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2023

09h00
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18h00

2023-T3 RECENT TRENDS IN COMPUTER ALGEBRA

Geometry of Polynomial System Solving, Optimization and Topology

Institut Henri Poincaré
Amphithéâtre Hermite / Darboux
11 rue Pierre et Marie Curie
75005 Paris

INSCRIPTION

Workshop with special week and topical day

Special week

October 9 to 13, 2023

- Polynomials Systems and Real Geometry by I. Emir and D. Plaumann (long course).

Tuesday 2pm-5:30pm, Wednesday 10am-12pm, Thursday 10am-12pm and 2pm-5:30pm.

URL de la page : <https://www.ihp.fr/fr/agenda/geometry-polynomial-system-solving-optimization-and-topology>

- Moment Method in Optimization by D. Henrion (short course).

Monday 10am-12pm, Tuesday 10am-12pm.

- General audience presentation by B. Sturmfels.

Wednesday 4pm.

Workshop: Geometry of Polynomial System Solving, Optimization and Topology

October 16 to 20, 2023

Organisers: C. D'Andrea, P. Lairez, M. Safey El Din, É. Schost, L. Zhi

Polynomial systems encode a wide range of non-linear (but static) phenomena which arise in many applications. Non-linearity makes them non-trivial to handle, both from complexity and reliability viewpoints. Still, because of their importance for key applications e.g. in mechanism design and optimization amongst many others, various algorithmic approaches have been developed. During the last decades, tremendous achievements have been accomplished to design faster algorithms for polynomial system solving, extend their capabilities to tackle topological issues and understand their complexities. For instance, let us mention new families of algorithms to exploit algebraic and geometric properties of polynomial systems and their solution sets such as sparsity or weighted and multi-homogeneity, algorithms for understanding the topology of semi-algebraic sets (Betti numbers, connectivity queries), the raise of sums-of-squares certificates to certify emptiness over the reals of polynomial systems through symbolic-numeric approaches, and last but not least, the stellar solution to 17th Smale problem by Lairez following previous works from Beltrán, Cucker and Pardo.

Many challenges remain to be addressed to pave the way towards high performance polynomial system solvers tackling large scale applications. Topical issues lie in the combination of efficiency and certification, computing exact certificates of emptiness, understanding the geometry of polynomial systems and their solution sets to exploit better their properties algorithmically. This workshop will cover broadly all these topics.

Invited speakers

- Christian Eder (Kaiserslautern, Germany) *Recent advances in Gröbner basis algorithms and geometric applications*
- Elisenda Feliu (Copenhagen, Denmark) *Positive solutions to polynomial systems and applications to reaction networks*
- Jon Hauenstein (Notre Dame, USA) *Some advances in numerical algebraic geometry for computing real solutions*
- Martin Helmer (Raleigh, USA) **Conormal Spaces and Whitney Stratifications**
- Teresa Krick (Buenos Aires, Argentina) *Title to be announced*
- Monique Laurent (Centrum Wiskunde & Informatica (CWI) Amsterdam, and Tilburg University, The Netherlands) *Sums of squares approximations in polynomial optimization: performance analysis and degree bounds*
- Anton Leykin (Atlanta, USA) *Title to be announced*
- Zijia Li (Beijing, China) *Title to be announced*
- Fatemeh Mohammadi (Leuven, Belgium) *Polynomial systems arising in the formal verification of programs*
- Marc Moreno Maza (London, Canada) *Title to be announced*
- Chenqi Mou (Beijing, China) *Chordal Graphs in Triangular Decomposition in Top-Down Style*
- Bernard Mourrain (Inria, Sophia-Antipolis) *Solving by duality*
- Cordian Riener (Tromsø, Norway) *Title to be announced*
- Ana Romero (La Roja, Spain) *Title to be announced*
- Pierre-Jean Spaenlehauer (Nancy, France) *Dimension results for sparse systems homogenized via rational polytopes*

Topical day: Mechanism Design and Computer Algebra

October 24, 2023

Organizer: J. Schicho

Speakers: Maria Alberich-Carraminana, Didier Henrion, Johanna Frischauf, Hans-Peter Schröcker, Josef Schicho



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HORAIRES

L'institut :

- lundi au vendredi de 8h30 à 18h,
- fermé les jours fériés.

Le musée - Maison Poincaré :

- lundi, mardi, jeudi et vendredi de 9h30 à 17h30,
- samedi de 10h à 18h,
- fermé le mercredi et le dimanche.