Yulia Petrova. Curriculum Vitae

Personal Data

Name:	Petrova Yulia (Iuliia) Petrovna
Date of Birth:	29 June 1991, Ukhta, Russia (ex. USSR)
Current position:	Postdoc of Excellence, IMPA Instituto de Matematica Pura e Applicada
Current address:	Estr. Dona Castorina, 110 (room 321) Jardim Botânico, Rio de Janeiro, Brazil, 22460-320
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Marital status:	married, no children
Last CV update:	10/01/2023

Research interests

- *Fluid dynamics*: multiphase flow in porous media, viscous/gravitational fingering phenomenon
- *Hyperbolic conservation laws*: Riemann problem, travelling and shock waves
- *Spectral theory*: asymptotics of eigenvalues for compact operators
- *Probability theory*: Gaussian processes, small ball probabilities
- *Industrial applications*: enhanced oil recovery (EOR) methods

Education

Nov 2018	PhD in Mathematics and Physics, St. Petersburg State University, Russia Supervisor: Alexander I. Nazarov. PhD thesis: «Exact L_2-small ball asymptotics for finite-dimensional perturbations of Gaussian processes» (in Russian). Short version (in Russian)
Jun 2013	MSc in Mathematics, chair of Mathematical Physics, St. Petersburg State University, Russia

Professional Experience

2021– present	Postdoc of excellence at Instituto de Matematica Pura e Applicada (IMPA) Rio de Janeiro, Brazil. Researcher at Center PI, IMPA
2017–2021	Researcher at Chebyshev laboratory, St. Petersburg State University, Russia. Participant of industrial projects with PJSC «Gazprom Neft»
2018–2021	Teaching at Department of Mathematics and Computer Science St. Petersburg State University, Russia
2014–2018	Assistant at Department of Mathematics and Information Technology St. Petersburg Academic University, Russia
2012–2015	Assistant at Institute of Physics, Nanotechnology and Telecommunications St. Petersburg Polytecnic University, Russia

Research Awards

2019	Laureat of the «Young Mathematician» prize of the St. Petersburg Mathematical Society
2018–2019	«Gazprom Neft» Scholarship
2018	Winner of 22nd Möbius Contest in nomination «Undergraduates and graduates»
2009	Euler Fellowship for undergraduate students

Recommendation letters

- Dan Marchesin, IMPA, Rio de Janeiro, Brazil (marchesi@impa.br)
- Alexander Nazarov, St. Petersburg department of PDMI, Russia (al.il.nazarov@gmail.com)
- Mikhail Lifshits, St. Petersburg State University, Russia (mikhail@lifshits.org)
- Yalchin Efendiev, Texas A&M, USA (yalchinrefendiev@gmail.com)

Research Grants

2021	Co-principal investigator of the Russian Science Foundation grant 21-11-00047: Stochastic processes and fields with application to data analysis
2019–2021	Participant of the Russian Science Foundation grant 19-71-30002: Analysis, geometry, mathematical physics and applications
2019–2020	Participant of the President grant MD-1791.2019.1: Parabolic equations describing displacement of viscous fluids in porous media and systems with hysteresis
2017–2018	Participant of Russian Science Foundation Grant 17-11-01003: Asymptotic spectral analysis: gaps, near-threshold anomalies, "invisibility" and eigenvalues
2016–2018	Participant of RFBR Grant 16-01-00258a: Approximation of stochastic processes and functionals of them
2013–2016	Participant of St. Petersburg State University Grant 6.38.670.2013: Partial Differential Equations and applications

Patent

2022	A. Groman, F. Bakharev, S. Tikhomirov, Y. Petrova, N. Rastegaev, A. Enin, K. Kalinin. Patent No. 2772808 C1 Russian Federation, IPC E21B 43/16, C09K 8/58. Method for enhanced oil recovery: No. 2021133106: Appl. 11/15/2021 : publ. May 25, 2022 / applicant Limited Liability Company "Gazpromneft-Technological Partnerships". – EDN WLGWAU

Research Papers and Preprints

12. (with A. Nazarov) *L_2-small ball asymptotics for Gaussian random functions.* Article in progress.
11. (with B. Plohr, D. Marchesin) *Vanishing adsorption admissibility criterion for contact discontinuities in the polymer model.* arXiv:2211.10326.
10. (with F. Bakharev, A. Enin, N. Rastegaev) *Impact of dissipation ratio on vanishing viscosity solutions of the Riemann problem for chemical flooding model.* arXiv:2111.15001. Accepted to Journal of Hyperbolic Differential Equations.
9. (with F. Bakharev, A. Enin, K. Kalinin, N. Rastegaev, S. Tikhomirov) *Optimal polymer slugs injection profiles.* Journal of Computational and Applied Mathematics, January 2023, p.115042; doi:10.1016/j.cam.2022.115042. Version on arXiv:2012.03114.
8. (with F. Bakharev, A. Enin, A. Groman, A. Kalyuzhnuk, S. Matveenko, I.Starkov, S. Tikhomirov) *Velocity of viscous fingers in miscible displacement: Comparison with analytical models.* Journal of Computational and Applied Mathematics, March 2022; doi:10.1016/j.cam.2021.113808.
7. (with S. Tikhomirov, F. Bakharev, A. Groman, A. Kalyuzhnyuk, A. Enin, K. Kalinin, N. Rastegaev) *Calculation of graded viscosity banks profile on the rear end of the polymer slug.* Paper SPE-206426-MS, SPE Russian Petroleum Technology Conference, October 2021; doi:10.2118/206426-MS.
6. *L_2-small ball asymptotics for a family of finite-dimensional perturbations of Gaussian functions.* Zapiski Nauchnykh Seminarov POMI, vol. 501. Nikitin's memorial volume, pp. 236–258, 2021. (In Russian). English version: arXiv:1905.07804.
5. (with F. Bakharev, L. Campoli, A. Enin, S. Matveenko, S. Tikhomirov, A. Yakovlev) *Numerical investigation of viscous fingering phenomenon for raw field data.* Transport in Porous Media, 2020, pp. 1–22; doi:10.1007/s11242-020-01400-5.
4. *On spectral asymptotics for a family of finite-dimensional perturbations of operators of trace class.* Doklady Math., 2018, vol. 98, №1, pp. 367–369; doi:10.1134/S1064562418050204.
3. *Exact L_2-small ball asymptotics for some Durbin processes.* Zap. nauchn. sem. POMI, 2017, vol. 466, pp. 211–233. (In Russian) Translated: Journal of Mathematical Sciences (USA), 2020, 244(5), pp. 842-857; doi:10.1007/s10958-020-04657-9.
2. *Spectral asymptotics for problems with integral constraints.* Mat. Zametki, 2017, vol. 102(3), pp. 405–414 (In Russian). Translated: Mathematical Notes, 2017, 102(3-4), pp. 369-377; doi:10.1134/S0001434617090073.
1. (with A. I. Nazarov) *The small ball asymptotics in Hilbertian norm for the Kac–Kiefer–Wolfowitz processes.* Teor. Veroyatnost. i Primenen., 2015, Volume 60, Issue 3, Pages 482–505. Translated: Theory of Probability and its Applications, 2016, 60(3), pp. 460-480; doi:10.1137/S0040585X97T987752.

Participation at Conferences & Schools

Feb 2023	*(planned)* Multiscale Analysis and Methods for Quantum and Kinetic Problems. Singapore.	
Jan 2023	*(planned)* 13th Americas Conference on Diff. Equations and Nonlinear Analysis and ICMC Summer Meeting on Differential Equations. São Carlos, Brazil. Invited speaker in section "Conservation Laws and Transport Equations"	
Oct 2022	Conference IMPA 70 years & International Conference on Dynamical Systems. Celebrating the 60th Birthday of Marcelo Viana, Rio de Janeiro, Brazil	
July 2022	O.A. Ladyzhenskaya centennial conference on PDE's. St. Petersburg, Russia. Online participation. "On the impact of dissipation ratio on vanishing viscosity solutions of Riemann problems for chemical flooding models"	Poster
July 2022	Hyperbolic Balance Laws & Beyond. Magdeburg, Germany	Poster
June 2022	International Conference on Hyperbolic Problems (HYP). Malaga, Spain "On admissibility criteria for contact discontinuities in Glimm-Isaacson model arising in chemical flooding"	Slides
May 2022	Workshop: Branching systems, reaction-diffusion equations and population models, Centre de recherches matematiques (CRM), Montreal. Online.	
Dec 2021	International conference "Probabilistic methods in analysis", in Sirius, Sochi, Russia. Plenary talk: "Small ball probabilities for Gaussian processes"	Slides
Dec 2021	Workshop: "Nonlinear PDEs and Modelling", St. Petersburg, Russia. Talk: "Looking for exact mixing velocities in miscible displacement: two-tube model"	Slides
Aug 2021	InterPore2021. Brazilian Chapter.	Slides
June 2021	InterPore2021. Online conference. Talk: "Graded viscosity banks on the rear end of the polymer slug"	Slides
Aug 2019	Third ZiF Summer School "Randomness in Physics and Mathematics" From Stochastic Processes to Networks. Bielefeld, Germany "Exact L_2-small ball asymptotics for detrended Green Gaussian processes"	Poster
May 2019	Stochastic models II. Euler Institute, St. Petersburg, Russia Talk: "Exact L_2-small ball probabilities for Durbin processes"	Slides
Jan 2018	The third Indo-Russian meeting in probability and statistics. Bangalore, India Talk: "Exact small ball asymptotics in L_2-norm for finite-dimensional perturbations of Gaussian processes: spectral method"	Slides
Dec 2017	St. Petersburg winter conference on Probability Theory and Mathematical physics. PDMI-MIAN. Talk: "On exact spectral asymptotics of finite-dimensional perturbations of integral operators of trace class"	Slides
June 2017	Symposium on Probability Theory and Random Processes, St. Petersburg "Exact L_2-small ball asymptotics for perturbations of Brownian bridge"	Slides
April 2017	International conference on partial differential equations Silkroad Mathematics Center series international conferences. Beijing, China "Spectral asymptotics in some problems with integral constraints"	Poster
June 2016	Days of Diffraction-2016, St. Petersburg, Russia Talk: "Spectral asymptotics in some problems with integral constraints"	Slides
May 2016	The 2nd Russian-Indian Joint Conference in Statistics and Probability. Talk: "Small ball asymptotics for detrended Green Gaussian processes"	Slides
Sept 2015	Yu.V.Linnik Centennial Conference, St. Petersburg, Russia Talk: "The L_2-small ball asymptotics for the Kac-Kiefer-Wolfowitz processes"	
July 2015	7th St.Petersburg Conference in Spectral Theory Talk: "Asymptotics of eigenvalues for some integro-differential operators"	Slides
July 2014	Students school on PDEs and Geometric Measure Theory, CIME, Italy	
July 2010	XIII Diffiety School on Mathematics, Santo Stefano del Sole, Italy	
July 2009	XII Diffiety School on Mathematics, Santo Stefano del Sole, Italy	

Invited talks at seminars (2020-2022)

Nov 2022	Oberseminar "Nonlinear Dynamics"at Freie Universität Berlin, Germany (joint talk with S.Tikhomirov). Seminar organizers: Bernold Fiedler, Isabelle Schneider, Eckehard Schöll, Matthias Wolfrum. Talk: "Two tube model of miscible displacement: travelling waves and normal hyperbolicity"	Slides
July 2022	Seminário de Probabilidade at Instituto de Matemática, UFRJ, Rio, Brazil. Seminar organizers: Giulio Iacobelli and Maria Eulalia Vares. Talk: "Small ball probabilities for Gaussian processes"	Slides
July 2022	Seminário Luiz Adauto de Análise/EDP at Instituto de Matemática, UFRJ, Rio, Brazil. Seminar organizer: Daniel Marroquin. Talk: "On chemical flooding models: Riemann problem solutions and viscous fingering phenomenon"	Slides
May 2022	Oberseminar "Nonlinear Dynamics" WIAS Berlin, Germany. Online. Seminar organizers: Bernold Fiedler, Isabelle Schneider, Eckehard Schöll, Matthias Wolfrum. Talk: "On the impact of dissipation ratio on vanishing viscosity solutions of Riemann problems for chemical flooding models"	Slides
12 May 2022	2-do Encontro Mulheres Matematicas do IMPA, Rio, Brazil. Online. Organizers: Claudia Lorena Duarte, Daniela Paiva Penuela, Zoraida Fernandez Rico. Sessão Temática - Dinâmica dos Fluidos.	Slides
April 2022	CeMEAI seminar at ICMC/USP in São Carlos, Brazil. Seminar organizer: Tiago Pereira. Talk: "On solutions of a Riemann problem for a chemical flooding model"	Slides
April 2022	Seminar of Applied and Computational Mathematics at IMPA, Rio, Brazil. Seminar organizers: Alexei Mailybaev, Dan Marchesin. Talk: "Toy model of viscous fingering"	Slides
April 2022	Seminar on Analisis and PDE at IMPA, Rio, Brazil. Seminar organizer: Felipe Linares. Talk: "On the impact of dissipation ratio on vanishing viscosity solutions of Riemann problems for chemical flooding models"	Slides
March 2022	Seminario das Mulheres IMPA, Rio, Brazil. Seminar organizer: Zoraida Fernandez-Rico. Talk: "Small ball probabilities for Gaussian Processes"	Slides
March 2022	Centro PI seminar at IMPA, Rio, Brazil. Seminar organizers: Roberto Imbuzeiro, Paulo Orenstein. Talk: "Oil Recovery: Fundamental research and Industrial applications"	Slides
Feb 2022	Applied Math/PDE Seminar UC Davis, California, USA. Online. Seminar organizers: Blake Temple, Steve Shkoller, Sameer Iyer. Talk: "On solutions of a Riemann problem for a chemical flooding model"	Slides
Nov 2021	Gabriel Lame Chair Seminar at Chebyshev Laboratory, St. Petersburg, Russia. Online. Seminar organizer: Jean-Michel Roquejoffre. Talk: "On the impact of diffusion ratio on vanishing viscosity solutions of Riemann problems for chemical flooding models"	Slides
Oct 2021	Seminario de EDP e Matematica Aplicada. Online. Seminar organizers: Juan Limaco, Mauro Rincon, Max Souza, Marcelo Calvacanti. Talk: "Admissibilidade das descontinuidades de contato: aplicação para recuperação melhorada de petróleo" (in Portuguese)	
May 2021	Colloquium of Industrial Projects at Chebyshev Laboratory, St. Petersburg, Russia. Organizer: Sergey Tikhomirov. Talk: "On mathematical results in Enhanced Oil Recovery project" (in Russian)	Slides
Feb 2020	Student colloquium at Chebyshev Laboratory, St. Petersburg, Russia. Talk: "Mathematical models describing the process of oil recovery"	
Jan 2020	Seminar "Industrial mathematics" at Chebyshev Laboratory, St. Petersburg, Russia. organizers: Fedor Bakharev, Sergey Tikhomirov, Yulia Petrova, Slava Borovitskiy. Talk: "On the solution of the Riemann problem for a hyperbolic system of conservation laws simulating the injection of a polymer into an oil reservoir" (in Russian)	

Teaching Experience

Spring 2021	Problem solving classes, calculus of variations for mathematicians Faculty of Mathematics and Computer Science St. Petersburg State University	Materials (rus)	Students reviews
Fall 2020	Problem solving classes, probability theory for mathematicians Faculty of Mathematics and Computer Science St. Petersburg State University	Materials (rus)	Students reviews
Spring 2020	Problem solving classes, complex analysis Faculty of Mathematics and Computer Science St. Petersburg State University	Materials (rus)	Students reviews
2018-2019	Problem solving classes, calculus (I, II, III, IV semesters) Faculty of Mathematics and Computer Science St. Petersburg State University	Materials (rus)	Students reviews
Jan 2019	Lecturer of the course «Random walks» in Educational Program in mathematics and computer science at «Sirius», Sochi, Russia		
Nov 2019	Assistant to the course «Dynamical systems» in COMSATS University Islamabad, Lahore Campus, Pakistan. ICTP-CUI Visiting Scholars Program for Training and Research in Math		
2014–2018	Problem solving classes, calculus (I, II, III, IV semesters) for physicists. St. Petersburg Academic University	Materials III, IV	
2012–2014	Problem solving classes, PDEs for physicists St. Petersburg Polytecnic University		
2012–2017	Teaching *Olympiad Mathematics* in "Formulo de Integreco", International educational center for gifted high-school students. I participated in 7 winter and summer Russian and international camps. Also from 2014 till 2017 taught online courses in olimpiad maths for school students from non-capital regions of Russia	Materials from the camp	

Additional experience

Organizational:	• co-organizer of seminar "Applied and Computational Mathematics" at IMPA • co-organizer of the seminar «Industrial Mathematics» from Feb 2019 till Feb 2022 at Chebyshev Laboratory, St. Petersburg, Russia. See also YouTube
Industrial:	I was a part of a long-term industrial project in Chebyshev Laboratory on Enhanced Oil Recovery (EOR) methods jointly with petroleum company «Gazprom Neft» in 2018–2021 in St. Petersburg, Russia
Teamwork:	I have experience working in a team of 13 people (2 professors, 6 mathematicians from students to postdocs, 3 numerical modellists, 1 chemist, 1 physicist) and leading a subproject of 5 people. Usually I am the leader of the group of 2-3 people
Programming:	COMSOL Multiphysics, Matlab, Git, basics of Python. Among numerical methods I worked with FEM, FVM, FDM
Adaptivity:	I easily adapt to different countries. I have been to almost all European countries, India, China, Pakistan, Egypt, Mexico. Now I am a postdoc in Brazil
Olympiads:	At school I frequently was the winner of city olympiads in maths, physics, chemistry and informatics. Several times I was the winner of math olympiad of republic level. I was actively teaching olympiad mathematics during my university studies
Thesis committee:	PhD thesis committee of Júlia Domingues Lemos (IMPA, October 2022); master thesis committee of Temirlan Abildaev (SPbSU, June 2020); bachelor thesis committee of Alexander Tarasov (SPbSU, 2019), Tatyana Moseeva (SPbSU, June 2020)

Languages

Russian:	Native speaker
English:	Fluent
Portuguese:	Proficient. Avançado superior na preparação Celpe-Bras, October 2022
Spanish:	Proficient. Intermediate talking, proficient reading and writing