

8+ years of experience in research, programming and teaching. Topics: graph theory, random generation, optimisation and statistics.

## ⚙️ WORK EXPERIENCE

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- Postdoctoral researcher **Université de Bourgogne** *Sept 2021 – present*
  - **Obtained** *the most precise* asymptotic description of the phase transition for directed random graphs.
    - Made this research reproducible by formally verifying the proofs and conducting numerical simulations.
  - Instructed a *Python* course for statisticians and **designed exercises**.
- Postdoctoral researcher **Université de Bordeaux** *Sept 2020 – Aug 2021*
  - **Solved** a *50-year old open problem* on obtaining the exact number of satisfiable *2-SAT* formulas.
    - Improved the accuracy of the central estimate from 3 to 12 digits by fitting polynomial regression.
    - Implemented the utility Python libraries for *2-SAT* and *digraph* counting.
- PhD, Postdoc (ATER) **Université Sorbonne Paris Nord** *Sept 2016 – Aug 2020*
  - **Designed** and **implemented** the *fastest tuning algorithm* for multi-parametric *random generators*.
    - Made tuning benchmark tractable: 5 hours for 1022 parameters vs.  $10^{292}$  years of exponential runtime.
    - Our result **was cited** by *bioinformaticians* and *software testers* needing controlled random input instances.
  - **Instructed** 11 courses on *algorithms and data structures*, scientific calculus (**Matlab**), compilation (**C**, **Java**, **OCaml**) cryptography (**Python**), functional programming (**OCaml**), and software testing (**CASL**).
  - Designed and recorded **tutorial videos** on lambda calculus during COVID-19 lockdown in 2020.
  - Tutored a **2nd year M.Sc. intern** at **SAS**. Topic: *Monitoring COVID-19 in Montpellier university hospital*.
- Research intern **Institute for Information Transmission Problems** *Sept 2014 – Aug 2016*
  - **Refined** the *log-density estimate* by analysing a specific maximum likelihood estimator.
  - Co-supervised a 1st-year M.Sc. student. Topic: *Stability of clustering algorithms*.
- Teaching assistant **Moscow Institute of Physics and Technology** *Sept 2014 – Aug 2016*
  - **Instructed** 7 courses including **Discrete Mathematics**, **Optimisation**, designed exercise sets.
    - Conducted complementary FAQ sessions, which lead the group to *highest score* among 8 groups.
    - Designed an *original course* on Acoustic and Music Theory, **video online**.

## 🎓 EDUCATION

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- **Ph.D.** in Computer Science **Université Sorbonne Paris Nord** *Sept 2016 – Aug 2019*  
Thesis: *An interdisciplinary image of Analytic Combinatorics*.
- **M.Sc.** **Moscow Institute of Physics and Technology** *Sept 2014 – Aug 2016*  
Thesis: *Towards Model Selection for Local Log-Density Estimation*.  
Selected coursework: Image Processing, Parallel Computing, Statistical Theory of Machine Learning, Bayesian Methods of Statistical Estimation, Mathematical Methods of Bioinformatics
- **B.Sc.** **Moscow Institute of Physics and Technology** *Sept 2010 – Aug 2014*  
Thesis: *Bootstrap credible sets for local maximum likelihood*.  
Selected coursework: Applied Statistics, Data Analysis, Optimisation, Databases / SQL

## ☆ PRIZES AND AWARDS

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- Ranked 26th/229 in **ACM ICPC NEERC**, programming team competition among universities, 2012.
- **Silver and Bronze medals** at **International Mathematical Olympiad**, high school competition. Selected twice as one of 6 participants nationwide. Ranked 130th/565 in 2009, 167th/565 in 2010.
- Ivanilov student scholarship, 2012. Given to **one student per course per year** at the faculty of Control and Applied Mathematics at Moscow Institute of Physics and Technology.

## AREAS OF EXPERTISE, TECHNICAL SKILLS

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*General:* probability • combinatorics • statistics • optimisation • algorithms • data structures

*Primary:* Python: numpy, sympy, matplotlib, networkx, cvxpy, arb/flint • C/C++ • Jupyter

*Secondary:* OCaml • Java • Matlab/Octave • R • Q# • SQL (MSSQL) • Python: scipy, sklearn, pandas

*Utilities:* git • latex • travis ci • bash/zsh • ssh • vim • notion

*Teaching:* 19 courses for B.Sc. and M.Sc. students • 4 years math olympiad circle

*Communication skills:* more than [dozen talks](#) in conferences and seminars • 5 years of B.Sc. tutoring

## OPEN SOURCE PROJECTS

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- **paganini:** a Python library for tuning of multi-parametric random generators.
  - Designed and implemented the core algorithm.
- **boltzmann-brain:** a Haskell library for generating from context-free grammars.
  - Deployed automatic homebrew builds using Travis CI in github.
- Supplements for research papers on enumeration of [directed graphs](#) and [2-SAT formulae](#).
  - Created 17 explanatory notebooks and 7 utility modules with a test suite.

## COLLABORATIONS AND PUBLICATIONS

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Wrote 10 papers in collaboration with 9 researchers from 9 universities: • [Nokia Bell Labs](#) • [IMB Dijon](#) • [LIPN Université Sorbonne Paris Nord](#) • [IRIF Université de Paris](#) • [Jagiellonian University Krakow](#) • [Uppsala University](#) • [Stellenbosch University](#) • [University of Antananarivo](#) • [Academia Sinica Taipei](#)

Authors are presented in alphabetical order, which corresponds to an equal contribution in computer science.

10. **The birth of the strong components.** *Dougal, S., Panafieu, É. de, Ralaivaosaona, D., Rasendrasahina, V., Wagner, S. (2022)* ArXiv Preprint.
9. **Tuning as convex optimisation: a polynomial tuner for multi-parametric combinatorial samplers.** Bendkowski, M., Bodini, O., *Dougal, S. (2021)* Combinatorics, Probability & Computing.
8. **Exact enumeration of satisfiable 2-SAT formulae.** *Dougal, S., Panafieu, É. de, Ravelomanana, V. (2021)* ArXiv Preprint.
7. **Counting directed acyclic and elementary digraphs.** de Panafieu, É., *Dougal, S. (2020)* Séminaire Lotharingien de Combinatoire.
6. **Statistical properties of lambda terms.** Bendkowski, M., Bodini, O., *Dougal, S. (2019)* Electronic Journal of Combinatorics.
5. **The birth of the contradictory component in random 2-SAT.** *Dougal, S. (2019)* ArXiv.
4. **Symbolic method and directed graph enumeration.** de Panafieu, É., *Dougal, S. (2019)* Acta Mathematica Universitatis Comenianae.
3. **Shifting the phase transition threshold for random graphs using degree set constraints.** *Dougal, S., Ravelomanana, V. (2018)* Lecture Notes in Computer Science.
2. **Polynomial tuning of multiparametric combinatorial samplers.** Bendkowski, M., Bodini, O., *Dougal, S. (2018)* Proceedings of the Meeting on Analytic Algorithmics and Combinatorics.
1. **Asymptotic distribution of parameters in random maps.** Bodini, O., Courtiel, J., *Dougal, S., Hwang H.-K. (2018)* Leibniz International Proceedings in Informatics.

## LANGUAGES

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• **English:** fluent • **French:** fluent • **Russian:** native • **Belarusian:** native • **German:** basic

## INTERESTS, HOBBIES

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• [Video editing](#) • [Music recording](#) • [Photography](#) • [Trail running](#) • [Climbing](#) • [Math popularisation](#)