Sergey Dovgal

EMAIL: dovgal.alea@gmail.com
WEBPAGE: https://sergey-dovgal.gitlab.io/

Academic career

2021– **Postdoctoral researcher** at IMB, Dijon

2020–2021 **Postdoctoral researcher** at LaBRI, Bordeaux

2019–2020 **A.T.E.R.** at Institut Galilée, University Sorbonne Paris Nord:
192 hours of teaching, researcher-teacher position

2016-2019 **Ph.D.** at University Paris 13

THESIS: AN INTERDISCIPLINARY IMAGE OF ANALYTIC COMBINATORICS
FACILITY: Laboratoire d'Informatique de Paris Nord
ADVISORS: Olivier Bodini and Vlady Ravelomanana
REFEREES: Éric Fusy, Valeriy Liskovets, Konstantinos Panagiotou
JURY: Mireille Bousquet-Mélou, Éric Fusy, Andrea Sportiello, Brigitte Vallée

2014–2016 **Master Thesis** at Moscow Institute of Physics and Technology

THESIS: FISHER AND WILKS THEOREMS FOR LOCAL LOG-DENSITY ESTIMATION
ADVISOR: Vladimir Spokoiny

2010–2014 **Bachelor Thesis** at Moscow Institute of Physics and Technology

THESIS: BOOTSTRAP CREDIBLE SETS FOR LOCAL MAXIMUM LIKELIHOOD
ADVISOR: Evgeny Burnaev and Vladimir Spokoiny

Other employments and education

2021–2022 **Teaching assistant** at Université de Bourgogne

2018–2019 **Teaching assistant** at Institut Galilée, University Paris 13

2014–2016 **Junior researcher** at Institute for Information Transmission Problems, Moscow

2014–2016 **Teaching assistant**, Moscow Institute of Physics and Technology, Department of Mathematical Foundations of Control

Distinctions and awards, prizes, competitions

2012 **Ivanilov student scholarship** – an award for distinguished faculty students. This award is given to one student per course every year at the faculty of Control and Applied Mathematics at Moscow Institute of Physics and Technology.

2009 **Silver medal** at International Mathematical Olympiad for High School Students.

2010 **Bronze medal** at International Mathematical Olympiad for High School Students.

2011 **Winner's award** at MIPT Discrete Mathematics Olympiad.

2012 **Third place** at intercollegiate all-russian Mathematical Olympiad in MIPT.

Top 12% at semi-finals of ACM ICPC in St.Petersburg (26-th place/229 teams)

RESEARCH AND PUBLICATIONS

JOURNAL PUBLICATIONS

TITLE **Statistical properties of lambda-terms**
AUTHORS Maciej Bendkowski, Olivier Bodini, Sergey Dovgal
JOURNAL Electronic Journal of Combinatorics P4.1

TITLE **Tuning as convex optimisation: a polynomial tuner for multi-parametric combinatorial samplers**
AUTHORS Maciej Bendkowski, Olivier Bodini, Sergey Dovgal
JOURNAL Combinatorics, Probability and Computing
COMMENT Accepted, Published online 15.12.2021

CONFERENCE PROCEEDINGS

TITLE **Counting directed acyclic and elementary digraphs**
AUTHORS Élie de Panafieu, Sergey Dovgal
CONFERENCE Formal Power Series and Algebraic Combinatorics (FPSAC) 2020
PUBLISHED Séminaire Lotharingien de Combinatoire, 84B (2020)

TITLE **Symbolic method and directed graph enumeration**
AUTHORS Élie de Panafieu, Sergey Dovgal
CONFERENCE EUROCOMB 2019
PUBLISHED Acta Mathematica Universitatis Comenianae, 88(3), 989–996

TITLE **Shifting the phase transition threshold for random graphs using degree set constraints**
AUTHORS Sergey Dovgal, Vlady Ravelomanana
CONFERENCE Latin American Symposium on Theoretical Informatics (LATIN) 2018

TITLE **Polynomial tuning of multiparametric combinatorial samplers**
AUTHORS Maciej Bendkowski, Olivier Bodini, Sergey Dovgal
CONFERENCE Workshop on Analytic Algorithmics and Combinatorics (ANALCO) 2018

TITLE **Asymptotic distribution of parameters in random maps**
AUTHORS Olivier Bodini, Julien Courtiel, Sergey Dovgal, Hsien-Kuei Hwang
CONFERENCE International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA) 2018
PUBLISHED Leibniz International Proceedings in Informatics (LIPIcs), 13:1–13:12

PREPRINTS

TITLE **Exact enumeration of satisfiable 2-SAT formulae**
AUTHORS Sergey Dovgal, Élie de Panafieu, and Vlady Ravelomanana
DATE August 2021

TITLE	**The birth of the strong components**
AUTHORS	Élie de Panafieu, Sergey Dovgal, Dimbinaina Ralaivaosaona, Vonjy Rasendrahasina, and Stephan Wagner
DATE	September 2020

TITLE	**The birth of the contradictory component in random 2-SAT**
AUTHOR	Sergey Dovgal
DATE	April 2019

SOFTWARE AND OPEN SOURCE PROJECTS

PAGANINI	A lightweight `Python` library for tuning multiparametric combinatorial specifications: proof-of-concept implementation of the first provable polynomial algorithm for multiparametric tuning. Accompanies the paper *Tuning as convex optimisation: a polynomial tuner for multi-parametric combinatorial samplers* with Maciej Bendkowski and Olivier Bodini. https://github.com/maciej-bendkowski/paganini The documentation for our code is available at https://paganini.readthedocs.io/en/latest/tutorial.html
BOLTZMANN BRAIN	A `Haskell` library and standalone application meant for random generation of combinatorial structures. It extends `Paganini` for multiparametric random generation. https://github.com/maciej-bendkowski/boltzmann-brain
STRONG COMPONENT NOTEBOOKS	`IPython notebooks` for symbolic computations, numerical simulations, numerical values of the integrals of the Airy functions, accompanying a recent paper *The birth of the strong components* with Élie de Panafieu, Dimbinaina Ralaivaosaona, Vonjy Rasendrahasina, and Stephan Wagner. https://gitlab.com/sergey-dovgal/strong-components-aux
2-SAT ENUMERATION NOTEBOOKS	`IPython notebooks` accompanying a recent paper *Exact enumeration of satisfiable 2-SAT formulae* with Élie de Panafieu and Vlady Ravelomanana. https://gitlab.com/sergey-dovgal/enumeration-2sat-aux

TEACHING AND PEDAGOGICAL EXPERIENCE

UNIVERSITÉ DE BOURGOGNE

TITLE	**Techinques de Programmation**
LEVEL	Licence III
POPULATION	∼20 students
ACTIVITY	TD, TP
LANGUAGE	Python

UNIVERSITY SORBONNE PARIS NORD

All the teaching in University Paris 13 / University Sorbonne Paris Nord was in French. Each course lasts one semester and contains a final written exam, and one or two intermediate exams, possibly combined with one or two assigned homeworks. My experience amounts to teaching

(on average) 8 hours per week, 12 weeks per semester for two semesters: $8 \times 12 \times 2 = \mathbf{192\ hours}$ + additional **20** hours during 2018–2019.

TITLE	**Compilation**		TITLE	**Advanced Data Structures**
LEVEL	Master I		LEVEL	Master I
ACTIVITY	Computer Practice		ACTIVITY	Computer Practice, Exercise Classes
POPULATION	∼20 students		POPULATION	∼20 students
LANGUAGES	OCaml, C, Java		LANGUAGES	C, Python, Java

TITLE	**Introduction to Algorithms**		TITLE	**Security**
LEVEL	Master I		LEVEL	Master I
POPULATION	∼30 students		POPULATION	∼30 students
ACTIVITY	Exercise Classes		ACTIVITY	Exercise Classes

TITLE	**Algorithms**		TITLE	**Introduction to Scientific Calculus**
LEVEL	Cours Preparatoire II			
POPULATION	∼20 students		LEVEL	Bachelor II for Engineers
ACTIVITY	Computer Practice, Exercise Classes		POPULATION	∼15 students
			ACTIVITY	Exercise Classes
LANGUAGE	C		LANGUAGE	Matlab/Octave

TITLE	**Algorithms and data structures**		TITLE	**Programming**
LEVEL	Bachelor II		LEVEL	Bachelor I
POPULATION	∼20 students		POPULATION	∼35 students
ACTIVITY	Computer Practice		ACTIVITY	Exercise Classes and Computer Practice
CONTROL	Written exam, project		CONTROL	Mini-tests and written exam
LANGUAGE	C		LANGUAGE	C

TITLE	**Functional Programming**			
LEVEL	Bachelor II		TITLE	**Logic**
POPULATION	∼20 students		LEVEL	Bachelor I
ACTIVITY	Exercise Classes an Computer Practice		POPULATION	∼25 students
			ACTIVITY	Exercise Classes
LANGUAGE	OCaml			

TITLE	**Algebraic specifications and software testing**
LEVEL	Bachelor II
POPULATION	∼50 students
ACTIVITY	Seminars
LANGUAGE	Common Algebraic Specification Language (CASL)

Moscow Institute of Physics and Technology

MIPT has a unique experience of giving selected Master Students an opportunity to teach Bachelor Students. In some very exceptional cases they can also teach "elective courses". I have developed the contents of all of these courses independently. The teaching is in Russian. The total teaching load is 9 semester courses, 12 hours each, resulting in $9 \times 12 = \mathbf{108\ hours}$.

TITLE	**Discrete Mathematics**	TITLE	**Algebra, Group Theory, Coding Theory**
LEVEL	Bachelor I	LEVEL	Bachelor I
POPULATION	∼20 students	POPULATION	∼20 students
ACTIVITY	Seminars	ACTIVITY	Seminars
CONTROL	Homework + mini-exams + oral test	CONTROL	Written exam + homework credits
DATE	2014–2016	DATE	2015–2016

TITLE	**Optimisation**	TITLE	**Enumerative Combinatorics**
POPULATION	∼20 students	POPULATION	3∼5 students
LEVEL	Bachelor III	LEVEL	Bachelor III (elective course)
ACTIVITY	Seminars	ACTIVITY	Seminars
CONTROL	Oral exam	CONTROL	Written exam
DATE	2015–2016	DATE	2016–2017

TITLE	**Advanced topics of functional analysis**	TITLE	**Acoustics and Music Theory**
LEVEL	Bachelor I-III (elective course)	LEVEL	For everyone (elective course)
POPULATION	3∼5 students	POPULATION	10∼50 students
ACTIVITY	Seminars	ACTIVITY	Seminars
CONTROL	Written assignments	CONTROL	Project
DATE	2014–2015	DATE	2013–2016

VIDEO AND SUPPLEMENTARY MATERIALS

- During the second semester of 2020-2021 I have recorded several videos for the students of the University Sorbonne Paris Nord covering topics from **logic and lambda calculus**[1].

- More supplementary materials (tutorials, solutions to exercises, old archives) can be found on my personal website[2].

- Prior to that, I have recorded short videos for the elective course on **Enumerative Combinatorics**[3] and has recorded a popular science explanation of my research domain[4] (in Russian).

- The full course on **Acoustic and Music Theory** (in Russian) has been videorecorded in 2014[5].

---

[1] https://www.youtube.com/watch?v=1l4InelfLZI&list=PLHqbWVnDLbsEOaYjpbz49CSHDIFe1xxzq
[2] https://electric-tric.github.io/teaching.html
[3] https://www.youtube.com/watch?v=yOMuyV9brXs&list=PLHqbWVnDLbsHJRjO95gAI2aZ33WG4E6aA
[4] https://www.youtube.com/watch?v=E4fvXP0ck_k
[5] https://www.youtube.com/playlist?list=PLHqbWVnDLbsEG4kbf-58M5uQgVWAvdC7m

Supervision and tutorship

TITLE	**Monitoring of the COVID-19 disease in the Montpellier university hospital**
AUTHOR	Nelson Botero Giraldo
LEVEL	Master II
YEAR	2020
ROLE	Tutorship
ADVISOR	Rémi Griveau
INSTITUTE	University Sorbonne Paris Nord, Villetaneuse

TITLE	**Stability of clustering**
AUTHOR	Lada Tokmakova
LEVEL	Master I
YEAR	2016
ROLE	Assistant supervision with Maxim Panov as main supervisor
INSTITUTE	Higher School of Economics, Moscow

Pedagogical Education

TITLE	**Teaching mathematics at the beginning of bachelor studies**
DURATION	9 hours
INSTITUTE	University Paris Diderot

TITLE	**Teaching survival kit / interactive approach to teaching**
DURATION	12 hours
INSTITUTE	University Sorbonne Paris Nord

Other pedagogical activities

TITLE	**School Olympiad Corner**
DATE	2012–2015
LOCATION	School-Lyceum no.5, Dolgoprudny, Russia

Summer Ecological School (LESh) is an educational project organised by various students originating mostly in Russia. The camp is situated in the countryside, and dedicated for pupils of 12-15 years old. While living in the nature, pupils receive lessons in an informal atmosphere on advanced concepts from mathematics, physics, robotics and programming, biology, chemistry. Each course is followed by an exam. Typically there are very few students (around 2-3 per discipline), and they are pre-selected.

TITLE	**Generating functions and their application to combinatorics**
DATE	2013
DURATION	4 sessions
LOCATION	Summer ecological school for pupils

TITLE	**Mathematical foundations of cryptography and complexity analysis**
DATE	2014
DURATION	4 sessions
LOCATION	Summer ecological school for pupils

Summary. Total of more than $\sim$ **450** hours of teaching (university, summer schools, etc)

Recent Talks

15.09.2021	*On the evolution of random strings*, Survey board talk, SPOC seminar
23.06.2021	*On a greedy algorithm for non-deterministic walks with several letters* , Lattice Path Conference 2021
25.03.2021	*Generating functions of graphs, directed graphs and 2-SAT*, LIGM Seminar, University Gustave Eiffel
25.03.2021	*Multiparametric Boltzmann sampling and applications*, MOCQUA Seminar, LORIA
18.03.2021	*The symbolic method for 2-SAT* at ALEA days 2021 (online)
21.09.2020	*The birth of the strong components* at Seminaire Combinatoire Énumérative et Algébrique, LaBRI
08.07.2020	*Counting directed acyclic and elementary digraphs.* FPSAC 2020 (online poster session)
03.03.2020	*Subcritical phases of random structures* at Combinatorics and Interactions Seminar, Institut Henri Poincaré
30.08.2019	*Symbolic method for directed graphs* at EUROCOMB 2019, Bratislava
13.03.2019	*Multiparametric Boltzmann sampling and applications* at LINCS, Bell Labs[a]

---
[a] `https://youtu.be/ozMVPG8T6KM`

26.02.2019	*Boltzmann samplers and beyond.* Survey board talk, GREYC, Caen

Languages

Russian	native	English	intermediate
French	intermediate	German	basic reading skills