 Co-chair of the Italian Conference on Theoretical Computer Science (ICTCS)
`http://ictcs2017.unina.it/`

2017 Co-chair of the International Workshop on Strategic reasoning (SR)
`http://sr2017.csc.liv.ac.uk/`

2017 Co-organiser of the Italian Conference on Computational Logic (CILC)
`http://cilc2017.unina.it/`

2017 Co-organiser of the First Workshop on Formal Methods in AI (FMAI)
`https://sites.google.com/site/fmai2017homepage/`

2017 PC member of the International Joint Conference on Artificial Intelligence (IJCAI)

2017 PC member of the AAAI Conference on Artificial Intelligence (AAAI)

2017 PC member for IRISA Master Research Internship

2016 PC member of the International Workshop of Strategic Reasoning (SR)

2016 PC member of the International Symposium on Games, Automata, Logics and Formal Verification (GandALF)

2016 PC member of the European Conference on Artificial Intelligence (ECAI)

2013 Co-organiser of the IST Austria Young Scientist Symposium on the topic 'Understanding Shape: in silico and in vivo'
`ist.ac.at/young-scientist-symposium-2013/`

2012 Founded the computer science seminar at IST Austria whose goal was to foster collaborations within the institute between computer scientists and, at the time, biologists.
`ist.ac.at/computer-science-seminar/`

Research Funding

2004-2007 **3 year New Zealand Science and Technology Postdoctoral Fellowship**.

2015-2016 **2 year Marie Curie Fellowship of INdAM "F. Severi"**, *Ranked 4th out of 27 applicants*
`https://cofund.altamatematica.it/2012/main/website?page=call-1`.

Refereed Publications

Book

[B1] Roderick Bloem, Swen Jacobs, Ayrat Khalimov, Igor Konnov, Sasha Rubin, Helmut Veith, and Josef Widder. *Decidability of Parameterized Verification*. Synthesis Lectures on Distributed Computing Theory. Morgan & Claypool Publishers, 2015.

Book Chapter

[BC1] Vince Bárány, Erich Grädel, and Sasha Rubin. "Automata-based presentations of infinite structures". In: *Finite and Algorithmic Model Theory*. Ed. by Javier Esparza, Christian Michaux, and Charles Steinhorn. Cambridge Books Online. Cambridge University Press, 2011, pp. 1–76.

Journal Articles

[J1] Benjamin Aminof and Sasha Rubin. "First Cycle Games". In: *Information and Computation,* (2016).

[J2] Roderick Bloem, Swen Jacobs, Ayrat Khalimov, Igor Konnov, Sasha Rubin, Helmut Veith, and Josef Widder. "Decidability in Parameterized Verification". In: *SIGACT News* 47.2 (2016), pp. 53–64.

[J3] Andrey Grinshpun, Pakawat Phalitnonkiat, Sasha Rubin, and Andrei Tarfulea. "Alternating traps in Muller and parity games". In: *Theoretical Computer Science* 521 (2014), pp. 73–91.

[J4] Sasha Rubin. "Automata Presenting Structures: A Survey of the Finite String Case". In: *Bulletin of Symbolic Logic* 14.2 (2008), pp. 169–209.

[J5] Bakhadyr Khoussainov, André Nies, Sasha Rubin, and Frank Stephan. "Automatic Structures: Richness and Limitations". In: *Logical Methods in Computer Science* 3.2 (2007).

[J6] Bakhadyr Khoussainov, Sasha Rubin, and Frank Stephan. "Automatic linear orders and trees". In: *ACM Transactions on Computational Logic* 6.4 (2005), pp. 675–700.

Conference Articles

[C1] Francesco Belardinelli, Alessio Lomuscio, Aniello Murano, and Sasha Rubin. "Verification of Broadcasting Multi-Agent Systems against an Epistemic Strategy Logic". In: *International Joint Conference on Artificial Intelligence (IJCAI 2017)*. 2017.

[C2] Francesco Belardinelli, Alessio Lomuscio, Aniello Murano, and Sasha Rubin. "Verification of Multi-agent Systems with Imperfect Information and Public Actions". In: *Proceedings of the 2017 International Conference on Autonomous Agents & Multiagent Systems, São Paulo, May 8-12, 2017*. 2017.

[C3] Raphael Berthon, Bastien Maubert, Aniello Murano, Sasha Rubin, and Moshe Vardi. "Hierarchical Strategic Reasoning". In: *LICS 2017*. 2017.

[C4] Blai Bonet, Giuseppe De Giacomo, Hector Geffner, and Sasha Rubin. "Generalized Planning: Non-Deterministic Abstractions and Trajectory Constraints". In: *International Joint Conference on Artificial Intelligence (IJCAI 2017)*. 2017.

[C5] Julian Gutierrez, Aniello Murano, Giuseppe Perelli, Sasha Rubin, and Michael Wooldridge. "Nash Equilibria in Concurrent Games with Lexicographic Preferences". In: *International Joint Conference on Artificial Intelligence (IJCAI 2017)*. 2017.

[C6] Benjamin Aminof, Vadim Malvone, Aniello Murano, and Sasha Rubin. "Graded Strategy Logic: Reasoning about Uniqueness of Nash Equilibria". In: *Proceedings of the 2016 International Conference on Autonomous Agents & Multiagent Systems, Singapore, May 9-13, 2016*. 2016, pp. 698–706.

[C7] Benjamin Aminof, Aniello Murano, Sasha Rubin, and Florian Zuleger. "Automatic Verification of Multi-Agent Systems in Parameterised Grid-Environments". In: *Proceedings of the 2016 International Conference on Autonomous Agents & Multiagent Systems, Singapore, May 9-13, 2016*. 2016, pp. 1190–1199.

[C8] Benjamin Aminof, Aniello Murano, Sasha Rubin, and Florian Zuleger. "Prompt Alternating-Time Epistemic Logics". In: *Principles of Knowledge Representation and Reasoning: Proceedings of the Fifteenth International Conference, KR 2016, Cape Town, South Africa, April 25-29, 2016*. 2016, pp. 258–267.

[C9] Benjamin Aminof and Sasha Rubin. "Model Checking Parameterised Multi-token Systems via the Composition Method". In: *Automated Reasoning - 8th International Joint Conference, IJCAR 2016, Coimbra, Portugal, June 27 - July 2, 2016, Proceedings*. 2016, pp. 499–515.

[C10] Giuseppe De Giacomo, Antonio Di Stasio, Aniello Murano, and Sasha Rubin. "Imperfect information games and generalized planning". In: *International Joint Conference on Artificial Intelligence (IJCAI 2016)*. 2016.

[C11] Benjamin Aminof, Aniello Murano, and Sasha Rubin. "On CTL* with Graded Path Modalities". In: *Logic for Programming, Artificial Intelligence, and Reasoning - 20th International Conference, LPAR-20 2015, Suva, Fiji, November 24-28, 2015, Proceedings*. 2015, pp. 281–296.

[C12] Benjamin Aminof, Aniello Murano, Sasha Rubin, and Florian Zuleger. "Verification of Asynchronous Mobile-Robots in Partially-Known Environments". In: *PRIMA 2015: Principles and Practice of Multi-Agent Systems - 18th International Conference, Bertinoro, Italy, October 26-30, 2015, Proceedings*. 2015, pp. 185–200.

[C13] Benjamin Aminof, Sasha Rubin, Francesco Spegni, and Florian Zuleger. "Liveness of Parameterized Timed Networks". In: *Automata, Languages, and Programming - 42nd International Colloquium, ICALP 2015, Kyoto, Japan, July 6-10, 2015, Proceedings, Part II*. 2015, pp. 375–387.

[C14] Benjamin Aminof, Sasha Rubin, and Florian Zuleger. "On the Expressive Power of Communication Primitives in Parameterised Systems". In: *Logic for Programming, Artificial Intelligence, and Reasoning - 20th International Conference, LPAR-20 2015, Suva, Fiji, November 24-28, 2015, Proceedings*. 2015, pp. 313–328.

[C15] Aniello Murano, Giuseppe Perelli, and Sasha Rubin. "Multi-agent Path Planning in Known Dynamic Environments". In: *PRIMA 2015: Principles and Practice of Multi-Agent Systems - 18th International Conference, Bertinoro, Italy, October 26-30, 2015, Proceedings*. 2015, pp. 218–231.

[C16] Sasha Rubin. "Parameterised Verification of Autonomous Mobile-Agents in Static but Unknown Environments". In: *Proceedings of the 2015 International Conference on Autonomous Agents and Multiagent Systems, AAMAS 2015, Istanbul, Turkey, May 4-8, 2015*. 2015, pp. 199–208.

[C17] Benjamin Aminof, Swen Jacobs, Ayrat Khalimov, and Sasha Rubin. "Parameterized Model Checking of Token-Passing Systems". In: *Verification, Model Checking, and Abstract Interpretation - 15th International Conference, VMCAI 2014, San Diego, CA, USA, January 19-21, 2014, Proceedings*. 2014, pp. 262–281.

[C18] Benjamin Aminof, Tomer Kotek, Sasha Rubin, Francesco Spegni, and Helmut Veith. "Parameterized Model Checking of Rendezvous Systems". In: *CONCUR 2014 - Concurrency Theory - 25th International Conference, CONCUR 2014, Rome, Italy, September 2-5, 2014. Proceedings*. 2014, pp. 109–124.

[C19] Krishnendu Chatterjee, Siddhesh Chaubal, and Sasha Rubin. "How to Travel between Languages". In: *Language and Automata Theory and Applications - 7th International Conference, LATA 2013, Bilbao, Spain, April 2-5, 2013. Proceedings*. 2013, pp. 214–225.

[C20] Alex Kruckman, Sasha Rubin, John Sheridan, and Ben Zax. "A Myhill-Nerode theorem for automata with advice". In: *Proceedings Third International Symposium on Games, Automata, Logics and Formal Verification, GandALF 2012, Napoli, Italy, September 6-8, 2012*. 2012, pp. 238–246.

[C21] Alexander Rabinovich and Sasha Rubin. "Interpretations in Trees with Countably Many Branches". In: *LICS 2012, Proceedings of the 27th Annual IEEE Symposium on Logic in Computer Science, Dubrovnik, Croatia, June 25-28, 2012*. 2012, pp. 551–560.

[C22] Tobias Ganzow and Sasha Rubin. "Order-Invariant MSO is Stronger than Counting MSO in the Finite". In: *STACS 2008, 25th Annual Symposium on Theoretical Aspects of Computer Science, Bordeaux, France, February 21-23, 2008, Proceedings*. 2008, pp. 313–324.

[C23] Lukasz Kaiser, Sasha Rubin, and Vince Bárány. "Cardinality and counting quantifiers on omega-automatic structures". In: *STACS 2008, 25th Annual Symposium on Theoretical Aspects of Computer Science, Bordeaux, France, February 21-23, 2008, Proceedings*. 2008, pp. 385–396.

[C24] Bakhadyr Khoussainov and Sasha Rubin. "Decidability of Term Algebras Extending Partial Algebras". In: *Computer Science Logic, 19th International Workshop, CSL 2005, 14th Annual Conference of the EACSL, Oxford, UK, August 22-25, 2005, Proceedings*. 2005, pp. 292–308.

[C25] Doron Bustan, Sasha Rubin, and Moshe Y. Vardi. "Verifying omega-Regular Properties of Markov Chains". In: *Computer Aided Verification, 16th International Conference, CAV 2004, Boston, MA, USA, July 13-17, 2004, Proceedings*. 2004, pp. 189–201.

[C26] Bakhadyr Khoussainov, André Nies, Sasha Rubin, and Frank Stephan. "Automatic Structures: Richness and Limitations". In: *LICS 2004, 19th IEEE Symposium on Logic in Computer Science, 14-17 July 2004, Turku, Finland, Proceedings*. 2004, pp. 44–53.

[C27] Bakhadyr Khoussainov, Sasha Rubin, and Frank Stephan. "Definability and Regularity in Automatic Structures". In: *STACS 2004, 21st Annual Symposium on Theoretical Aspects of Computer Science, Montpellier, France, March 25-27, 2004, Proceedings*. 2004, pp. 440–451.

[C28] Bakhadyr Khoussainov, Sasha Rubin, and Frank Stephan. "On Automatic Partial Orders". In: *LICS 2003, 18th IEEE Symposium on Logic in Computer Science, 22-25 June 2003, Ottawa, Canada, Proceedings*. 2003, pp. 168–177.

[C29] Hajime Ishihara, Bakhadyr Khoussainov, and Sasha Rubin. "Some Results on Automatic Structures". In: *LICS 2002, 17th IEEE Symposium on Logic in Computer Science, 22-25 July 2002, Copenhagen, Denmark, Proceedings*. 2002, p. 235.

Workshop Articles

[W1] Blai Bonet, Giuseppe De Giacomo, Hector Geffner, and Sasha Rubin. "Generalized Planning: Non-Deterministic Abstractions and Trajectory Constraints". In: *ICAPS 2017 Workshop on Generalized Planning*. 2017.

[W2] Benjamin Aminof, Vadim Malvone, Aniello Murano, and Sasha Rubin. "Graded Strategy Logic". In: *Proceedings 4th International Workshop on Strategic Reasoning, SR 2016, New York, USA*. 2016.

[W3] Benjamin Aminof and Sasha Rubin. "First Cycle Games". In: *Proceedings 2nd International Workshop on Strategic Reasoning, SR 2014, Grenoble, France, April 5-6, 2014*. 2014, pp. 83–90.

Service

Editorial assistance

2013-2016 Handbook of Model Checking, to be published by Springer, and edited by Edmund Clarke, Thomas Henzinger, Helmut Veith and Roderick Bloem. Duties included: reviewing chapters, organising reviews and reviewers, liasing between editors and Springer editor. http://www.springer.com/us/book/9783319105741

Grant writing

2016-2017 I assisted Benjamin Aminof and Florian Zuleger with writing and editing an Austrian Science Fund (FWF) grant application.

2014 I assisted Helmut Veith with writing and editing FWF grant applications and reports for the National Research Network (NFN) of the Austrian Science Fund (FWF) http://arise.or.at/

Reviewing

Book Handbook of Model Checking

Journals Artificial Intelligence, Journal of Symbolic Logic, Logical Methods in Computer Science, Theory of Computing Systems, Central European Journal of Mathematics, Information and Computation, Journal of Logic and Computation, Annals of Mathematics and Artificial Intelligence, Theory and Practice of Logic Programming

Conferences IJCAI, KR, AAMAS, AAAI, EUMAS, ECAI, LICS, STACS, ICALP, MFCS, CONCUR, CSL, FoSSaCS, FSTTCS, SR, KRR@SAC, CiE, GandALF, RV, LPAR, LATA

Recent Research visits

2016,2017 **Host: Mike Wooldridge, Oxford University**, *Topic: Rational Synthesis*.

2016,2017 **Host: Alessio Lomuscio, Imperial College London**, *Topic: Strategic-Epistemic logics for Multi-Agents Systems*.

2016 **Host: Diego Calvanese and Marco Montali, University of Bolzanno**, *Topic 1: Data-aware strategic logics; Topic 2: Knowledge Representation for Business Process Management*.

2016   **Hosts: Frank Stephan and Sanjay Jain, National University of Singapore**, *Topic: Learning Theory and Verification*.

2015,2016   **Host: Giuseppe De Giacomo, Sapienza, Rome**, *Topic 1: Synthesis under Assumptions; Topic 2: Generalised Planning with Partial Observability*.

2015   **Host: Helmut Veith, TU Wien**, *Topic 1: Logic and Impossibility Results in Distributed Computing; Topic 2: Abstractions for Fault-tolerant Distributed Algorithms*.