

CURRICULUM VITAE

Nataliia Goncharuk

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Positions

- **2022 – now:** Assistant Professor, Department of Mathematics, Texas A&M University, College Station, TX.
- **2019-2022:** Postdoctoral fellow, Department of Mathematics, University of Toronto, Canada.
- **2016-2019:** HC Wang Assistant Professor, Department of Mathematics, Cornell University, Ithaca, NY.
- **2015-2016:** Junior researcher, Laboratory of Algebraic geometry and its Applications, Higher school of Economics, Moscow, Russia.

Degrees

- **2012–2016:** Postdoctoral studies, Higher School of Economics and Independent University of Moscow.
2016: Defended PhD thesis “Circle diffeomorphisms and complex dynamics” at Institute for Information Transmission Problems, Moscow.
Doctoral advisor: Yulij S. Ilyashenko.
- **2007–2012** Lomonosov Moscow State University, Department of Mechanics and Mathematics, Diploma with highest honors.
- **2007-2012** Independent University of Moscow, Diploma with highest honors.

Research interests

- circle dynamics;
- renormalizations;
- one-dimensional complex dynamics;
- polynomial foliations in \mathbb{C}^2 ;
- global bifurcations of planar vector fields.

Prizes and Awards

- **2018 Prize of the Moscow Mathematical Society given to young mathematicians.**
For the series of works "New fractal set 'bubbles' and complex rotation numbers"
- **Simons foundation grant** for undergraduate and doctoral students in Mathematics, 2013, 2015.
- **August Möbius Contest** Winner in nomination “Undergraduates”, 2012.
- **Open Contest of research works** held by Higher School of Economics
Winner in nomination “Mathematics”, 2011.
- **Dobrushin scholarship** spring 2010 – spring 2012 (all semesters).
- **International Mathematical Olympiad:** Gold medal, 2006 (Ukrainian team)
- **National Ukrainian Mathematical Olympiad:** diploma of 1st degree, 2003–2006.

Publications

- 1. N. Goncharuk, “Rotation numbers and moduli of elliptic curves”, *Functional Analysis and Its Applications*, 2012, 46:1, pp. 11–25. (translated from Russian)
- 2. X. Buff, N. Goncharuk, “Complex rotation numbers”, *Journal of Modern Dynamics*, Volume 9(2015), pp. 169-190.
- 3. N. Goncharuk, Yu. Kudryashov, “Bounded limit cycles of polynomial foliations in \mathbb{C}^2 ” *Bulletin of the Brazilian Mathematical Society, New Series* (2017) Volume 48, Issue 1, pp 63–83.
- 4. N. Goncharuk, Yu. Kudryashov, “Cheap complex limit cycles” (arXiv:1702.00897), *Nonlinearity*, Volume 31, Number 3 (2018).
- 5. N. Goncharuk, Yu. Kudryashov, “Genera of non-algebraic leaves of polynomial foliations of \mathbb{C}^2 ” (arXiv:1407.7878), *Moscow Math. J.*, Volume 18, Issue 1, 2018, pp. 63–83.
- 6. N. Goncharuk, “Complex rotation numbers: bubbles and their intersections”, *Analysis and PDE*, Volume 11, No 7 (2018), pp. 1787 – 1801.
- 7. N. Goncharuk, “Self-similarity of bubbles”, arxiv:1805.04769, *Nonlinearity* 32 (2019), 2496-2521.
- 8. N.Goncharuk, Yu. Ilyashenko, N.Solodovnikov, “Global bifurcations in generic one-parameter families with a parabolic cycle on S^2 ” (arXiv:1707.09779), *Moscow Math. J.*, Volume 19, Issue 4, October–December 2019, pp. 709–737.
- 9. N.Goncharuk, Yu. Ilyashenko, “Large bifurcation supports”, arXiv:1804.04596.
- 10. N. Goncharuk and Yu. Kudryashov, “Bifurcations of the Polycycle “Tears of the Heart”: Multiple Numerical Invariants” (arXiv:1808.07459), *Moscow Math. J.*, Volume 20, Issue 2, April– June 2020, pp. 323–341.
- 11. N. Goncharuk, Yu. Kudryashov, N. Solodovnikov, “New structurally unstable families of planar vector fields”, arXiv:1908.02693, *Nonlinearity* 34:1 (2021).
- 12. N. Goncharuk, Yu. Kudryashov, “Families of vector fields with many numerical invariants”, arXiv:2003.01269, *Discrete and Continuous Dynamical Systems*, doi: [10.3934/dcds.2021114](https://doi.org/10.3934/dcds.2021114).
- 13. N.Goncharuk, Yu. Ilyashenko, “Various Equivalence Relations in Global Bifurcation Theory”, *Proceedings of the Steklov Institute of Mathematics*, 2020, vol. 310, p. 78–97.
- 14. N.Goncharuk, M.Yampolsky, “Analytic linearization of conformal maps of the annulus”, arXiv:2004.05126, *Advances in Mathematics*, Volume 409, Part A, 2022, 108636, ISSN 0001-8708, <https://doi.org/10.1016/j.aim.2022.108636>.
- 15. N.Goncharuk, K.Khanin, Yu. Kudryashov, “Circle homeomorphisms with breaks with no $\mathbb{C}^{2-\nu}$ conjugacy”, arxiv:2112.02765, *Journal of Modern Dynamics*, 2023, 19: 751-772.
- 16. N. Goncharuk, M.Yampolsky, “Renormalization of circle maps and smoothness of Arnold tongues”, arXiv:2307.15195, submitted.
- 17. N.Goncharuk, I.Gorbovickis, “Renormalization and scaling of bubbles”, arXiv:2312.11308, submitted.
- **Lecture notes** (in Russian):
A. I. Bufetov, N.B.Goncharuk, Yu.S.Ilyashenko, Lecture notes of the course “Ordinary differential equations”, part I, Moscow: the Board of Trustees of the Department of Mechanics and Mathematics of MSU, 2012. — 120 p.

Teaching experience

- **Texas A& M University (2023-2024): Theory of functions of a complex variable (MAT617,618); The Putnam challenge (MATH490);**
- **(2022-2023): Differential equations MATH308 and MATH 308-Honors.**
- **University of Toronto (2019-2022):** Differential equations 1 MAT244 (3 times); Complex Variables MAT334.
- **Cornell university (2016-2019):** Real analysis (6110), Dynamical systems (6260), Honors introduction to Analysis I (4130), Intro to Analysis (3110), Introduction to Differential equations (3120) – 3 times, Calculus II (1120).
- **"Bachelor of Arts in Economics" joint program of NES and HSE, Moscow (2013-2016):** Calculus-1 (large lecture course), Introduction to modern topology (lectures and practice), Calculus-2 (practical session).
- **Summer school "Modern Mathematics" (Dubna, Russia), mini-courses (2010-2017):** Bifurcations of planar vector fields (2017); with Yury Kudryashov: Schottky groups (2015), Arnold's cat (2013), Maps of the circle and continuous fractions (2011), Deterministic Chaos (2010).
- **Russian–Japanese mathematical winter school (2013), Moscow, Higher School of Economics,** Mini-course "Complex rotation numbers"
- **Independent university of Moscow (2011),** Course "Rotation numbers and moduli of elliptic curves"
- **Moscow State University (2011):** organized the undergraduate seminar "Dynamical systems" (with A. Bufetov and O. Romaskevich).
- **Moscow State School #57 , High school (2011-2012): Teacher** (selected topics of Calculus, Algebra, and Mathematical logic).

Selected invited talks

- **7th Brazilian School of Dynamical systems, Universidade Federal do Ceará, Brazil,** plenary talk "Renormalization and Arnold tongues", October 2023.
- **EDAI seminar, PUC-Rio, Rio-de-Janeiro, Brazil,** "Renormalization and Arnold tongues", October 2023.
- **Workshop on Mathematical Billiards, UT Dallas, USA (zoom),** "Complex rotation numbers", August 2023.
- **Inaugural CNAM – Fields Nonlinear Days: Renormalization and Friends, Toronto, Canada,** "Renormalization and Arnold tongues", August 2023.
- **Workshop "Adventurous Berkeley Complex Dynamics", MSRI, Berkeley, California,** "Complex rotation numbers and renormalization", May 2022.
- **Introductory Workshop on Tame Geometry, Transseries and Applications to Analysis and Geometry,** Fields Institute for Research in Mathematical Sciences, Toronto, Canada, "Complex rotation numbers", January 2022.
- **Dynamical Systems Seminar, Institut de Mathématiques de Toulouse, France,** "Complex rotation numbers and renormalization", January 2022.
- **Seminaire Teich, Institut de mathématiques de Marseille,** "Nombres de rotation complexes et des jolies images dans l'espace des paramètres" (zoom, December 2021).
- **Dynamical systems seminar, Stony Brook university,** Institute for Mathematical Sciences, "Renormalization and irrational Arnold tongues" (October 2021).
- **The Budapest-Wien Dynamics seminar** (zoom, March 2021), "Complex rotation numbers and bubbles".

- **Virtual Workshop Many faces of renormalization** (zoom, March 2021; Simons Center for Geometry and Physics, Stony Brook University), “Bubbles and renormalization”.
- **Séminaire de Systèmes Dynamiques, Institut de Mathématiques de Jussieu-Paris Rive Gauche** (zoom; January 2021) “Complex rotation numbers and bubbles”.
- **Seminário do Grupo de Sistemas Dinâmicos, Universidade Federal do Rio de Janeiro**, (zoom, Nov 2020), “Structurally unstable families of planar vector fields” (with Yury Kudryashov).
- **Geomtop Weizmann Seminar** (zoom; Rehovot, Israel, 2020) “Complex rotation numbers”
- **Resistencia Dinamica** (zoom; Rio de Janeiro, Brazil, 2020) “Complex rotation numbers”
- **Analytic Low-Dimensional Dynamics: a celebration of Misha Lyubich's 60th birthday** (Toronto, Canada, 2019) “Complex rotation numbers”.
- **Meeting of the Moscow Mathematical Society** (Moscow, 2018), “Complex rotation numbers and bubbles”.
- **Dynamical systems seminar, Stony Brook university, Institute for Mathematical Sciences** (2017) “Complex rotation numbers”.
- **International conference “Geometric aspects of modern dynamics” (Porto, Portugal, 2016)**, “Complex rotation numbers”
- **CAPA seminar, Uppsala University** (2016), “Bubbles”.
- **AMS - EMS - SPM joint meeting (Porto, Portugal, 2015)**, “Genera of non-algebraic leaves of polynomial foliations of CP^2 ”.
- **Oliver club, Cornell university** (2015), “Bubbles”.
- **Seminario de foliaciones y singularidades UNAM, Instituto de Matemáticas** (Mexico, 2014), “Complex rotation numbers”
- **Seminar “Sistemas Dinámicos” UNAM, Instituto de Matemáticas** (Cuernavaca, 2014), “The topology of solutions of polynomial vector fields in C^2 ”.
- **International conference “Spectral Theory and Differential equations”** dedicated to the Anniversary of B.M.Levitan (Moscow, Russia, 2014), “Geometry of non-algebraic solutions of polynomial vector fields in CP^2 ”.
- **International conference “Holomorphic foliations and complex dynamics” (Moscow, 2012)**, “Complex rotation numbers”.
- **Seminar of the Department of Differential Equations, Steklov Mathematical Institute** (Moscow, 2011, 2010), “Rotation numbers and moduli of elliptic curves”.
- **Séminaire à l'UMPA de géométrie et dynamique, ENS Lyon (2011)**, “The limit behavior of complex rotation number”.
- **Séminaire à l'UMPA de géométrie et dynamique, ENS Lyon (2010)**, “The rotation number and the moduli of elliptic curves”.
- **ESF conference “Algebraic Methods in Dynamical Systems”** (Bedlewo, Poland, 2010) Poster “The rotation number and the moduli of elliptic curves”.