

# CLÉMENT W. ROYER

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Postdoctoral research associate in numerical optimization and applications.

## CURRENT POSITION

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**Wisconsin Institute for Discovery**

*Postdoctoral research associate*

Since November 14, 2016

*Madison, WI, USA*

- Trans-disciplinary research institute at the University of Wisconsin-Madison.
- In the group of Stephen J. Wright, part of the *Data Science Hub*.

## RESEARCH AND PUBLICATIONS

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### Research interests

- **Complexity in nonlinear optimization:** bound the worst-case cost of an algorithm to satisfy a certain criterion;
- **Introduction of randomness in optimization methods:** enhance their performance (and reduce their cost) using random techniques (sampling, perturbation) and randomized linear algebra;
- **Zeroth-order/derivative-free optimization:** complex problems for which derivatives are too expensive or not available.

### Publications in refereed journals

*Except in one case identified below, authors are always listed by alphabetical order.*

- **A Newton-CG algorithm with complexity guarantees for smooth unconstrained optimization.** C. W. Royer, M. O'Neill and S. J. Wright. *Mathematical Programming*, available online.
- **Direct search based on probabilistic feasible descent for bound and linearly constrained problems.** S. Gratton, C. W. Royer, L. N. Vicente and Z. Zhang. *Computational Optimization and Applications*, available online.
- **A decoupled first/second-order steps technique for nonconvex nonlinear unconstrained optimization with improved complexity bounds.** S. Gratton, C. W. Royer and L. N. Vicente. *Mathematical Programming*, available online.
- **Complexity analysis of second-order line-search algorithms for smooth nonconvex optimization.** C. W. Royer and S. J. Wright. *SIAM Journal on Optimization*, 28(2):1448-1477, 2018.
- **Complexity and global rates of trust-region methods based on probabilistic models.** S. Gratton, C. W. Royer, L. N. Vicente and Z. Zhang. *IMA Journal of Numerical Analysis*, 38(3):1579-1597, 2018.
- **A second-order globally convergent direct-search method and its worst-case complexity.** S. Gratton, C. W. Royer and L. N. Vicente. *Optimization: A Journal of Mathematical Programming and Operations Research*, 65(6):1105-1128, 2016.
- **Direct search based on probabilistic descent.** S. Gratton, C. W. Royer, L. N. Vicente and Z. Zhang. *SIAM Journal on Optimization*, 25(3):1515-1541, 2015.

### Submitted reports

- **A subsampling line-search method with second-order results,** E. Bergou, Y. Diouane, V. Kungurtsev and C. W. Royer, Technical report arXiv:1810.07211, 2018.

- **A stochastic Levenberg-Marquardt method using random models with application to data assimilation**, E. Bergou, Y. Diouane, V. Kungurtsev and C. W. Royer, Technical report arXiv:1807.02176, 2018.

## RESEARCH PROJECTS

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**Mathematics for complex environmental and power systems** US Department Of Energy

- Member of the project since 2016;
- In the nonconvex optimization axis, within the framework of *optimization under uncertainty*.

**Nonconvex matrix optimization** US Department of Defense

- Active member of the University of Wisconsin-Madison team.
- Studying nonconvex aspects of matrix optimization problems, in a *distributed data* setting.

**Institute for Fundamentals in Data Science** US National Science Foundation

- Active participant through the Wisconsin Institute of Discovery.
- Gathers expertise on all aspects of data science (computer science, maths, statistics, bio-informatics, biology).

## EDUCATION & PREVIOUS POSITIONS

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**Qualification to apply for associate professorship** January 2017

*Universities National Council (CNU), France*

- Qualified in Applied Mathematics and Computer Science.

**Institute for Research in Computer Science in Toulouse (IRIT)** October 2013-October 2016

*Research Assistant*

*Toulouse, France*

- In the Parallel Algorithms and Optimization (APO) Team.

**INPT-ENSEEIH Engineering school**

October 2013-September 2016

*Teaching Assistant*

*Toulouse, France*

- Practical courses: Parallel Programming with OpenMP (in C); Linear Algebra, PDE Discretization Techniques, Krylov Space Methods and Numerical Optimization (using MATLAB).
- Tutorial classes: Differential Calculus, Analysis Tutorials.

**PhD in applied mathematics**

2013-2016

*Obtained November 4, 2016*

*UPS, University of Toulouse, France*

- Topic: Probabilistic properties and complexity analysis in derivative-free optimization methods.
- Co-advised by Serge Gratton (Univ. Toulouse) and Luís Nunes Vicente (Univ. Coimbra, Portugal).

**Engineering and Master's Degree in Computer Science**

2010-2013

*Two degrees equivalent to Master's degree*

*INPT, University of Toulouse, France*

- Engineering Degree in Computer Science and Applied Mathematics, minor in Scientific Computing.
- Master's Degree in Computer Science, minor in Distributed Computing and Critical Software.

## SKILLS

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**Main programming experience**

Matlab, C, C++, Fortran.

**Additional programming skills**

Java, CamL, Maple, Julia.

**Languages**

French (native), English (fluent),

Portuguese (intermediate), Spanish (scholar)