**D8 Research Opportunity and Performance Evidence (ROPE) - Ten career-best academic research outputs**

1. (\*) 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. doi: DOI10.24963/ijcai.2017/14.

IJCAI is an ERA A/CORE A\* conference and in 2017 there was a 25% acceptance rate and 2540 submissions. The paper supplies a **breakthrough approach** to the formal analysis of multiagent systems with incomplete information. It supplies a sound and complete algorithm for the verification of basic strategic properties for a large class of systems, i.e., those in which agent's have public actions. Published in 2017, **it will likely shift the research being** donein decidable and tractable distributed synthesis and automated reasoning in multi-agent systems from hierarchical assumptions which will be viewed as too restrictive, to systems in which agents' can have non hierarchical observations. It will form the basis of Objective 1.

1. (\*) Raphaël Berthon, Bastien Maubert, Aniello Murano, Sasha Rubin, and Moshe Y. Vardi. “Strategy logic with imperfect information”. In: 32nd Annual ACM/IEEE Symposium on Logic in Computer Science, LICS 2017, Reykjavik, Iceland, June 20-23, 2017. IEEE Computer Society, 2017, pp. 1–12. isbn: 978-1-5090-3018-7. doi: 10.1109/LICS.2017.8005136.

LICS is an ERA A/CORE A\* conference. This paper **gives a uniform framework and generalises almost all known approaches** (first conceived in the late 1970s) to taming the problem of synthesis under imperfect information in the long tradition that uses a hierarchical assumption on the agent observations.

1. (\*) Benjamin Aminof and Sasha Rubin. “First Cycle Games”. In: Information and Computation (2016). doi: http://dx.doi.org/10.1016/j.ic.2016.10.008.

This article appeared in a **journal ranked Q2** by SJR. It gave the first significant and easy to apply generalisation of a standard technique for proving memorless determinacy in the theory of games on graphs, i.e., of the cornerstone 1979 paper Ehrenfeucht, A. & Mycielski, J. Int J Game Theory (1979) 8: 109. https://doi.org/10.1007/BF01768705 (326 citations). It also **corrected a number of mistakes from existing literature**. For these reasons it was **immediately cited, notably by ERC-grant winning researchers** including Kim G. Larsen, Jean-Francois Raskin, and Patricia bouyer. The theoretical insights it contains about memoryless determinacy are valuable for devising efficient algorithms and translations in Objective 3.

1. (\*) 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. doi: 10.1007/978-3-319-25524-8\_12.

This paper won the **best-paper award.** It follows on from the work of the candidate that was done during his Marie Curie cofund individual fellowship 2014-2015. The paper passed the first round of reviews for the Journal of Autonomous and Multi-agent Systems (JAAMAS).

1. (\*) 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. doi: 10.2200/S00658ED1V01Y201508DCT013.

This **book** surveys the zoo of theoretical results about verification of parameterised systems. The book required reading and **synthesising more than 50 papers in the area**. It has received **30 citations** on google scholar and has allowed us and others to better understand and exploit existing results, as well as find new avenues for the problem of verification of parameterised systems. It includes work of the candidate from 2015 (10.1007/978-3-642-54013-4\_15) that **generalised two cornerstone papers in the field, both by Turing award winners: E.A. Emerson**  "Reasoning about rings", EA Emerson, KS Namjoshi - POPL **1995**, and **Ed Clarke** "Verification by network decomposition, E Clarke, M Talupur, T Touili, H Veith, CONCUR 2014, 276-291.

1. "Verification by 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. doi: 10.1007/978-3-540-27813-9\_15.

This work, published in the premier venue on computer aided verification, a ERA A/CORE A\* conference, has 31 citations on google scholar, including **citations in a standard reference on model checking**, i.e., "Principles of model checking", C Baier, JP Katoen, KG Larsen - 2008. The work **generalises** a classic paper from 1990: C. Courcoubetis and M. Yannakakis. Markov decision processes and regular events, from ICALP, 1990**.**

1. 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. doi: 10.4230/LIPIcs.STACS.2008.1353.

This paper **solved a 12 year-old conjecture** of **Bruno Courcelle** in a branch of **mathematical logic** called finite model-theory.

1. Sasha Rubin. “Automata Presenting Structures: A Survey of the Finite String Case”. In: Bulletin of Symbolic Logic 14.2 (2008), pp. 169–209.

This article has received **93 citations** on google scholar, and appears in a **journal ranked Q1** by SJR. **To put this in context, this number of citations is roughly a third of the citations given to the paper that**  **founded the topic,** i.e., "Automatic presentations of structures", B Khoussainov, A Nerode - Logic and computational complexity, 1995 (293 citations on google scholar). The work **pioneered the development of the topic,** summarising and extending my PhD thesis (which has 73 citations on google scholar).

1. Bakhadyr Khoussainov, André Nies, Sasha Rubin, and Frank Stephan. “Automatic Structures: Richness and Limitations”. In: Logical Methods in Computer Science 3.2 (2007). doi: 10.2168/LMCS-3(2: 2)2007.

This article has received **99 citations** on google scholar, and appears in **journal ranked Q1** by SJR. **To put this in context,** t**his number of citations is roughly a third of the citations given to the paper that**  **founded the topic,** i.e., "Automatic presentations of structures", B Khoussainov, A Nerode - Logic and computational complexity, 1995 (293 citations on google scholar). The article is based on our 2004 LICS conference paper --- LICS is the premier conference in logic in computer science and is **CORE A\*.**

1. Bakhadyr Khoussainov, Sasha Rubin, and Frank Stephan. “Automatic linear orders and trees”. In: ACM Transactions on Computational Logic 6.4 (2005), pp. 675–700. doi: 10.1145/1094622.1094625.

This article has received **64 citations** on google scholar, and appears in a **journal ranked Q1** by SJR. **It develops new techniques** **for showing the limitations** of using automata for reasoning about complex mathematical systems. This article is based on our 2003 LICS conference paper --- LICS is the premier conference in logic in computer science and is **CORE A\*.** It quickly **generalised a breakthrough result** in the area, i.e., Automaticité des ordinaux et des graphes homogenes, C Delhommé - Comptes Rendus Mathematique, 2004 which itself has 62 citations on google scholar (and was communicated privately to the authors before being published).