

Mioara Maria Joldes

<http://homepages.laas.fr/mmjoldes/>

LAAS-CNRS

7, avenue du Colonel Roche

BP 54200

31031 Toulouse cedex 4

Phone: (+33) (0)5 61 33 69 26

E-mail: joldes@laas.fr

Personal Details:

Born August 1984; Romanian nationality.

I - Education

[2019] **Habilitation à Diriger des Recherches (HDR)** at Université Toulouse III Paul Sabatier.
Validated symbolic-numeric algorithms and practical applications in aerospace.

[2008 - 2011] **PhD in Computer Science** at École Normale Supérieure de Lyon, France.

[2007 - 2008] **Master Diploma in Computer Science** at École Normale Supérieure de Lyon.

[2003 - 2008] **Engineer Diploma** in Computer Science from Technical University of Cluj-Napoca, Romania.

II - Work

[Jan 2013 -] CNRS Researcher (DR2 since Oct. 2023, Section 06) at LAAS-CNRS, Toulouse, France; member of MAC Team (until Aug. 2019) and ROC team (since Sept. 2019).

[Oct-Dec 2022; Apr-Jun 2023] Invited Researcher Imperial College London, Maths. Dept.

[2011 - 2013] Postdoctorant, Computer-aided proofs in analysis (CAPA) Team, Uppsala Univ., Sweden.

III - Research

Keywords: **Rigorous/Validated Computing, Computer Arithmetic, Symbolic-Numeric Computing, Applications to Optimal Control and Aerospace**

Goals: Use numerical computations, but provide mathematical statements about the obtained result, such as sure, yet reasonably tight, error bounds. Build efficient symbolic-numeric objects, algorithms and software tools with direct application in control of dynamical systems and particularly in aerospace. Use and develop expertise and ideas from *Computer Arithmetic, Computer Algebra, Numerical Analysis*.

Prizes and Awards

- **2024:** MATRIX Institute Australia - Simons Travel Grant for the Dynamics and Computation Research Program 5-16 Feb 2024.
- **2022-2023:** Imperial College London & CNRS Invited Researcher Fellowship (6 months).
- **2022:** Google Open Source Peer Bonus Award for the Sollya Software.
- **2021:** **CNRS Bronze Medal**, Institut des Sciences de l'Information et de leurs Interactions.
- **2020:** Best Paper Award at the 31st IEEE International Conference on Application-specific Systems, Architectures and Processors (ASAP) for the article *Efficient Floating-Point Implementation of the Probit Function on FPGAs*, co-authored with B. Pasca (Intel Corp., France).
- **2019:** Distinguished Paper Award at the International Symposium on Symbolic and Algebraic Computation (ISSAC) for the article *On moment problems with holonomic functions*, co-authored with F. Bréhard and J.-B. Lasserre (LAAS-CNRS).
- **2007:** Excellence Scholarship from ENS de Lyon for International Master Students.
- **2000:** First Prize at the National Olympiad of Mathematics, Romania.

Invited conferences, seminars (selection)

I gave 5 plenary invited talks in international well-established conferences pertaining to computer algebra, computational mathematics, computer arithmetic and symbolic-numeric computations. I gave invited

talks at conferences organized by French Research organisations as well as invited seminars during invited stays in 7 foreign research teams (CRM Montreal Univ., Monash Univ., CUNY New York, Imperial College, Strathclyde Univ., Uppsala Univ., NIA Institute) and a dozen invited seminars in France. I also participated in several Aerospace related conferences in order to present and promote my work (a selection is provided below for completeness).

- **Nov 2024 & June 2025**: Invited course for the young researchers school of GDR IFM (EJCIFM2025) and for the annual meeting of GT Arith (RAIM 2024).
- **Sept 2024**: Invited talk at the Workshop on Computer-assisted proofs in nonlinear analysis in the thematic program Computational Dynamics: Analysis, Topology and Data at the CRM, Montreal Univ., Canada.
- **Feb 2024**: Invited talk at the School of Mathematics Colloquium, Monash University, Melbourne, Australia.
- **June 2023**: Plenary talk at DART XI (Differential Algebra and Related Topics), <https://dart-xi.github.io/>, London, UK.
- **July 2022**: Plenary talk at ISSAC'22 International Symposium on Symbolic and Algebraic Computation <http://issac-conference.org/2022/>, Lille, France.
- **March 2022**: Invited course at JNCF'22 (Francophone Computer Algebra Days) <https://conferences.cirm-math.fr/2568.html>, CIRM, Luminy, France.
- **April 2021**: Invited talk at *Kolchin Seminar in Differential Algebra*, CUNY, New York.
- **January 2021**: Invited talk at the workshop *Machine Learning in Certified Systems*, <https://mlcertifiedsystems.deel.ai/>
- **November 2020**: Invited talk at *Séminaire différentiel*, Université de Versailles-St Quentin, Math. Lab.
- **February 2020**: Invited talk at Imperial/UCL Numerics Seminar, London, UK.
- **March 2019**: Invited talk at National Days of Informatics-Mathematics, (Journées du GDR IM), Orléans.
- **October 2018**: Plenary talk at the conference Dynamics, Topology and Computations, Bedlewo, Poland.
- **October 2017**: Plenary talk at RAIM 2017: Rencontres Arithmétique de l'Informatique Mathématique, Lyon.
- **July 2017**: Semi-plenary talk at Foundations of Computational Mathematics, FOCM2017, Barcelona, Spain.
- **May 2017**: Invited talk at the Dept. Mechanical & Aerospace Engineering, Univ. of Strathclyde, Glasgow, UK.
- **September 2016**: Plenary talk at SCAN conference, 17th International Symposium on Scientific Computing, Computer Arithmetics and Verified Numerics, Sweden.

Invited educational, general public seminars

I was invited and then became more involved in educational and general public lectures.

- **March 2024**: Invited speaker, *A Clean Space for a Clean Planet at ChangeNOW 2024*, Paris
- **Oct 2023**: Interview for the csb-inscience.blogspot.com with L1 students at Sorbonne Université, CMI Physique
- **March 2022**: Public lecture, *Journée Nouveaux Entrants*, LAAS-CNRS, Toulouse
- **March 2022**: *Speed dating scientifique : Les femmes scientifiques sortent de l'ombre*, Quai des savoirs, Toulouse
- **Nov 2021**: Interview with Brigitte Vallée for the Gazette du GDR-IM <https://www.gdr-ifm.fr/gazette/>
- **Oct 2021**: Interview for INS2I News: *La rigueur au service de l'aérospatial*
- **Sept 2021**: Public lecture, *Journée Nouveaux Entrants de l'INS2I*, Paris
- **2018,2019**: 2 General public articles for INS2I (*Vers du calcul numérique formellement certifié, L'heureux mariage du calcul formel et de l'optimisation*)
- **2018**: Public lecture for secondary school winners of Alkindi contest <http://www.concours-alkindi.fr/>

Reviewing & program committees:

I have reviewed $\simeq 100$ articles for the following journals: ACM Transactions on Math Software, Automatica, IEEE Transactions in Computers, Mathematics in Computer Science, Numerical Algorithms, VLSI Journal, Communications in Nonlinear Science and Numerical Simulation, Nonlinear Dynamics, Journal of Approximation Theory, as well as for main conferences in computer arithmetic, computer algebra and control: ASAP, ARITH, ISSAC, SYNASC, ECC, IFAC.

– Program Committee member of the following conferences: SYNASC2016, ISSAC2017, ARITH2019–2024;

– PC Chair of ARITH2021 and Steering Committee member of ARITH since 2021.

PhD/HdR Jurys & Selection Committees:

- Reviewer (Principal Opponent) of F. M. Bartha's Phd Thesis, *Computer-aided proofs and algorithms in analysis*, Bergen Univ., Math Department, Norway, June 14, 2013
- Member of R. Serra's Phd Thesis committee, *In-orbit Servicing: Collision Risk Assessment and Optimal Maneuvers for Collision Avoidance and Rendezvous*, defended 10-12-2015, Toulouse

- Member of G. Rance’s Phd Thesis committee, *Commande H-infinie paramétrique et application aux viseurs gyrostabilisés*, defended 9-07-2018 at Centrale Supélec, France
- Member of D. Gallois-Wong’s Phd Thesis committee, *Formalisation en Coq des algorithmes de filtre numérique calculés en précision finie*, defended 4-3-2021 at Université Paris-Saclay, France
- Member of T. Hilaire’s HdR Committee, *From filter/controller to code - Contributions to Fixed-Point arithmetic implementations under accuracy constraint*, defended 21-03-2024, Paris
- Member of the Selection Committee for Assistant Prof., Section 27 (Computer Science), Lille University, 2024 ; Member of the Selection Committee for Assistant Prof., Section 27 (Computer Science), Sorbonne University, 2025 ; Member of the Selection Committee for Prof., Section 26 (Applied Maths), Limoges University, 2025 ; Member of Inria Admissibility Jury for the Inria d’Université Côte d’Azur Center, 2025

IV. Projects, Collaborations

Academic Collaborations

- **International Emerging Action IEA PRESTO - Probabilistic Reliable and Efficient Numerics for Stochastically-Constrained Trajectory Optimization 2023 - 2025** Collaborative research project with Fabrizio Dabbene and Martina Mammarella (CNR-IEIT, Italy) and with Denis Arzelier (DR CNRS, LAAS) and the PhD student Matthieu Masson.
- **S. Olver, Numerical Analysis, Imperial College London (ICL)** In Feb. 2020, I initiated a scientific collaboration concerning the interaction between validated numerics and spectral methods (mutual visits, seminars) with S. Olver, Reader at Imperial College. To further develop our project, I was recently awarded a 6 months ICL-CNRS fellowship for the academic year 2022-2023.¹
- **Stardust-R, the H2020 Space Debris and Asteroid research network** led by Prof. Massimiliano Vasile, Strathclyde Univ., Glasgow. Since Feb. 2019, I am a partner in this organization which regroups most major academic actors involved in Space-related research. I also collaborate (mutual visits, seminars) with Prof. Vasile’s team in Strathclyde.
- **CAPA Team, Uppsala, Sweden** Since 2011 I collaborate with Computer Aided Proofs in Analysis (CAPA) team, Mathematics Department, Uppsala, Sweden. I work with Prof. Warwick Tucker for solving problems in Discrete Dynamical Systems with the help of high performance computing. For that, we do mutual visits and research seminars.
- **Pascaline Team, LIP, Lyon** I collaborate with Pascaline Team in various projects (e.g., ANR NuSCAP) related to Computer Arithmetic and Computer Algebra (N. Brisebarre, J.-M. Muller, B. Salvy). We hope that this collaboration will result in a broader visibility, understanding and application of arithmetic and computer algebra techniques.

Research Projects

Concerning projects with academic partners, I was strongly involved in the management of the French ANR project FastRelax (60%, 10/2014–09/2019) as the Scientific responsible of LAAS-CNRS partner and then continued (with the same role) for the follow-up project ANR NuSCAP. I was also member of two American Institute of Mathematics (AIM) projects.

Concerning industrial partners, I was the head of a Research Collaboration R&T Project with CNES (French Space Agency) regarding *Global Collision Probability Assessment and Station Keeping of Satellites* (2016–2018) and then have engaged as co-principal investigator (with D. Arzelier) in two granted R&T CNES projects 2020–2022². These projects were selected and funded following a competitive consultation involving major players in the space sector. They are covered either by the Multi-year Research and Technology Program (PPRT), or by European fundings in the framework EU-SST (Space Surveillance and Tracking). The activity conducted essentially aims to cover the needs of prospective research and technological leaps, by employing techniques from scientific fields other than the space sector. The deliverables on these projects consisted of several research reports (see publication list) and they contain thorough bibliographical studies and novel research contributions, with both theoretical algorithms and practical implementations. During January 2025 – 31st May 2026, I am involved with D. Arzelier in

¹<https://www.imperial.ac.uk/abraham-de-moivre/opportunities/icl-cnrs-fellowships/>

²The total funding secured with R&T CNES projects for the LAAS partner is around 300k€.

a new EUSST R&D – Collision Avoidance Enhancement (Work Package 2: Legal – Risk Estimation Improvement) in collaboration with the industrial partner GMV.

V - Supervision, Teaching

Starting 2013, I fully supervised or co-supervised 5 undergraduate internships, 7 master internships and 4 PhD theses (one on-going). I also took part in the supervision of a 5th PhD thesis for 2 years (2013-2015).

PhD Students:

- 2022–2025 M. Masson, *Efficient numerical algorithms for orbital collision risk assessment and avoidance*: co-supervision (40%) with D. Arzelier and C. Artigues (ROC, LAAS).
- 2016–2019 F. Bréhard, PhD defense on July 12, 2019, *Certified numerics in function spaces: Polynomial approximations meet computer algebra and formal proof*: co-supervision (40%) with N. Brisebarre and D. Pous (LIP, ÉNS Lyon). F. Bréhard is CR CNRS, CFHP Team, CRISAL Laboratory, Lille.
- 2015–2018 P.R. Arantes Gilz, PhD defense on Octobre 17, 2018, *Embedded and validated control algorithms for the spacecraft rendezvous*: supervisor (Directrice de thèse, 50%) with C. Louembet (MAC, LAAS). P.R. Arantes Gilz is engineer with SII (Société pour l'Informatique Industrielle), Toulouse.
- 2014–2017 V. Popescu, PhD defense on July 6, 2017, *Towards Fast and Certified Multiple Precision Arithmetic Libraries*: co-supervision (50%) with J.-M. Muller (LIP, ÉNS Lyon). V. Popescu is now Data Scientist at Cerebras Systems in San Diego, USA.
- 2013–2015 R. Serra, PhD defense on December 2015, *In-orbit Servicing: Collision Risk Assessment and Optimal Maneuvers for Collision Avoidance and Rendezvous*: for two years (after my arrival at CNRS) I took part in the supervision of R. Serra together with D. Arzelier and A. Rondepierre (LAAS-CNRS). R. Serra is now engineer at Thales Services, Toulouse.

Master internships (4-6 months):

- 2021 R. Buguet and N. Prevot, M1: co-supervision (33%) with D. Arzelier.
- 2018-2019 M.-F. Montaruli, M2: co-supervision (33%) with D. Arzelier et S. Laurens (CNES).
- 2018 D. Guého, M1: co-supervision (40%) with S. Laurens, D. Arzelier and A. Rondepierre.
- 2017 L. Martire, M2: co-supervision (33%) with D. Arzelier and A. Rondepierre.
- 2016 F. Bréhard, M2: supervision (100%).
- 2014 V. Popescu, M2: supervision (100%).

Undergraduate internships (1.5 - 3 months) :

- 2018 A.-M. Nanes, co-supervision (30%) with J.-M. Muller and N. Brisebarre.
- 2015 N. Deak, co-supervision (40%) with D. Arzelier and C. Louembet.
- 2015 B. Fulop, co-supervision (70%) with N. Brisebarre.
- 2014 O. Marty, supervision (100%).
- 2013 V. Popescu, co-supervision (70%) with W. Tucker.

VI. Publications

Publications' list available at <https://homepages.laas.fr/mmjoldes/publicationsList.pdf>