# The 28th International Conference on Applications of Computer Algebra ACA'2023

# PROGRAM

**Warsaw University of Life Sciences – SGGW**
**Institute of Information Technology**
**July 17 – 21, 2023**

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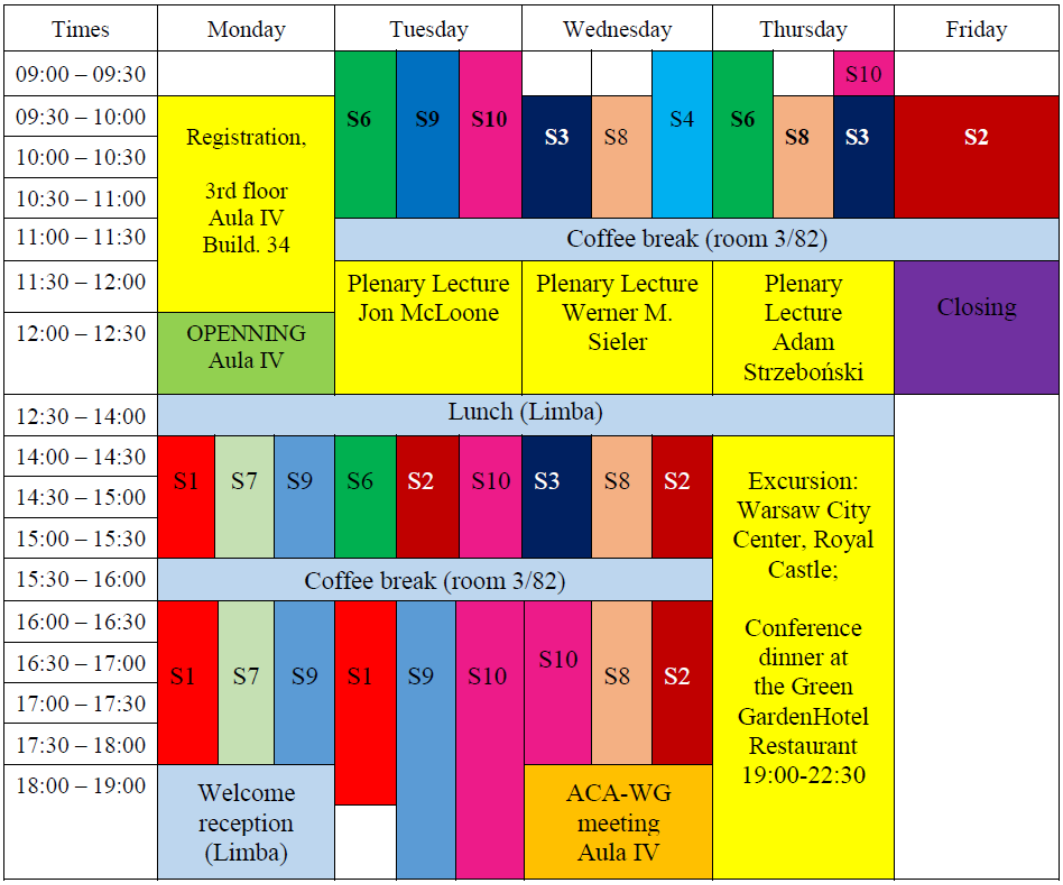
# ACA2023 – General Schedule




S1 – Computer Algebra in Education
S2 – Computer Algebra Modeling in Science and Engineering
S3 – D-Finite Functions and Beyond: Algorithms, Combinatorics and Arithmetic
S4 – Computer Algebra Systems and Interval Methods
S6 – Computer Algebra Applications in the Life Sciences
S7 – Computational Differential and Difference Algebra and its Applications
S8 – Algebraic Geometry from an Algorithmic Point of View
S9 – Effective Ideal Theory and Combinatorial Techniques in Commutative and Non-Commutative Rings and Their Applications
S10 – Algebraic and Algorithmic Aspects of Differential and Integral Operators

# Schedule for Invited Talks

## Tuesday, July 18, 2023

Build. 34, 3d floor, Lecture Hall "Aula IV"

11:30 – 12:30 **Jon McLoone**
Wolfram's Vision for Unified Computation

## Wednesday, July 19, 2023

Build. 34, 3d floor, Lecture Hall "Aula IV"

11:30 – 12:30 **Werner M. Seiler**
Theoretical and Numerical Analysis of Singular Initial and Boundary Value Problems

## Thursday, July 20, 2023

Build. 34, 3d floor, Lecture Hall "Aula IV"

11:30 – 12:30 **Adam Strzebonski**
Recent Symbolic Computation Developments in Mathematica

# Schedule for Computer Algebra in Education Session

*Organized by Michel Beaudin, Michael Wester, Noah Dana-Picard, Alkis Akritas, José Luis Galán García, Elena Varbanova*

## Monday, July 17

Build. 34, 3d floor, Lecture Hall "Aula IV"

14:00 – 14:30 **Elena Varbanova**, Stoyan Kapralov, Stanislav Simeonov
Assessment of students' knowledge and abilities in undergraduate mathematics

14:30 – 15:00 **Setsuo Takato**, Hideyo Makishita
Online drills created by extended CindyJS and scoring them with Maxima

15:00 – 15:30 **Eli Bagno**, Thierry Dana-Picard, Shulamit Reches
ChatGPT excels in medicine but falters in basic algebra

15:30 – 16:00 Coffee Break

16:00 – 16:30 Johannes Middeke, **David J. Jeffrey**, Aishat Olagunju
Orthogonal matrices: third time around

16:30 – 17:30 **Michel Beaudin**
Using CAS in the classroom: personal thoughts (Part III)

17:30 – 18:00 **Josef Böhm**
Surfaces and their Duals

## Tuesday, July 18

Build. 34, 3d floor, Lecture Hall "Aula III"

16:00 – 16:30 **David J. Jeffrey**, Albert D. Rich
Rubi gems

16:30 – 17:00 **Thierry Dana-Picard**, Tomas Recio
Automated computation of geometric Loci in Mathematics Education

17:00 – 17:30 Zoltán Kovács, Tomás Recio, **M. Pilar Vélez**
GeoGebra Automated Reasoning Tools: why and how (to use them in the classroom)

17:30 – 18:00 **Magdalena Skrzypiec**, W. Mozgawa, A. Naiman, P. Pikuta
Orthogonal trajectories to isoptics of ovals

18:00 – 18:30 **Hideyo Makishita**
Using CAS in mathematics education with the quadratic curve addition method

# Schedule for Computer Algebra Modeling in Science and Engineering Session

*Organized by Alexander Prokopenya, Haiduke Sarafian*

## Tuesday, July 18

Build. 34, 3d floor, Room 3/40

14:00 – 14:30 **Ryszard Kozera**
Fitting sparse reduced data

14:30 – 15:00 **Marcin Choinski**
A discrete SIS model built on the strictly positive scheme

15:00 – 15:30 **Marcin Ziółkowski**
On applications of computer algebra systems in queueing theory calculations

## Wednesday, July 19

Build. 34, 3d floor, Room 3/40

14:00 – 14:30 **Haiduke Sarafian**
Analyzing electric circuits with computer algebra

14:30 – 15:00 **Setsuo Takato**, Hideyo Makishita
LMS with simple modeling developed by extended CindyJS and Maxima

15:00 – 15:30 Setsuo Takato, **Jose A. Vallejo**
Billiards: At the intersection of Math, Physics and Computer Algebra

15:30 – 16:00 Coffee Break

16:00 – 16:30 Tatjana Petek, **Valery G. Romanovski**
Computation of normal forms for systems with many parameters

16:30 – 17:00 Alina Ivashkevich, Victor Red'kov, **Alexander Chichurin**
Spin 1 particle with anomalous magnetic moment in external uniform electric field: solutions with cylindric symmetry

17:00 – 17:30 **Alexander Prokopenya**
On stability of stationary motion of the 3D swinging Atwood machine

17:30 – 18:00 **AmirHosein Sadeghimanesh**, Matthew England
Semi-algebraic representations for the multistationarity region of reaction networks

## Friday, July 21

Build. 34, 3d floor, Room 3/40

09:30 – 10:00 **Aigerim Ibraimova**, Alexander Prokopenya, Mukhtar Minglibayev
Derivation of the evolution equations in the restricted three-body problem with variable masses by using Computer Algebra

10:00 – 10:30 **Aiken Kosherbayeva**, Mukhtar Minglibayev, Alexander Prokopenya
The problem of many bodies with isotropically varying masses

10:30 – 11:00 **Zhanar Imanova**, Alexander Prokopenya, Mukhtar Minglibayev
Investigation of a two-planetary problem of three bodies with variable masses varying anisotropically at different rates

11:00 – 11:30 Coffee Break

# Schedule for D-Finite Functions and Beyond: Algorithms, Combinatorics and Arithmetic Session

*Organized by Shaoshi Chen, Frédéric Chyzak, Antonio Jiménez-Pastor, Manuel Kauers, Veronika Pillwein*

## Wednesday, July 19

Build. 34, 3d floor, Lecture Hall "Aula IV"

09:30 – 10:00 Shaoshi Chen, **Lixin Du**, Manuel Kauers
Reduction based creative telescoping for definite summation of P-recursive sequences: the integral basis approach (online)

10:00 – 10:30 **Armin Straub**
Automatic Lucas-type congruences

10:30 – 11:00 **Philipp Nuspl**
Linear recurrence sequences in the OEIS

## Wednesday, July 19

Build. 34, 3d floor, Lecture Hall "Aula IV"

14:00 – 14:30 **Hadrien Brochet**, Bruno Salvy
Reduction based creative telescoping for definite summation of D-finite functions: the Lagrange identity approach

14:30 – 15:00 **Catherine St-Pierre**
How a linear recurrence problem inspired a solution in algebraic geometry

15:00 – 15:30 **Qing-Hu Hou**, Guo-Jie Li, Na Li, Ke Liu
Two applications of the telescoping method

## Thursday, July 20

Build. 34, 3d floor, Room 3/40

09:30 – 10:00 **Florent Brehard**, Nicolas Brisebarre, Mioara Joldes
A symbolic-numeric validation algorithm for linear ODEs with Newton-Picard method

10:00 – 10:30 Clemens G. Raab, **Georg Regensburger**
Algebraic consequences of the fundamental theorem of calculus in differential rings

10:30 – 11:00 **Manfred Buchacher**
Separating variables in bivariate polynomial ideals: the local case

# Schedule for Computer Algebra Systems and Interval Methods

*Organized by Milan Hladik, Małgorzata Jankowska, Vladik Kreinovich, Bartłomiej Kubica, Nathalie Revol, Iwona Skalna*

## Wednesday, July 19

Build. 34, 3d floor, Room 3/40

09:00 – 09:30 **Małgorzata A. Jankowska**, Bartłomiej J. Kubica, Andrzej Marciniak, Tomasz Hoffmann
On the application of an interval finite difference method and symbolic methods for solving the heat conduction problem

09:30 – 10:00 **Tomasz Hoffmann**, Andrzej Marciniak, Małgorzata A. Jankowska
On the application of directed interval arithmetic for solving elliptic BVP

10:00 – 10:30 **Bartłomiej Jacek Kubica**
Symbolic and algorithmic differentiation for the interval algorithm of training contracting autoencoders

10:30 – 11:00 **Laurent Granvilliers**
Symbolic recipes for solving nonlinear systems of equations with interval methods (online)

# Schedule for Computer Algebra Applications in the Life Sciences

*Organized by AmirHosein Sadeghimanesh, Andrzej Mizera, Ali Kemal Uncu*

## Tuesday, July 18

Build. 34, 3d floor, Lecture Hall "Aula III"

09:00 – 09:30 **Ovidiu Radulescu**
Inferring stochastic models of gene transcription from initiation events by computer algebra

09:30 – 10:00 **Alexandru Iosif**
Duality in mass-action networks

10:00 – 10:30 Marta Casanellas, Roser Homs Pons, **Angélica Torres**
Phylogenetic invariants for time-reversible models

10:30 – 11:00 **Andrzej Mizera**
Divide and control: an efficient decomposition-based approach towards the control of asynchronous Boolean networks

## Tuesday, July 18

Build. 34, 3d floor, Lecture Hall "Aula III"

14:00 – 14:30 **Adam L. MacLean**
Gene regulatory network inference with joint multi-omic single-cell data to learn dynamic cell state transitions

14:30 – 15:00 **Jiayue Qi**, Josef Schicho
Five equivalent representations of a phylogenetic tree

15:00 – 15:30 **Marcus Aichmayr**, Georg Regensburger
Computing sign vector conditions for existence and uniqueness of equilibria of chemical reaction networks

## Thursday, July 20

Build. 34, 3d floor, Lecture Hall "Aula IV"

09:00 – 09:30 **Nicola Vassena**
How to find or exclude bifurcations in biochemical systems?

09:30 – 10:00 **Oskar Henriksson**
Generic dimension of varieties arising in reaction network theory and 3D genome reconstruction

10:00 – 10:30 **Valery G. Romanovski**
Hopf bifurcations in some biochemical models

10:30 – 11:00 **Adam Strzeboński**
CAD adjacency computation using validated numerics

# Schedule for Computational Differential and Difference Algebra and its Applications Session

*Organized by Alexander Levin, Alexey Ovchinnikov, Daniel Robertz*

## Monday, July 17

Build. 34, 3d floor, Room 3/40

14:00 – 14:30 **Vladimir V. Bavula**
Classifications of prime ideals and simple modules of the Weyl algebra A1 in prime characteristic (online)

14:30 – 15:00 **Rida Ait El Manssour**, Gleb Pogudin
Multiplicity of arc spaces of fat points

15:00 – 15:30 **Alexander Levin**
A New Type of Difference Gröbner bases and their applications

15:30 – 16:00 Coffee Break

16:00 – 16:30 **Antoine Etesse**
On the Schmidt–Kolchin conjecture (online)

16:30 – 17:00 **Matthias Seiß**, Daniel Robertz
Specializations of normal forms in differential Galois theory

17:00 – 17:30 **V. Ravi Srinivasan**, Partha Kumbhakar
A classification of first order differential equations

17:30 – 18:00 **Valery G. Romanovski**
Local integrability of polynomial vector fields

# Schedule for Algebraic Geometry from an Algorithmic Point of View Session

*Organized by Cristina Bertone, Francesca Cioffi*

## Wednesday, July 19

Build. 34, 3d floor, Lecture Hall "Aula III"

09:30 – 10:00 Davide Bolognini, Antonio Macchia, Giancarlo Rinaldo, **Francesco Strazzanti**
An algorithmic approach to characterize Cohen-Macaulay binomial edge ideals of small graphs

10:00 – 10:30 **Dušan Dragutinovic**
Binary curves of genera four and five

10:30 – 11:00 **Ignacio García-Marco**, Irene Márquez-Corbella, Edgar Martínez-Moro, Yuriko Pitones
Free resolutions and generalized Hamming weights of binary linear codes

11:00 – 11:30 Coffee Break

## Wednesday, July 19

Build. 34, 3d floor, Lecture Hall "Aula III"

14:00 – 14:30 Amir Hashemi, **Matthias Orth**, Werner M. Seiler
Infinite free resolutions induced by Pommaret-like bases over Clements–Lindström rings

14:30 – 15:00 **Michela Ceria**, Francesco Pavese
The $m$-ovoids of $W(5,2)$ and their generalizations

15:00 – 15:30 **Teo Mora**, Michela Ceria, Andrea Visconti
Degroebnerization for data modelling problems

15:30 – 16:00 Coffee Break

16:00 – 16:30 **Teo Mora**, Michela Ceria
Generalizing Möller algorithm: a flexibility issue

16:30 – 17:00 **Meirav Amram**
On classification of algebraic curves and surfaces, using algorithmic methods

17:00 – 17:30 **Alberto Calabri**
On the weighted proximity graph of the base locus of a plane Cremona map

17:30 – 18:00 **Ozhan Genc**
Irreducible supernatural bundles on Grassmannians

## Thursday, July 20

Build. 34, 3d floor, Lecture Hall "Aula III"

09:30 – 10:00 **Emanuela De Negri**, Enrico Sbarra
Jet schemes of Pfaffian ideals

10:00 – 10:30 Philippe Gimenez, **Mario González-Sánchez**
Sumsets and the Castelnuovo-Mumford regularity of projective monomial curves

10:30 – 11:00 Amir Hashemi, Mahshid Mirhashemi, **Werner M. Seiler**
Applying machine learning to the computation of Pommaret bases – A progress report

# Schedule for Effective Ideal Theory and Combinatorial Techniques in Commutative and Non-Commutative Rings and Their Applications Session

*Organized by Michela Ceria, André Leroy, Samuel Lundqvist, Teo Mora, Eduardo Sáenz de Cabezón*

## Monday, July 17

Build. 34, 3d floor, Lecture Hall "Aula III"

14:00 – 15:00 **Sihem Mesnager**
A breakthrough concerning the solution of a famous equation on finite fields and its impacts in the context of S-boxes in symmetric cryptography

15:00 – 15:30 Rodrigo Iglesias, **Matthias Orth**, Eduardo Sáenz-de-Cabezon, Werner M. Seiler
A new view on the Rees algebra of a monomial plane curve parametrization

15:30 – 16:00 Coffee Break

16:00 – 16:30 **Cristina Bertone**, Francesca Cioffi, Matthias Orth, Werner M. Seiler
Marked bases for some quotient rings and applications - part I

16:30 – 17:00 Cristina Bertone, **Francesca Cioffi**, Matthias Orth, Werner Seiler
Marked bases for some quotient rings and applications - part II

17:00 – 17:30 Philippe Gimenez, Diego Ruano, **Rodrigo San-Jos'e**
Vanishing ideals and evaluation codes

17:30 – 18:00 **Viktor Levandovskyy**
Letterplace: theory, technology, and implementation

## Tuesday, July 18

Build. 34, 3d floor, Room 3/40

09:00 – 09:30 **Filip Jonsson Kling**, Samuel Lundqvist, Lisa Nicklasson
On binomial complete intersections

09:30 – 10:00 **Lisa Nicklasson**
Pinched Veronese algebras

10:00 – 10:30 **Victor Ufnarovski**, Erik Kennerland, Anna Torstensson
Almost monomial subalgebras of MK[x] and their LAGBI bases

10:30 – 11:00 **Discussion**

## Tuesday, July 18

Build. 34, 3d floor, Room 3/40

16:00 – 16:30 **Yosuke Sato**, Ryoya Fukasaku
On simplification of comprehensive Gröbner systems

16:30 – 17:00 **Tateaki Sasaki**
Term elimination sequence and removal of extraneous factors in two-polynomial systems

17:00 – 17:30 **Shinichi Tajima**, Katsusuke Nabeshima
Testing tameness of a complex polynomial map via comprehensive Gröbner systems

17:30 –18:00 **Katsusuke Nabeshima**, Shinichi Tajima
Primary decomposition via algebraic local cohomology with tag variables

18:00 – 18:30 **Deepak Kapur**
A Gröbner basis as a combination of congruence closures (online)

# Schedule for Algebraic and Algorithmic Aspects of Differential and Integral Operators Session

*Organized by Moulay Barkatou, Thomas Cluzeau, Clemens Raab, Georg Regensburger*

## Tuesday, July 18

Build. 34, 3d floor, Lecture Hall "Aula IV"

09:00 – 09:30 **Mohamed Barakat**
Doctrine specific ur-algorithms (online)

09:30 – 10:00 **Vladimir V. Bavula**
The most general theory of one-sided fractions (online)

10:00 – 10:30 **Manfred Buchacher**
The Newton-Puiseux algorithm and effective algebraic series

10:30 – 11:00 **Alexander Levin**
New dimension polynomials and invariants of inversive difference-differential field extensions

## Tuesday, July 18

Build. 34, 3d floor, Lecture Hall "Aula IV"

14:00 – 14:30 **Cyrille Chenavier**, Thomas Cluzeau, Alban Quadrat
Computation of Koszul homology and application to involutivity of partial differential systems

14:30 – 15:00 **Clemens Hofstadler**, Clemens G. Raab, Georg Regensburger
A semi-decision procedure for proving operator statements

15:00 – 15:30 **Sette Diop**
A differential algebraic approach of systems theory

15:30 – 16:00 Coffee Break

16:00 – 16:30 **Shaoshi Chen**, Hao Du, Hui Huang, Ziming Li
Hypergeometric creative telescoping (online)

16:30 – 17:00 **Alexei Cheviakov**
Approximate symmetries and conservation laws and their applications to PDEs (online)

17:00 – 17:30 **Antonio Jiménez-Pastor**
Difference-differential polynomials in SageMath

## Wednesday, July 19

Build. 34, 3d floor, Lecture Hall "Aula IV"

16:00 – 16:30 Thomas Cluzeau, **Camille Pinto**, Alban Quadrat
Towards an effective integro-differential elimination theory

16:30 – 17:00 **Franz Winkler**
Symbolic solutions of differential equations

17:00 – 17:30 Thieu N. Vo, **Yi Zhang**
Rational solutions of first-order algebraic ordinary difference equations

17:30 – 18:00 **Viktor Levandovskyy**
On an interplay of computer algebra and ring theory

## Thursday, July 20

Build. 34, 3d floor,Room 3/40

09:00 – 09:30 **Sebastian Posur**
An abelian ambient category for behaviors in algebraic systems theory (online)