

CARLOS D'ANDREA

1 Curriculum Vitae

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1.1 Education

- **Ph.D. in Mathematics**, Universidad de Buenos Aires, Argentina, 2001.
Advisor: Alicia Dickentstein.
- **Bs. and Ms in Mathematics**, Universidad del Nordeste, Argentina, 1997.

1.2 Positions

2020–... Full Professor. University of Barcelona
2009 – 2019 Assistant Professor. University of Barcelona
2005 – 2008 “Ramon y Cajal” Postdoctoral Fellow, University of Barcelona
2002 – 2005 Miller Research Fellow, University of California, Berkeley
2001 – 2002 ECOS Postdoctoral Position, INRIA Sophia Antipolis, France

1.3 Selected Research Projects (2015–2020)

2019 – 2022 European H2020-MSCA-ITN-2019 “learninG, pRocessing
And oPtimising shapES” (GRAPES)
In charge of the Spanish node
2016 – 2019 European H2020-MSCA-ITN-2015 “Algebraic Representations in
Computer-Aided Design for complEx Shapes” (ARCADES)
In charge of the Spanish node
2014 – 2016 Argentine-Spanish PICT-2013-0294 “Algebra and Number Theory”
Principal Investigator of the Spanish team
2014 – 2016 French-Spanish CNRS PICS “Diophantine Geometry and Computer Algebra”
General Researcher

1.4 Selected Publications (2015–2020)

1. Cortadellas Benítez, Teresa; Cox, David; D’Andrea, Carlos. *The Rees Algebra of Parametric Curves via liftings*. J. Pure Appl. Algebra 224 (2020) 869–893.
2. Busé, Laurent; Cid Ruiz, Yairon; D’Andrea, Carlos. *Degree and birationality of multi-graded rational maps*. Proc. Lond. Math. Soc. (3) 121 (2020) 743–787.
3. D’Andrea, Carlos; Ostafe, Alina; Shparlinski, Igor; Sombra, Martín. *Reductions modulo primes of systems polynomial equations and algebraic dynamical systems*. Trans. Amer. Math. Soc. 371 (2019), no. 2, 1169–1198.

4. Chang, Mei-Chu; D’Andrea, Carlos; Ostafe, Alina; Shparlinski, Igor; Sombra, Martín. *Orbits of polynomial dynamical systems modulo primes*. Proc. Amer. Math. Soc. 146 (2018), no. 5, 2015–2025.
5. Bostan, Alin; D’Andrea, Carlos; Krick, Teresa; Szanto, Agnes; Valdetaro, Marcelo. *Subresultants in multiple roots: an extremal case*. Linear Algebra Appl. Vol. 529, 185–198 (2017).
6. D’Andrea, Carlos; Narváez-Clauss, Marta; Sombra, Martín. *Quantitative equidistribution of Galois orbits of small points in the N -dimensional torus*. Algebra & Number Theory 11 (2017), no. 7, 1627–1655.
7. Cortadellas Benítez, Teresa; D’Andrea, Carlos. *The Rees algebra of a monomial plane parametrization*. J. Symbolic Comput. 70 (2015), 71–105.

1.5 Scientific Organizations/Events

- Effective Methods in Algebraic Geometry MEGA: Member of the Advisory Board since 2007. Scientific Chair of MEGA 2021(Tromsø), member of the Scientific & Local committees of MEGA 2019 (Madrid), Chair of the Local Committee of MEGA 2009 (Barcelona).
- International Symposium on Symbolic and Algebraic Computation ISSAC: Member of the Program Committee 2007, 2014 & 2016.
- Foundation of Computational Mathematics FoCM: Member of the Organizing Committee of FoCM 2017 (Barcelona), member of the Plenary Speakers Committee of FoCM 2017, co-organizer of the mini-workshop on Computational Algebraic Geometry in FoCM 2008, 2011 & 2014.
- SIAM Activity Group on Applications of Algebraic Geometry SIAM AG²: Member since 2018. Co-organizer of minisymposiums at SIAM AG 2013, 2017 & 2019.
- Spanish Network on Computer Algebra EACA: Member of the Scientific Board since 2012. Chair of EACA 2014 (Barcelona), Co-Chair of the workshop on applications of Computational Algebra (Santander, 2019).

1.6 Editorial committees

- Journal of Symbolic Computation, member of the editorial board since 2015.
- Guest Editor (w/ Alessandra Bernardi and Thorsten Theobald) of the special issue of the JSC for MEGA 2019.
- Guest Editor (w/ Marc Giusti, Luis Miguel Pardo and Ragni Piene) of the special issue of JSC for MEGA 2009.
- Guest Editor (w/ Bernard Mourrain) of the special issue of JSC for ISSAC 2007.
- Revista de Educación Matemática de la Unión Matemática Argentina, member of the editorial board since 2019.

2 Vision statement for Symbolic Computation and JSC

2.1 On the field of Symbolic Computation

Curiously, the definition of “Symbolic Computation” one finds in Wikipedia ([1]) associates it with (actually puts it under) “Computer Algebra”. I have always considered Symbolic Computation as a larger area including (at least symbolic) Analysis, Geometry, Complexity Theory, Logic, design and implementation of Algorithms, and Applications to mention some of them.

The JSC’s webpage ([2]) highlights the following research areas:

- *Computational algebra*
- *Computational geometry (non-linear)*
- *Automated theorem proving*
- *Automatic programming*
- *Design and implementation of symbolic computation languages and systems*
- *Applications in education, science, engineering and industry*

I think all of these are very important areas of research that we should continue focusing in. We should also continue to highlight connections with areas that have always been key to Symbolic Computation like Statistics, Informatics, and Cryptography to mention some of them.

I also believe that in these times where interdisciplinary research is getting more and more common (and also more funded), it is important to keep track of all the “symbolic” background that several applied areas can bring to the core of symbolic computation. This would also put our research available to a broader audience.

One of these interactions I know quite well because I worked there, is Computer Aided Design, where very clever determinantal formulae hinted by researchers in that community in the 90’s led to a rich production of both abstract and applied Mathematics up until this day, see [3] for more details.

In this spirit, I think that we should keep a close eye to all the mathematical developments that come attached to the new emerging applied areas of Big Data Analysis, Machine Learning and Artificial Intelligence.

There are also very strong connections of Mathematics with Biology and Medicine that Symbolic Computation has their take in. For instance, the study of Big Data led to the surge and development of Persistent Homology (cf. [4]), an area of Algebraic Topology that without any doubt now has a big portion of its methods and problems under the umbrella of Symbolic Computation. In the same vein, there are “symbolic computational” aspects of Machine Learning and Artificial Intelligence that need to be explored, found, and make them shine in scientific papers at JSC.

There should be also definitely room for the applications, and for illustrations of these applications at JSC. In that sense, connections with engineering, industry and education must not be abandoned.

2.2 On the scope of Journal of Symbolic Computation

I believe all aspects of the field, from theoretical to applied, should be properly covered and emphasized. I think it is also of importance -and this should be a task of the whole Editorial Board (including the General Editor)- to search connections from the areas that we know and cover well and the general more interdisciplinary big areas of research that are currently being of central interest both in science and for a general audience: Medicine, Biology, Design, and the challenges of Informatics in modern life (Big Data, Machine Learning, Artificial Intelligence).

2.3 On the organization of the journal / Refereeing procedure

Our working environment changes continuously, and adaptation is required at faster speed. In that sense I salute this call for renovation of the General Editor of JSC. I think this is very healthy both for the journal and also for the community, and should be done in a more systematic way.

In this direction, I commit to serve as general editor -if selected- for a period of 5 years, and then submit to the Editorial Board a new call for this position. I also believe that the group of editors should be updated in a more dynamical way. How to do this is something that should be probably studied and implemented by the actual board in the following years.

This process should be done very carefully as my vision is that the Editorial Board as a whole is the one that “makes” the Journal, as we all have experienced when we want to submit a paper for publication, that our attention goes directly to the list of editors in order to find one that may find our work interesting. I think that the choice of names of the Editorial Board should be carefully done and also adapted conveniently taking care of all kind of diversities: geography, gender, and research topics, among others.

I see the role of the General Editor as some kind of coordinator, who is there to start a process (receives and checks submitted papers and decides which editor/s to be in charge if the paper looks promising), and also to ease possible issues arising from the relation authors-referees-editors. The General Editor should also be in charge of advertising the journal, and looking for new emerging areas that should be incorporated into the topics of interest of JSC.

The relation with the publishing company is a delicate topic, due to the issues our community has had and still have with private publishers. I defend open access of all kind of research, have all my papers available online, and think that we should all make our contribution to have all papers in open access platforms.

It is my understanding that currently the editorial board has a very independent way of working without almost not interference by the publisher, and also that authors are encouraged to make their results publicly available in open platforms in the web. I intend to continue with this policy, and explore also the possibilities of updating the editorial refereeing system to a more convenient for all of us within these parameters.

I also find important to try to get the most open versions of the published articles that the publisher allows. I think it is important that we preserve the privacy and confidentiality of all kind of data including names of reviewers, reports, and interactions among editors, authors and referees.

Another delicate issue is the surge of “indexes” that tend to assign a metric on the quality of papers and journals. This is not a trivial topic because in several countries (Spain being of them) these metrics are being used to evaluate research and researchers, so should not be dismissed if we want to keep the JSC as a reference in the area, and encourage good and young researchers to publish there. But we also do not want to just fit into some kind of games where the rules have been predefined and try to raise our “citation index” for instance at any cost. I think we should have an open interaction among all the members of the editorial board -and may be include the publisher in it- to see what is the best path to address this issue.

There are several international conferences that are of historic relevance to JSC, ISSAC and MEGA, to mention a few of them. There have been regularly special issues associated to these conferences, and many others. I think we should continue with this tradition and be open to more provided that the refereeing process is done with rigour and up to the standards of the journal. I also think it should be important to recover the “annual meeting” of the editorial board of JSC at one of these major conferences to improve our connections and also share some of our common experiences in the editorial tasks.

2.4 On the outlook for the field of Symbolic Computation and the journal

We are already experiencing the increasing interest that the so-called “Science of Big Data” is having in the industry, governments, and also the scientific community. We have seen also how Symbolic Computation has found its role within this context in the study and design of efficient algorithms tailored to common problems in this area, the discretization of purely continuous tools, and also in the analysis of topological aspects derived from the models that are used for data analysis.

It is expected that the same will happen with Artificial Intelligence and Machine Learning, and also with this whole effort that science as a whole is doing to try to understand and overcome the current pandemics of Covid-19.

In this sense, the Journal of Symbolic Computation should be a pioneer in the search of Mathematical tools that are of use or are being used in these areas, and highlight them so that they may provide as a guide for motivated scientists to interact from the more theoretical to the applied scenarios within these large interdisciplinary areas.

In the last years we have also witnessed an increasing interest within our community in the study of computational aspects which could help prove automatically theorems or even discover mathematical theorems. Of particular attention is the area of Mathematical Knowledge Management ([5]), whose objective is “to develop new and better ways of managing sophisticated mathematical knowledge, based on innovative technology of computer science, the internet, and intelligent knowledge processing” ([6]).

The news and developments done in this direction should be followed with special attention by the whole mathematical community, and in particular by researchers in the computational area. Several members of our editorial board are involved in this area, so we are already having one foot well put in it, but definitely extra attention should be paid to news and innovations coming from there.

References

- [1] https://en.wikipedia.org/wiki/Computer_algebra
- [2] <https://www.journals.elsevier.com/journal-of-symbolic-computation>
- [3] D'Andrea, Carlos. *Moving curve ideals of rational plane parametrizations*. Lecture Notes in Computer Science, Vol 8942 "Computer Algebra and Polynomials" (ISBN: 978-3-319-15080-2), 30-49 (2015). [arXiv.1308.6790](https://arxiv.org/abs/1308.6790).
- [4] Edelsbrunner, Herbert; Harer, John. *Persistent homology—a survey*. Surveys on discrete and computational geometry, 257–282, Contemp. Math., 453, Amer. Math. Soc., Providence, RI, 2008.
- [5] https://en.wikipedia.org/wiki/Mathematical_knowledge_management
- [6] <https://cicm-conference.org/2019/cicm.php?event=mkm>

3 Motivation

All the research I have done in my academical career focuses in computational aspects of Mathematics, particularly Commutative Algebra and Algebraic Geometry. Naturally, the Journal of Symbolic Computation is one of the very first journals that I ran into from very early on, my first article in this journal being the solution of some open problems published in one of its previous numbers. I have 7 papers published in this journal.

I joined the Editorial Board of JSC in 2015, and enjoyed a lot doing editorial work for the community since then. I also had the chance of collaborating not only academically but also logistically with several editors of this journal, and share ideas and opinions about how to continue making this journal a top reference in the area. I like the JSC community because it is about Math, and also of applications of Math.

As mentioned before, I would like to continue this spirit of renovation of the journal by committing to serve for five years and then have an open process like this one for the whole editorial board to decide again the General Editor. I also plan to work out with the rest of the board some regular process for for updating it with some frequency.

I am also open and would require the collaboration of the whole board to the new challenges we are having and will continue to have as computers and the internet are more and more essential for our daily work, and also to search and find new connections between symbolic computation and not only the emerging areas of computer science which are now receiving a lot of public attention, but also those classic parts of science like Medicine or Biology which have potential and actual connections with our daily research. And of course to continue encouraging the publication of nice, outstanding contributions of Symbolic Computation to the standard areas of Logic, Statistic, Informatics, and others.