From
09
OCT.
2023
to
24
OCT.
2023

09h00
-
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

Geometry of Polynomial System Solving, Optimization and Topology

October 9-24, 2023 - IHP, Paris

Workshop with special week and two topical days

Special week

URL of the page: https://www.ihp.fr/en/events/geometry-polynomial-system-solving-optimization-and-topology

October 9 to 13, 2023

- Polynomials Systems and Real Geometry (long course, Monday to Friday), <u>I. Emiris</u> and <u>D. Plaumann</u>
- Moment Method in Optimization (short course, Monday and Tuesday), <u>D. Henrion</u>
- General audience presentation, Wednesday 11th, <u>B. Sturmfels</u>

Workshop: Geometry of Polynomial System Solving, Optimization and Topology

October 16 to 20, 2023

Organizers: <u>C. D'Andrea</u> , <u>P. Lairez</u> , <u>M. Safey El Din</u>, <u>É. Schost</u> , <u>L. Zhi</u>

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

- Elisenda Feliu, *Title to be announced*
- Martin Helmer, *Conormal Spaces and Whitney Stratifications*
- Anton Leykin, *Title to be announced*
- Bernard Mourrain, *Title to be announced*

Topical days

Topical day: Computer Vision. *October 23, 2023*

Organizer: <u>L. Busé</u>

Topical day: Mechanism Design and Computer Algebra. *October 24, 2023*

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INSTITUT HENRI POINCARÉ

Sorbonne Université / CNRS
11 rue Pierre et Marie Curie
75231 Paris Cedex 05

TIMETABLE

The institute:
• Monday to Friday from 8:30am to 6pm,
• closed on public holidays.

The museum - Maison Poincaré :
• Monday, Tuesday, Thursday and Friday
from 9:30am to 5:30pm,
• Saturday from 10am to 6pm,
• closed on Wednesday and Sunday.