Manuel Kauers

Personal Data

Name	Manuel Kauers
Date of Birth	February 20, 1979
Place of Birth	Lahnstein, Germany
Nationality	German
Address	Institute for Algebra, J. Kepler University Altenbergerstraße 69, A–4040 Linz
Website	`www.kauers.de` (includes a complete list of publications)
ORCID	orcid.org/0000-0001-8641-6661

Education

June 1998	High school graduation (Abitur) in Lahnstein, Germany.
May 2002	University degree (Dipl.-Inform.) in computer science, University of Karlsruhe.
Oct. 2005	Doctoral degree (Dr. techn.) in symbolic computation, University of Linz.
Dec. 2008	Habilitation in mathematics, University of Linz.

Career History

2002–2005	PhD Student at RISC Linz
2005–2007	PostDoc at RISC Linz
2008	PostDoc at INRIA Rocquencourt
2009–2015	Senior Postdoc and project leader at RISC Linz
2015–	Professor for algebra and chair of the Institute for Algebra at JKU.

Research Area

- Keywords: computer algebra, symbolic computation discrete and experimental mathematics
- Relevant ACM CCS1998 tags: I.1.2, I.1.4, F.2.2, G.2.1
- Relevant AMS MSC2010 tags: 68W30, 13P10, 33F10, 05A15, 05A16
- Main contributions: proofs of several combinatorial conjectures, including Gessel's conjecture and the qTSPP conjecture; development of algorithms and software for symbolic summation and integration algorithms.
- Regular collaborators: Alin Bostan and Frédéric Chyzak (INRIA, France); Doron Zeilberger (Rutgers University, USA); Shaoshi Chen (Chinese Academy, China); Christoph Koutschan (RICAM, Austria); Michael Singer (NCSU, USA).

Selected Publications

- Alin Bostan and Manuel Kauers. With an appendix by Mark van Hoeij. The Complete Generating Function for Gessel Walks is Algebraic. *Proceedings of the AMS,* 138(9):3063–3078, September 2010. DOI: `https://doi.org/10.1090/S0002-9939-2010-10398-2`
- Manuel Kauers and Peter Paule. *The Concrete Tetrahedron: Symbolic Sums, Recurrence Equations, Generating Functions, Asymptotic Estimates*, 203 pp. Texts and Monographs in Symbolic Computation. Springer Wien, ISBN 978-3-7091-0444-6, December 2010. DOI: `https://doi.org/10.1007/978-3-7091-0445-3`
- Johannes Blümlein, Manuel Kauers, Carsten Schneider, and Sebastian Klein. Determining the closed forms of the $O(a_s^3)$ anomalous dimension and Wilson coefficients from Mellin moments by means of computer algebra, *Computer Physics Communications,* 180(11):2143–2165, November 2009. DOI: `https://doi.org/10.1016/j.cpc.2009.06.020`
- Manuel Kauers and Peter Paule. A computer proof of Moll's log-concavity conjecture. *Proceedings of the AMS,* 135(12):3847–3856, December 2007. DOI: `https://doi.org/10.1090/S0002-9939-07-08912-5`

- Manuel Kauers, Christoph Koutschan, and Doron Zeilberger. Proof of Ira Gessel's Lattice Path Conjecture, *Proceedings of the National Academy of Sciences,* 106(28):11502–11505, July 2009. DOI: `https://doi.org/10.1073/pnas.0901678106`
- Alin Bostan, Mireille Bousquet-Mélou, Manuel Kauers and Stephen Melczer. On 3-dimensional lattice walks confined to the positive octant. *Annals of Combinatorics,* 20(4):661–704, December 2016. DOI: `https://doi.org/10.1007/s00026-016-0328-7`
- Manuel Kauers. SumCracker: A package for manipulating symbolic sums and related objects. *Journal of Symbolic Computation,* 41(9):1039–1057, September 2006. DOI: `https://doi.org/10.1016/j.jsc.2006.06.005`
- Shaoshi Chen, Manuel Kauers, and Michael F. Singer. Telescopers for Rational and Algebraic Functions via Residues. *Proceedings of ISSAC'12,* Grenoble, France, pp. 130–137, July 2012. DOI: `https://doi.org/10.1145/2442829.2442851`
- Ainhoa Aparicio Monforte and Manuel Kauers. Formal Laurent Series in Several Variables. *Expositiones Mathematicae,* 31(4):350–367, December 2013. DOI: `https://doi.org/10.1016/j.exmath.2013.01.004`
- Christoph Koutschan, Manuel Kauers, and Doron Zeilberger. A Proof of George Andrews' and David Robbins' q-TSPP-Conjecture. *Proceedings of the National Academy of Sciences,* 108(6):2196–2199, January 2011. DOI: `https://doi.org/10.1073/pnas.1019186108`

Selected other Scientific Activities

- Keynote speaker at SLC 81 (2018), BIRS Workshop on Theory and Practice of Satisfiability Solving (2018), BIRS Workshop on Lattice Walks at the Interface of Algebra, Analysis, and Combinatorics (2017), Linz Seminar on Fuzzy Set Theory (2015), SYNASC'15, AofA'14, ECCAD'13, FPSAC'12, SLC 65 (2010); altogether nearly 50 invited talks at international conferences since 2006 and nearly 40 invited colloquium talks since 2004.
- Winner of a Start prize (2009; see `https://en.wikipedia.org/wiki/Start-Preis` for information on this program), the AMS David P. Robbins Prize (2016; together with Christoph Koutschan and Doron Zeilberger; see `https://en.wikipedia.org/wiki/David_P._Robbins_Prize` for information on this award) as well as best paper awards at FM-CAD'17 (together with Armin Biere and Daniela Ritirc) and ISSAC'10 (together with Veronika Pillwein)
- Acquired altogether about 3 Mio Euros of research grants since 2006, from which so far 7 Ph.D. students and 18 PostDocs have been supported.
- Organizing committee member of ISSAC'05, Calculemus'07 (PC co-chair), FPSAC'09, ISSAC'11, ISSAC'13, DART8 (general chair), ISSAC'18 (general co-chair), CASC'19; PC member of ISSAC'06, ISSAC'08, ADG'08, CICM'12, ISSAC'13, SYNASC'15, FPSAC'16, SYNASC'16 (track co-chair), ICMS'18 (PC co-chair), FPSAC'19, ISSAC'19 (PC chair), Maple 2019, SC^2 2020, Maple 2020
- Editorial board member of Annals of Combinatorics (2020–), Journal of Symbolic Computation (2018–), and Advances in Applied Mathematics (2010–), managing editor of Communications in Computer Algebra (2010–2014).
- Author of various freely available open source software packages for Mathematica and Sage, including a popular tool for automated guessing as well as the ore_algebra library for Sage.

Laura Kovács

Personal Data

Name	Laura Kovacs
Date of Birth	April 26, 1980
Place of Birth	Resita, Romania
Nationality	Hungarian and Romanian
Address	Formal Methods in Systems Engineering – FORSYTE group, TU Wien Favoritenstraße 9-11, A–1040 Vienna
Website	`https://forsyte.at/people/kovacs/`
ORCID	orcid.org/0000-0002-8299-2714
Publications	`https://dblp.uni-trier.de/pers/hd/k/Kov=aacute=cs:Laura`

Education

June 1998	High school graduation in Timişoara, Romania.
Feb. 2004	University degree (MSc) in math and computer science, West University of Timişoara, Romania.
Oct. 2007	Doctoral degree (Dr. techn.) in computer science, JKU Linz, Austria.
Nov. 2012	Habilitation in computer science, TU Wien, Austria.

Career History

2003–2007	PhD Student, RISC Linz
2007–2009	PostDoc, EPFL Lausanne
2009–2010	PostDoc, ETH Zürich
2010–2013	FWF Hertha Firnberg Research Fellow Assistant Professor, TU Wien
2013–2016	Associate Professor in computer science, Chalmers U. of Technology, Sweden
2016–	Full Professor in computer science, TU Wien

Career breaks: Maternity leaves 2014-2015 and 2017.

Research Area

- Keywords: formal methods, program analysis, automated reasoning, symbolic computation
- Relevant ACM CCS1998 tags: D2.4, F3.1, F3.2, F4.1, G2.1, I1.2, I2.3
- Relevant AMS MSC2010 tags: 03F07, 03B25, 68N30, 68Q60, 68T15, 68R05, 68W30
- Main contributions: automated approaches for inferring loop invariants and Craig interpolants; development of algorithms and software for first-order theorem proving and its applications in program analysis; co-developer of the Vampire first-order theorem prover.
- Regular collaborators: Gilles Barthe (MPI Bochum, Germany); Ezio Bartocci (TU Wien, Austria); Matteo Maffei (TU Wien, Austria); Andrei Voronkov (U. Manchester, UK).

Selected Publications

- Bernhard Gleiss, Laura Kovács and Jakob Rath. *Subsumption Demodulation in First-Order Theorem Proving*, 10th International Joint Conference on Automated Reasoning (IJCAR), 2020, To appear. `https://arxiv.org/abs/2001.10213`
- Gilles Barthe, Renate Eilers, Pamina Georgiou, Bernhard Gleiss, Laura Kovács, and Matteo Maffei. *Verifying Relational Properties using Trace Logic*, 19th International Conference on Formal Methods in Computer-Aided Design (FMCAD), pg. 170–178, 2019. `https://doi.org/10.23919/FMCAD.2019.8894277`.
- Ezio Bartocci, Laura Kovács, and Miroslav Stankovic. *Automatic Generation of Moment-Based Invariants for Prob-Solvable Loops*, 17th International Symposium on Automated

Technology for Verification and Analysis (ATVA), pg. 255–176, 2019. https://doi.org/10.1007/978-3-030-31784-3_15.

- Jens Knoop, Laura Kovács, and Jakob Zwirchmayr. *Replacing Conjectures by Positive Knowledge: Inferring Proven Precise Worst-Case Execution Time Bounds using Symbolic Execution*, Journal of Symbolic Computation, volume 80, pg. 101–124, 2017. https://doi.org/10.1016/j.jsc.2016.07.023.
- Andreas Humenberger, Maximilian Jaroschek, and Laura Kovács. *Automated Generation of Non-Linear Loop Invariants Utilizing Hypergeometric Sequences*, 42nd International ACM Symposium on Symbolic and Algebraic Computation (ISSAC), pg. 221-228, 2017. https://doi.org/10.1145/3087604.3087623.
- Laura Kovács, Simon Robillard, and Andrei Voronkov. *Coming to Terms with Quantified Reasoning*, 44th ACM SIGPLAN Symposium on Principles of Programming Languages (POPL), pg. 260–270, 2017. http://dl.acm.org/citation.cfm?id=3009887.
- Laura Kovács and Andrei Voronkov. *First-Order Theorem Proving and Vampire*, 25th International Conference on Computer Aided Verification, pp. 1–35, 2013. https://doi.org/10.1007/978-3-642-39799-8_1.
- Laura Kovács and Andrei Voronkov. *Interpolation and Symbol Elimination*, 22nd International Conference on Automated Deduction (CADE), pp. 199-213, 2009. https://doi.org/10.1007/978-3-642-02959-2_17.
- Laura Kovács and Andrei Voronkov. *Finding Loop Invariants for Programs over Arrays Using a Theorem Prover*, 12th International Conference on Fundamental Approaches to Software Engineering (FASE), pp. 470–485, 2009. https://doi.org/10.1007/978-3-642-00593-0_33.
- Laura Kovács. *Reasoning Algebraically About P-Solvable Loops*, 14th International Conference on Tools and Algorithms for the Construction and Analysis of Systems (TACAS), pp. 249-264, 2008. https://doi.org/10.1007/978-3-540-78800-3_18.

Selected other Scientific Activities

- ERC Proof of Concept Grantee, 2018.
- ERC Starting Grant Awardee, 2014.
- Wallenberg Academy Fellow, Sweden, 2014.
- FESTO Austria Prize for Young Researchers and Scientists, FESTO IT company in process automation, Austria, 2011.
- FWF Hertha Firnberg Research Fellow, Austria, 2010–2013 in computer science, such as the SAT, SMT and Automated Reasoning (SSAR) Summer Schools 2018 and 2019; and the VTSA Summer School on Verification Technology, Systems, and Applications, 2014.
- Invited speaker at 19 international conferences/workshops in computer science, such as the 2nd Facebook Testing and Verification Symposium (FaceTAV), 2018, Facebook, London; the 26th EACSL Annual Conference on Computer Science Logic (CSL), 2017, Stockholm, Sweden; and the 23th International Conference on Mathematical Foundations of Programming Semantics (MFPS), Ljubljana, Slovenia, 2017.
- PC Chair of CONCUR 2020, LPAR 2002 (LPAR-23), SYNASC 2015, SCSS 2013 and PC member of over 100 international conferences, including top tier conferences such as ISSAC, POPL, LICS, CAV and IJCAR/CADE.
- Steering Committee Member of CADE – Conference on Automated Deduction, since 2016.
- Consulting for Dassault Aviation and Intel Haifa, 2010.

Symbolic Computation and the JSC

Manuel Kauers and Laura Kovács

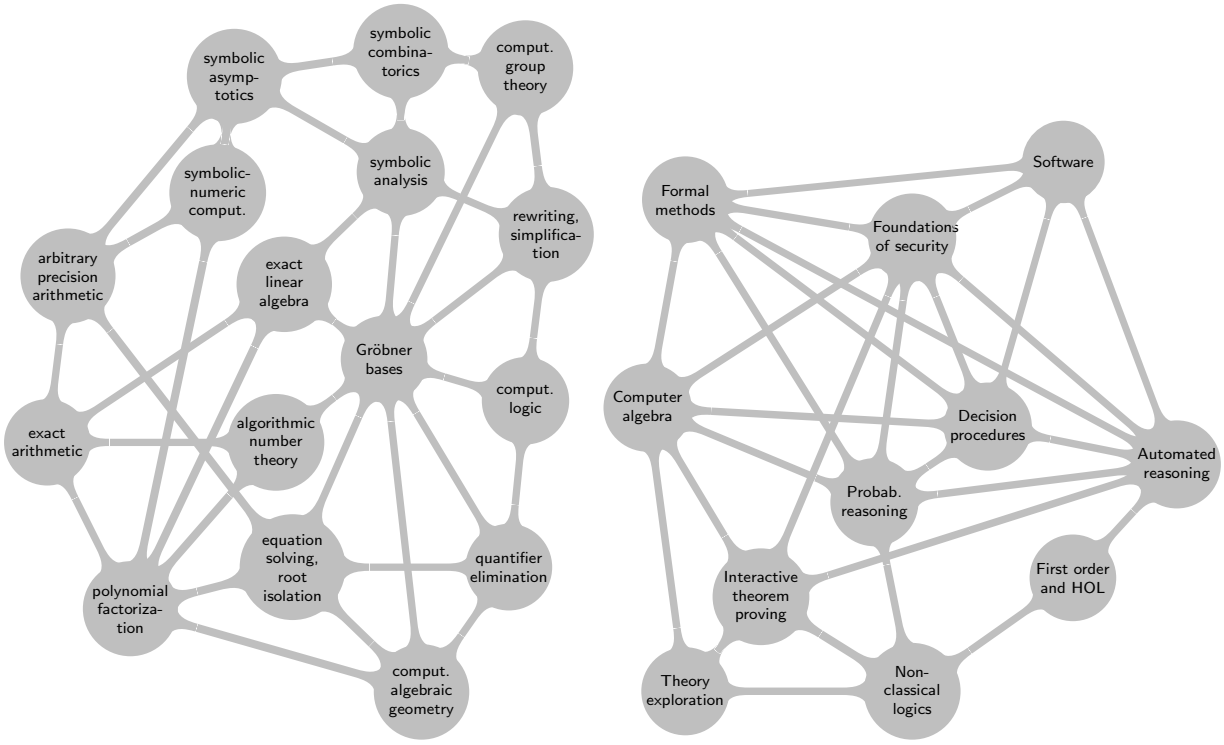
The Scientific Landscape

We do not have any drastic ideas for changing the scientific landscape of symbolic computation. Our vision and mission statement aligns exactly with the JSC founding words of Bruno Buchberger back in 1985: maintaining the JSC as the flagship publication venue of "mathematicians and computer scientists who have a particular interest in symbolic computation". What Buchberger wrote about the field of symbolic computation in the first issue of JSC has often been cited as a suitable definition for the area, and it is remarkable enough that even today, 35 years later, his text still looks fresh and appropriate. With symbolic computation being an established and recognized area of mathematics and computer science, we are convinced that the general description of the area will also remain valid for the next 35 years. Of course, this does not mean that the area is petrified. It certainly is not. New subareas have been emerging, others have lost relevance, and relations among subareas keep changing. This shows that symbolic computation is very alive, but in our view, it does not imply that the general definition of what symbolic computation is needs to be updated.

According to Buchberger's statement from 1985, symbolic computation in a broad sense concerns "the algorithmic solution of problems dealing with symbolic objects," and it it consists of "computational algebra and computational logic" in a more narrow sense. He continues to add that computational algebra (nowadays more commonly called computer algebra) shall be interpreted widely enough to include for example also (parts of) computational geometry, and that computational logic shall be interpreted widely enough to include for example also automated program verification. The dimension of subject matters is supplemented by a dimension of aspects. Aspects relevant to symbolic computation include the full spectrum of fundamental theory development, design and analysis of algorithms, implementation and benchmarking of software systems, and their application to problems arising in other areas.

Quite a large number of subareas of symbolic computation can be identified. Buchberger's editorial contains a list of such subareas. Not all of them have passed the test of time. We have made an attempt to summarize the current state of affairs by arranging the most important subareas of computer algebra and computational logic in a graphical way. The result is shown on the next page. Of course, such pictures could be drawn in many different ways. Nevertheless, we believe that the sketches do give some orientation over the state of the art. In addition to the technical subareas of computer algebra and computational logic as shown in the pictures, the area of symbolic computation also covers software aspects, such as the design and implementation of computer algebra systems or automated theory provers as well as mathematical interface or programming languages.

Zooming out to the next higher level, we see symbolic computation as a whole embedded into a cluster of related scientific areas. Neighboring areas include for example algebra and number theory, cryptography and security, numerics and optimization, discrete and experimental mathematics, or complexity and computability theory. While the transitions to these areas are getting more and more smooth, it is clear that these areas stand on their own and are not contained in (and do not contain) the area of symbolic computation. The overlap with



Left: a simplified view on symbolic computation from the perspective of computer algebra
Right: a simplified view on symbolic computation from the perspective of computational logic

neighboring areas translates into an overlap with the scope of other journals. Journals such as AMS Mathematics of Computation, SIAM Journal on Computing, the new SIAM Journal on Applied Algebra and Geometry, ACM Transactions on Mathemtical Software, Journal of Automated Reasoning (Springer), or Theoretical Computer Science (Elsevier) regularly publish articles that clearly belong to the area of symbolic computation, even if symbolic computation is not in the center of their scope.

There are also some journals, like Mathematics in Computer Science or AAECC, whose scope is strongly related to symbolic computation. There are of course many conferences as well, such as ISSAC, MEGA, ACA, ANT, SNC, CASC, SODA, FOCS, SCSS, CADE/IJCAR, LPAR, LICS, CAV, POPL, just to mention the most prominent ones, whose call for papers seeks contributions in symbolic computation and closely related areas.

Scope and Standards of JSC

In our opinion, the scope of JSC should cover all subjects and aspects of the area of symbolic computation, as specified by Buchberger in 1985 and summarized above. We realize however that over the years, the focus of JSC has shifted more and more towards the computer algebra side. JSC papers on topics related to computational logic have become more and more rare. Recognizing that there have also been exciting developments in computational logic during the past decades and that the computer algebra community and the computational logic community would greatly benefit from more mutual exchange, we would like to *work towards a more balanced representation of both parts of symbolic computation in the journal.* It is for this reason that we have decided to apply for the position as a pair of two editors, with one of us clearly rooted on the computer algebra side (Manuel Kauers) and the other clearly rooted on the computational logic side (Laura Kovács).

JSC is recognized in the community as the most important journal of the area. The jour-

nal enjoys a high reputation, which in our opinion it fully deserves. The high reputation of the journal is directly correlated with the general high quality of the research it is published. Maintaining these high standards is not an arbitrary academic exercise, but it is of existential importance for our young colleagues searching for positions or seeking promotion, who can present their publication(s) in JSC as convincing evidence for their scientific strength. We are therefore committed to maintain the high standards which have been applied until now and which have been the source of the high reputation of the journal. At the same time, we will avoid be(com)ing so narrow minded as to only accept papers that match a certain pattern, but we will instead be especially open towards papers experimenting with new styles or unexpected types of results.

Running the Journal

Also as far as the workflow of the journal is concerned, we do not think that any major adjustments are needed. An obvious difference is that we will run the journal as a team of two EiCs, and we plan to do so by taking turn in playing the role of "acting EiC", i.e., one of us will handle submissions arriving in January, March, May, ..., and the other will handle incoming submissions in February, April, June, ... We intend to continue the established policy that the acting EiC screens an incoming submission, and decides to either reject it immediately or to assign it to a member of the editorial board. Authors can nominate up to three editorial board members as handling editors. Once the paper is assigned to an editor, the reviewing process is in his or her hands until (and including) the final decision, which the EiC will only overrule in exceptional situations. We will thus continue to leave much of the responsibility for ensuring the scientific quality to the members of the editorial board, and we believe that doing so is an appropriate way to also guarantee a certain amount of diversity within the area.

We will also continue to invite PC chairs of ISSAC and MEGA as guest editors for a special issue related to their conference. This shall give contributors of these conferences the possibility to publish journal versions of their conference papers, which is of particular importance in some countries where conference papers are not sufficiently impressive to hiring or promotion committees. The standards at ISSAC and MEGA are similar to those of JSC, so that many conference papers published there can easily be turned into journal papers that meet JSC standards.

As part of our efforts to bring computational logic back to the journal, we will select one or two top conferences of the area, such as CADE/IJCAR, and offer the option to have special issues to them as well. For other conferences, we will decide on an individual basis whether granting a special issue seems appropriate when organizers approach us. Besides special issues related to conferences, we shall also continue the established practice of inviting suitable colleagues to edit a special issue on an emerging or trending topic whenever a topic arises that seems appropriate for doing so.

We believe that the time that JSC can be run by email is coming to an end, and we will search for viable alternatives. We are aware that members of the editorial board have privacy concerns against the use of Elsevier's system, but what matters more in our opinion is that this system is not sufficiently user-friendly. We do not plan to use it. EasyChair has become the de-facto standard for organizing conferences and is very simple and intuitive to use, but the workflow for a conference is too different from that of a journal, so running JSC over EasyChair will not be a solution either. We are considering to write a small light-weight online submission system ourselves. This way we can adapt to the specific workflow outlined above, and we can host the system on a server at JKU which meets reasonable privacy concerns.

The shift of JSC towards computer algebra is reflected in a current bias of the editorial board towards computer algebra. We do not plan to adjust this bias abruptly. Instead, if we are appointed as EiCs, we would offer all current editorial board members to remain on the

board, if they wish to stay, and we would appoint about five additional members whose focus is clearly on the computational logic side. Further adjustments will be coordinated with the natural fluctuations happening on the board. In any case, we will always solicit opinions of editorial board members before including a new member to the board.

Finally, we also believe that the term of office of EiCs should not be indefinite. We will therefore decide after five years whether we want to continue doing the job, and if we do, we will ask the editorial board whether it wants us to continue doing the job. If so, we would do it only for another five years, so that our term of office as EiC will end after at most 10 years.

Publishing and Open-Access

There is growing demand for open access and we are working hard to meet that option for researchers. We will continue to follow the publishing and open-access policies of Elsevier, and thus offer a mix of publishing models supported by Elsevier. On the other hand, as scientists ourselves, we are committed to the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities. As such, we will support efforts to make scientific publications freely available either in hybrig models of open access (gold/green/other open access), by respecting Elsevier rules on publishing. Potential changes in publication policies will be decided in consensus with the editorial board.

Motivation

Without a question, the Journal of Symbolic Computation is the flagship journal of our community. Many important results of the past three decades have been published in this journal. It will be both a privilege and a responsibility to lead this journal in the years to come, a privilege in so far as the editor(s) of the main journal naturally have an exposed position and an increased visibility, and a responsibility in so far as it will be the task of the editor(s) to ensure that JSC continues to play its leading role. We are committed to serve the symbolic computation community by devoting the necessary time and effort into the management and the future development of the journal, and we would be delighted to be given this opportunity. Two personal motivation statements of the two proposed EiC team members are given below.

Manuel Kauers

Symbolic Computation has always been, and probably will always be, in the center of my scientific interests. Most of my own work revolves around symbolic techniques for symbolic summation and integration, algorithms for D-finite and other special functions, and the application of these techniques in combinatorics and experimental mathematics. The choice for this specialization goes back to my PhD thesis in 2005 and was further determined the research grants I was awarded since then (including a START Prize, the most prestigious Austrian award for junior scientists). My excitement for symbolic computation goes however far beyond the subject matters I have been working on so far. Every year, I greatly enjoy participating at ISSAC to get a panorama view on the latest developments in all parts of computer algebra. I have not missed any ISSAC since 2003, and I have been proud to serve as PC chair at ISSAC'19 in Beijing. My excitement for symbolic computation goes even further and also includes computational logic, for which I must however admit that I am not as up-to-date as on the topics of computer algebra. Becoming editor of JSC will not only be a great honor and a way to do an important job for our community, but it will also be personally rewarding for me to further extend my knowledge in symbolic computation, especially towards areas such as computational logic that I have not been able to follow very closely recently.

Laura Kovács

As a former PhD student of the Theorema research group at RISC-Linz, lead by Bruno Buchberger, my research was continuously changing from theoretical subjects in symbolic computation to the combination and applications of symbolic computation and automated reasoning in software sciences. My PhD thesis in 2007 introduced an algorithmic approach based on such a combination for generating generating all polynomial invariants for software loops. These results have been then generalized to safety verification of software systems, by using complementing symbolic computation methods with statistical approaches, first-order theorem proving and formal verification. Based on my scientific achievements, in 2014 I was awarded an ERC Starting Grant by the European Research Council – the goal of my ERC Starting Grant is perfectly aligned with the overall mission of the JSC and our vision as detailed in our EiC application with Manuel Kauers. Namely, my ERC Starting Grant is entitled "SYMCAR: Symbolic Computation and Automated Reasoning for Program Analysis", a research area and direction that I would be determined to bring back to the landscape of the JSC. I would be very much committed to encourage the submission of top scientific results in formal methods to the JSC, complementing and advancing this way the already very high scientific reputation of JSC in areas of computational logic.