

# Gleb Pogudin

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## Contact Information

Affiliation **LIX, CNRS, École Polytechnique**, *Institut Polytechnique de Paris*.

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## Employment

- 2020–now **Assistant Professor**, *École Polytechnique*, France.  
Laboratoire d'informatique
- 2019–2020 **Assistant Professor**, *Higher School of Economics*, Moscow.  
Department of Computer Science
- 2017–2019 **Assistant Professor/Faculty Fellow**, *New York University*.  
Courant Institute of Mathematical Sciences
- 2017–2019 **Visiting Scholar**, *City University of New York*.  
Graduate Center
- 2016–2017 **Postdoc**, *Johannes Kepler University*, Linz, Austria.  
Institut für Algebra, mentored by Manuel Kauers
- 2012–2016 **Math Instructor**, *Moscow State University*.  
Department of Mechanics and Mathematics and A.N.Kolmogorov high school
- 2014–2016 **Math Instructor**, *College of Moscow Institute of Physics and Technology*.
- 2012–2013 **Programmer**, *Yandex Company*.  
Banner System: Real-time computations and Data Analysis

## Education

- 2012–2016 **Ph.D. in Mathematics**, *Moscow State University*.  
Advisor: Yu. P. Razmyslov
- 2007–2012 **Diploma in Mathematics and Applied Mathematics**, *Moscow State University*.  
Advisor: Yu. P. Razmyslov. Diploma with honours.

## Publications

### Preprints

1. I. C. Pérez Verona, A. Ovchinnikov, G. Pogudin, M. Tribastone, *CLUE: Exact maximal reduction of kinetic models by constrained lumping of differential equations*, <https://arxiv.org/abs/2004.11961>.
2. W. Li, A. Ovchinnikov, G. Pogudin, T. Scanlon, *Algorithms yield upper bounds in differential algebra*, <https://arxiv.org/abs/2005.01608>.

3. A. Ovchinnikov, A. Pillay, G. Pogudin, T. Scanlon, *Computing all identifiable functions for ODE models*, <https://arxiv.org/abs/2004.07774>.
4. A. Ovchinnikov, G. Pogudin, N. Thieu Vo, *Bounds for elimination of unknowns in systems of differential-algebraic equations*, <https://arxiv.org/abs/1610.04022>.
5. W. Li, A. Ovchinnikov, G. Pogudin, T. Scanlon, *Elimination of unknowns for systems of algebraic differential-difference equations*, <https://arxiv.org/abs/1812.11390>.
6. E. Amzallag, A. Minchenko, G. Pogudin, *Degree bound for toric envelope of a linear algebraic group*, <https://arxiv.org/abs/1809.06489>.
7. A. Ovchinnikov, G. Pogudin, P. Thompson, *Input-output equations and identifiability of linear ODE models*, <https://arxiv.org/abs/1910.03960>.
8. M. Buchacher, M. Kauers, G. Pogudin, *Separating variables in bivariate polynomial ideals*, <https://arxiv.org/abs/2002.01541>.

#### Peer-reviewed articles

1. G. Pogudin, T. Scanlon, M. Wibmer, *Solving difference equations in sequences: Universality and Undecidability*, Accepted for publication in the Forum of Mathematics, Sigma, 2020.
2. H. Hong, A. Ovchinnikov, G. Pogudin, C. Yap, *Global identifiability of differential models*, accepted for publication in the Communications in Pure and Applied Mathematics, 2020.
3. A. Ovchinnikov, G. Pogudin, T. Scanlon, *Effective difference elimination and Nullstellensatz*, accepted for publication in the Journal of the European Mathematical Society, 2020.
4. E. Paul, G. Pogudin, W. Qin, R. Laubenbacher *The dynamics of canalizing Boolean networks*, Complexity, vol 2020, ID3687961, 2020.
5. G. Pogudin, *Primitive element theorem for fields with commuting derivations and automorphisms*, Selecta Mathematica, 25:57, 2019.
6. H. Hong, A. Ovchinnikov, G. Pogudin, C. Yap, *SIAN: software for structural identifiability analysis of ODE models*, Bioinformatics, vol. 35(16), pp. 2873–2874, 2019.
7. E. Amzallag, G. Pogudin, M. Sun, N. Thieu Vo, *Complexity of triangular representations of algebraic sets*, Journal of Algebra, vol. 523, pp. 342–364, 2019.
8. G. Pogudin, *A differential analog of the Noether normalization lemma*, International Mathematics Research Notices, vol. 2018(4), pp. 1177–1199, 2018.
9. G. Pogudin, A. Szanto, *Irredundant Triangular Decomposition*, refereed Proceedings of the 2018 ACM International Symposium on Symbolic and Algebraic Computation, pp. 311–318, 2018.
10. G. Pogudin, *Products of ideals and jet schemes*, Journal of Algebra, vol. 502, pp. 61–78, 2018.
11. R. Gustavson, A. Ovchinnikov, G. Pogudin, *New order bounds in differential elimination algorithms*, Journal of Symbolic Computation, vol. 85, pp. 128–147, 2018.
12. G. Pogudin, *Power series expansions for the planar monomer-dimer problem*, Physical Review E, vol. 96, 033303, 2017.

13. M. Kauers, G. Pogudin, *Bounds for Substituting Algebraic Functions into D-finite Functions*, refereed Proceedings of the 2017 ACM International Symposium on Symbolic and Algebraic Computation, pp. 245–252, 2017.
14. O. Gerasimova, Yu.P. Razmyslov, G. Pogudin *Rolling Simplexes and Their Commensurability III (Capelli Identities and Their Application to Differential Algebras)*, Journal of Mathematical Sciences, vol. 221(3), pp. 315–325, 2017.
15. G. Pogudin, Yu.P. Razmyslov, *Prime Lie algebras satisfying the standard Lie identity of degree 5*, Journal of Algebra, vol. 468, pp. 182–192, 2016.
16. R. Gustavson, A. Ovchinnikov, G. Pogudin, *Bounds for orders of derivatives in differential elimination algorithms*, refereed Proceedings of the 2016 ACM International Symposium on Symbolic and Algebraic Computation, pp. 239–246, 2016.
17. E.S. Golod, G. Pogudin, *Modules of zero Gorenstein dimension over graph algebras*, Sbornik:Mathematics, vol. 207, issue 7, pp. 81–100, 2016.
18. G. Pogudin, *The primitive element theorem for differential fields with zero derivation on the base field*, Journal of Pure and Applied Algebra, vol 219(9), pp. 4035–4041, 2015.
19. G. Pogudin, *Primary differential nil-algebras do exist*, Moscow University Mathematics Bulletin, vol 69(1), pp 33–36, 2014.
20. Yu.P. Razmyslov, G. Pogudin, *The Heisenberg envelope for the Hochschild algebra of a finite-dimensional Lie algebra*, Journal of Mathematical Sciences, vol. 193(4), pp 580–585, 2013.
21. Yu.P. Razmuslov, G. Pogudin, *Paradigm of Max-Factor and finite-dimensional representation of Lie algebras*, Moscow University Mathematics Bulletin, vol. 67(4), pp 170–172, 2012.
22. G. Pogudin, *Wronskian of derivations*, Moscow University Mathematics Bulletin, Volume 66(1), pp 47–49, 2011.

#### Other publications

1. M. Drmota, C. Krattenthaler, G. Pogudin, *Problem 11997*, The American Mathematical Monthly, vol. 124, number 7, p.660.

#### Recent presentations

1. *SIAN: a tool for assessing structural identifiability of parametric ODEs*, International Symposium on Symbolic and Algebraic Computation (ISSAC), Beijing, 15-18 July 2019.
2. *Parameter identifiability for ODE models via an input-output representation* (poster), SIAM Applied Algebraic Geometry, Bern, 9-13 July 2019 (Best poster award).
3. *Primitive Element Theorem for fields with commuting derivations and automorphisms*, Applications of the model theory of fields with operators, Manchester, 17-20 June 2019.
4. *Global identifiability of differential models*, Biomathematics/Computational Biology Colloquium, Courant Institute of Mathematical Sciences, October 23 2018.

5. *Elimination of unknowns in systems of difference equations*, Differential Algebra and Related Topics IX, Leeds, 30 July - 2 August 2018.
6. *Global identifiability of differential models*, International Congress on Mathematical Software (ICMS), South Bend, 23-27 July 2018.
7. *Irredundant triangular decomposition*, International Symposium on Symbolic and Algebraic Computation (ISSAC), New York, 16-19 July 2018.
8. *Power series expansion of the free energy for monomer-dimer tilings*, Rutgers Experimental Mathematics Seminar, New Brunswick, 1 February 2018.
9. *Algorithms for checking global identifiability*, Kolchin Seminar in Differential Algebra, CUNY Graduate Center, New York, 1 September 2017.
10. *Computation of a representation of radical ideal via triangular sets*, SIAM Applied Algebraic Geometry, Atlanta, 1-4 August 2017.
11. *Elimination for systems of nonlinear ODEs arising in biology*, Annual Meeting of Society for Mathematical Biology, Salt Lake City, 17-20 July 2017.
12. *Jet Ideals and Products of Ideals in Differential Rings*, Kolchin Seminar in Differential Algebra, CUNY Graduate Center, New York, 18 November 2016.
13. *New effective differential Nullstellensatz*, Differential Algebra and Related Topics VII, CUNY Graduate Center and Hunter College, New York, 1-4 October 2016.
14. *Bounds for orders of derivatives in differential elimination algorithms*, International Symposium on Symbolic and Algebraic Computation (ISSAC), Waterloo, 19-22 July 2016.
15. *On the Existence of Surjective Projection of a  $d$ -Dimensional Differential Algebraic Variety onto  $\mathbb{A}^d$* , Kolchin Workshop on Differential Algebra, CUNY Hunter College, New York, 13-15 May 2016.
16. *Differential analogue of the Primitive Element theorem*, Seminar on Computer Algebra, Moscow State University and Dorodnicyn Computing Centre, Moscow, 20 April 2016.
17. *A “polynomial shifting” trick in differential algebra*, Mathematical Aspects of Computer and Information Sciences (MACIS), Berlin, 11-13 November 2015.
18. *Some properties of the differential ideal  $[x^m]$*  (poster), Model Theory, Difference/Differential Equations and Applications, Lumini, 7-10 April 2015.
19. *On the primitive element theorem for differential field extensions with zero derivation on the base field*, Polynomial Computer Algebra, Euler International Mathematical Institute, St. Petersburg, 16-19 April 2014.
20. *Some properties of the differential ideal  $[x^m]$* , Polynomial Computer Algebra, Euler International Mathematical Institute, St. Petersburg, 6-10 May 2013.

## Teaching

- École Polytechnique:
  - Computer Programming (CSE102, lab sessions),
  - Concurrent and Distributed Computing (CSE305, lab sessions).

- Higher School of Economics:
  - Algorithms and Data Structures 1,
  - Computations in Nonlinear Algebra.
- New York University: Basic Algorithms (4 semesters).
- New York Math Circle: “College Bridge” program.
- Johannes Kepler University: Algebra for Computer Scientists, project leader for “Project Week of Applied Mathematics” (link).
- Moscow State University, Department of Mechanics and Mathematics:
  - Abstract Algebra I, II,
  - Ring theory.
- Moscow State University, A.N. Kolmogorov school:
  - Calculus I, II.
  - Intermediate Algebra.
- College of Moscow Institute of Physics and Technology:
  - Discrete Mathematics,
  - Probability and Statistics.

## Mentoring students

- 2018-2019 Project “*The Dynamics of Canalizing Boolean Networks*” by Eli Paul and William Qin (high school students). The paper we wrote is available at <https://arxiv.org/abs/1902.00056>.
- 2017-2018 Project “*A method for identifying parameters in the May-Leonard system using Gröbner bases*” by Esha Sawant (high school student). The project advanced to the finals of the NYC Science and Engineering Fair.

## Teaching awards

- 2015, 2016 The Best Teacher of the A.N. Kolmogorov High School (Moscow State University).
- 2014 Grant recipient of the Education Department of Moscow.

## Professional service

- Program Committee Member of Computer Algebra in Scientific Computing (CASC 2020, Linz, Austria).
- Co-organizer of the workshop Model Theory of Differential Equations, Algebraic Geometry, and their Applications to Modeling (2020, BIRS, Canada)
- Program Committee Member of the 44th International Symposium on Symbolic and Algebraic Computation (ISSAC 2019, Beijing, China).
- Chair of the Workshop on Symbolic-Numeric Methods for Differential Equations and Applications (NYU, USA, 2018).
- Selection Committee Member for Dean’s Undergraduate Research Fund (NYU, USA, 2018).
- Judge of the NYU Undergraduate Research Conference (NYU, USA, 2018).

- Publicity Chair of the 43rd International Symposium on Symbolic and Algebraic Computation (ISSAC 2018, CUNY and NYU).
- Poster Committee Member of the 43rd International Symposium on Symbolic and Algebraic Computation (ISSAC 2018, CUNY and NYU).
- Local Organizer of the 8th Differential Algebra and Related Topics conference (Johannes Kepler University, Linz, Austria, 2017).

### ■ Additional skills

Programming languages: C++, Python, Perl, Maple, Mathematica, Java, SQL, Coq.