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## 1 Current position and experience

|                        |   |
|------------------------|---|
| <b>September 2019-</b> | Maître de conférences (Faculty)<br><i>MIDO</i> Department (Maths & Computer Science)<br><i>LAMSADE</i> Laboratory, in the Machine Intelligence and Learning Systems (MILES) team<br><i>Université Paris-Dauphine</i><br><i>Université PSL</i><br><i>Paris, France</i> |
|------------------------|---|

### 1.1 Previous positions

|                                    |  |
|------------------------------------|--|
| <b>November 2016-August 2019</b>   | Postdoctoral research associate in Optimization<br>Data Science Hub<br><i>Wisconsin Institute for Discovery</i><br><i>University of Wisconsin-Madison</i><br><i>Madison, WI, USA</i><br>Principal Investigator: Stephen J. Wright. |
| <b>October 2013-October 2016</b>   | Doctoral researcher in Applied Mathematics<br><i>Institut de Recherche en Informatique de Toulouse (IRIT)</i><br><i>Toulouse, France.</i>  |
| <b>October 2013-September 2016</b> | Teaching assistant under doctoral grant<br><i>École Nationale Supérieure d'Électrotechnique, d'Électronique, d'Informatique, d'Hydraulique et des Télécommunications (ENSEEIHT)</i><br><i>Toulouse, France.</i>                    |

## 1.2 Internships

|                             |   |
|-----------------------------|---|
| <b>February-April 2016</b>  | Visiting scholar ( <i>Thesis Parts Appointment</i> )<br><i>Argonne National Laboratory</i><br><i>Lemont, IL, USA</i><br>Supervised by Stefan Wild and Jeffrey Larson.   |
| <b>March-September 2013</b> | Stochastic optimization on direct-search methods<br><i>Universidade de Coimbra, Coimbra, Portugal</i><br><i>IRIT, Toulouse, France</i><br>3 <sup>rd</sup> -year ENSEEIHT internship.  |
| <b>January-March 2013</b>   | Improvement of the iterative resolution of<br>the electromagnetic diffraction calculus with integral equations<br><i>Laboratoire PLAsma et Conversion d'Énergie (LAPLACE)</i><br><i>Toulouse, France</i><br>3 <sup>rd</sup> -year ENSEEIHT “long project”<br>Collaboration of Computer Science and Electronics departments. |
| <b>June-August 2012</b>     | Study of the injectivity domain of the prolate ellipsoid<br><i>Institut de Mathématiques de Bourgogne, Dijon, France</i><br>2 <sup>nd</sup> -year ENSEEIHT internship.  |

## 2 Publications

*Standard practice in my research area is to order the authors by alphabetical order. Only one report below does not conform to that rule, thanks to a generous recommendation from my co-authors.*

### 2.1 Submitted preprints

1. E. Bergou, Y. Diouane, V. Kungurtsev and C. W. Royer, A subsampling line-search method with second-order results. Technical report arXiv:1810.07211, 2018.
2. E. Bergou, Y. Diouane, V. Kungurtsev and C. W. Royer, A stochastic Levenberg-Marquardt method using random models with application to data assimilation. Technical report arXiv:1807.02176, 2018.

### 2.2 International journals

1. C. W. Royer, M. O'Neill and S. J. Wright, A Newton-CG algorithm with complexity guarantees for unconstrained optimization. *Mathematical Programming*, available online since January 2019.
2. S. Gratton, C. W. Royer, L. N. Vicente and Z. Zhang, Direct search based on probabilistic feasible descent for bound and linearly constrained problems. *Computational Optimization and Applications*, 72(3):525-559, 2019.
3. S. Gratton, C. W. Royer and L. N. Vicente, A decoupled first/second-order steps technique for nonconvex nonlinear unconstrained optimization with improved complexity bounds. *Mathematical Programming*, available online since September 2018.
4. C. W. Royer and S. J. Wright. Complexity analysis of second-order line-search algorithms for smooth nonconvex optimization. *SIAM Journal on Optimization*, 28(2):1448-1477, 2018.
5. S. Gratton, C. W. Royer, L. N. Vicente and Z. Zhang, Complexity and global rates of trust-region methods based on probabilistic models. *IMA Journal of Numerical Analysis*, 38(3):1579-1597, 2018 (published online August 2017).
6. S. Gratton, C. W. Royer and L. N. Vicente, A second-order globally convergent direct-search method and its worst-case complexity. *Optimization: A Journal of Mathematical Programming and Operations Research*, 65(6):1105-1128, 2016.
7. S. Gratton, C. W. Royer, L. N. Vicente and Z. Zhang, Direct Search based on Probabilistic Descent. *SIAM Journal on Optimization*, 25(3):1515-1541, 2015.

### 2.3 Conference proceedings

1. J.-B. Caillaud and C. W. Royer, On the injectivity and nonfocal domains of the ellipsoid of revolution, *Geometric Control Theory and sub-Riemannian Geometry*, 73-86, Springer-Verlag, 2014.

### 2.4 PhD thesis

1. C. W. Royer, *Derivative-Free Algorithms based on Probabilistic and Deterministic Properties: Complexity Analysis and Numerical Relevance*, University of Toulouse, November 2016.

### 3 Conference talks and seminars

#### 3.1 Invited talks and seminars

1. C. W. Royer, *A decoupled first/second-order steps technique and its application to non-convex derivative-free optimization*, International Conference on Continuous Optimization, Berlin (Germany), August 2019. Based on a joint work with S. Gratton and L. N. Vicente. (Invited by A. L. Custódio and F. Rinaldi.)
2. C. W. Royer, *Complexity guarantees for practical second-order algorithms*, International Conference on Continuous Optimization, Berlin (Germany), August 2019. Based on a joint works with M. O’Neill and S. J. Wright. (Replacing S. J. Wright, invited by A. Berahas.)
3. C. W. Royer, *Probabilistic properties in numerical optimization: Theoretical analysis and numerical relevance*, LAMSADE Seminar Series, Université Paris-Dauphine (Paris, France), May 2019. (Invited by F. Yger and J. Monnot.)
4. C. W. Royer, *Nonconvex optimization via Newton-CG methods with complexity guarantees*, Lehigh Industrial and Systems Engineering Seminar Series, Lehigh University, Bethlehem (PA, USA), March 2019. Based on joint works with M. O’Neill and S. J. Wright. (Invited by the Industrial and Systems Engineering department.)
5. C. W. Royer, *A stochastic Levenberg-Marquardt method using random models with application to data assimilation*, SIAM Computational Science and Engineering conference, Spokane (WA, USA), February-March 2019. Based on joint work with E. Bergou, Y. Diouane and V. Kungurtsev. (Invited by M. Menickelly and J. Mueller.)
6. C. W. Royer, *Nonconvex optimization with complexity guarantees: a Newton-CG approach*, APO seminar, Toulouse (France), January 2019. Based on joint works with M. O’Neill and S. J. Wright. (Invited by Serge Gratton.)
7. C. W. Royer, *Newton-Conjugate Gradient methods with complexity guarantees for nonconvex optimization*, Department of Mathematics and Industrial Engineering, École Polytechnique de Montréal, Montréal (QC, Canada), October 2018. (Invited by the department.)
8. C. W. Royer, *Using models in allocating and partitioning algorithms*, Conference *ISMP 2018*, Bordeaux (France), July 2018. Co-authors: J. Larson, S. M. Wild. (Invited by Y. Diouane and S. Wild).
9. C. W. Royer, *Complexity analysis of second-order line-search algorithms for smooth nonconvex optimization*, 2018 INFORMS Optimization Conference, Denver (CO, USA), March 2018. Co-author: S. J. Wright. (Invited by A. Mokhtari, S. Paternain and A. Ribeiro in a session “Nonconvex optimization”).
10. C. W. Royer, *Complexity analysis of second-order line-search algorithms for smooth nonconvex optimization*, Workshop “Beyond convexity: Emerging Challenges in Data Science”, Oaxaca (Mexico), October 2017. Co-author: S. J. Wright. (Invited by the organizers T. Kolda, R. Nowak, R. Willett and S. Wright).
11. C. W. Royer, *Including inexact second-order aspects in first-order methods for nonconvex optimization*, Optimization 2017, Lisbon (Portugal). Co-author: S. J. Wright. (Invited as session organizer by L. N. Vicente.)

12. C. W. Royer, *Direct search based on probabilistic feasible descent for bound and linearly constrained problems*, SIAM Conference on Optimization, Vancouver (Canada), May 2017. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang. (Invited in the mini-symposia “Derivative-free optimization” chaired by Stefan Wild and Sébastien Le Digabel.)
13. C. W. Royer, *Probabilistic Properties in Derivative-Free and Derivative-Based Optimization Methods*, Séminaire SPOC, Institut de Mathématiques de Bourgogne, Dijon (France), April 2017. (Invited by Alexandre Cabot and Yoann Offret.)
14. C. W. Royer, *Probabilistic Analysis of Derivative-Free Methods*, LANS Seminar, Argonne National Laboratory, Lemont (IL, USA), April 2016. Based on joint works with S. Gratton, L. N. Vicente and Z. Zhang. (Invited by Stefan Wild.)
15. C. W. Royer, *Probabilistic Analysis of Derivative-Free Methods*, WID-DOW Seminar, University of Wisconsin-Madison, Madison (WI, USA), April 2016. Based on joint works with S. Gratton, L. N. Vicente and Z. Zhang. (Invited by Stephen J. Wright.)
16. C. W. Royer, *Direct Search using Probabilistic Descent*, Conference ISMP 2015, Pittsburgh (PA, USA), July 2015. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang. (Invited by Zaikun Zhang.)
17. C. W. Royer, *Direct Search using Probabilistic Descent*, Conference Optimization 2014, Guimarães (Portugal). Co-authors: S. Gratton, L. N. Vicente, Z. Zhang. (Invited by Serge Gratton.)

### 3.2 Contributed talks

1. C. W. Royer, *A decoupled first/second-order steps technique for nonconvex optimization*, MOPTA 2019, Bethlehem (Pennsylvania, USA), August 2019. Co-authors: S. Gratton, L. N. Vicente.
2. C. W. Royer, *Stochastic optimization with probabilistic properties: A case study for optimization under uncertainty?*, MACSER Optimization under Uncertainty Seminar, Madison (Wisconsin, USA), June 2019.
3. C. W. Royer, *Handling bad outcomes in derivative-free optimization with probabilistic properties* (Poster), ICERM Workshop on Mathematical Optimization of Systems Impacted by Rare, High-Impact Random Events, Providence (Rhode Island, USA), June 2019.
4. C. W. Royer, *Complexity guarantees and numerical behavior of Newton-type methods for smooth nonconvex optimization*, IMA Conference on Numerical Linear Algebra and Optimization, Birmingham (UK), June 2018. Co-authors: M. O’Neill, S. J. Wright.
5. C. W. Royer, *Numerical Optimization with Complexity Guarantees* (Poster), Autumn School on Optimization in Machine Learning and Data Science, Trier (Germany), August 2017.
6. C. W. Royer, *Complexity analysis of second-order line-search algorithms for smooth nonconvex optimization*, MOPTA 2017, Bethlehem (Pennsylvania, USA), August 2017. Co-author: S. J. Wright.
7. C. W. Royer, *Complexity and Global Rates of Optimization Methods based on Probabilistic Properties* (Poster), ACNTW Workshop, Chicago (Illinois, USA), May 2017. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang.

8. C. W. Royer, *Probabilistic Feasible Descent Techniques for Derivative-Free Linearly Constrained Optimization*, 14th EUROPT Workshop, Warsaw (Poland), July 2016. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang.
9. C. W. Royer, *Second-Order Convergence in Direct-Search Methods*, CIMI Workshop on Optimization with Application to Machine Learning & Data Assimilation, Toulouse, January 2016. Co-authors: S. Gratton, L. N. Vicente.
10. C. W. Royer, *Form First to Second-Order Quality Measures in Direct-Search Methods*, Days of the GDR MOA (CNRS), Dijon, France, December 2015. Co-authors: S. Gratton, L. N. Vicente.
11. C. W. Royer, *Form First to Second-Order Quality Measures in Direct-Search Methods*, APO PhD students day, Toulouse, November 2015. Co-authors: S. Gratton, L. N. Vicente.
12. C. W. Royer, *Form First to Second-Order Quality Measures in Direct-Search Methods*, 13th EUROPT Workshop, Edinburgh (UK), July 2015. Co-authors: S. Gratton, L. N. Vicente.
13. C. W. Royer, *Direct Search using Probabilistic Descent* (Poster), Workshop *Convex Optimization and Beyond*, Edinburgh (UK), 2014. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang.
14. C. W. Royer, *Direct Search using Probabilistic Descent*, APO PhD students day, Toulouse, 2013 and 2014. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang.
15. C. W. Royer, *Direct Search using Probabilistic Descent*, International Conference on Continuous Optimization, Lisbon (Portugal), 2013. Co-authors: S. Gratton, L. N. Vicente, Z. Zhang.

## 4 Funding and Awards

### 4.1 Funded positions

- Postdoctoral position at the University of Wisconsin-Madison (2016-2019) partially funded through the DARPA-Lagrange project *Nonconvex Matrix Optimization: Geometry, Algorithms and Distributed Implementations*. Funding source: United States Department of Defense.
- Postdoctoral position at the University of Wisconsin-Madison (2016-2019) partially funded through the *MACSER: Multifaceted Mathematics for Rare, High-Impact Events in Complex Energy and Environment Systems* project, and its predecessor *M2ACS: Multifaceted Mathematics for Complex Energy Systems*. Funding source: United States Department of Energy.
- Teaching assistant fellowship (2013-2016) at the National Polytechnical Institute of Toulouse, France. Funding source: French Ministry of Higher Education and Research, through the Excellence Laboratory CIMI (International Center of Mathematics and Computer Science in Toulouse).
- *Doctoral fellowship “president quota”*: selective three-year thesis funding (2013-2016) from Université Toulouse III Paul Sabatier provided by its presidency. Funding source: French Ministry of Higher Education and Research.

## 4.2 Awards and financial support

- Support from ICERM (The Institute for Computational and Experimental Research in Mathematics, USA) to attend the workshop *Mathematical Optimization of Systems Impacted by Rare, High-Impact Random Events*, June 2019. Funding source: National Science Foundation through ICERM.
- *Best Poster Award* : delivered during the ALOP Autumn School of Trier University, August 2017. Travel support received from the Research Training Group ALOP.
- *Early Career Travel Award*: delivered by the Society of Industrial and Applied Mathematics (SIAM) to attend the SIAM Conference on Optimization, May 2017. Funding source: National Science Foundation through ICERM.

## 5 Additional research activities

- Session organizer for the *ISMP 2018* conference held in Bordeaux, France.  
Topic: Mixed-integer derivative-free optimization.  
Invited speakers: A. R. Conn, U. García-Palomares, D. Sinoquet.
- Session organizer for the *Optimization 2017* conference in Lisbon, Portugal.  
Topics: randomized methods, first-order algorithms with applications.  
Invited speakers: G. Garrigos, R. M. Gower, J. Liang, V. Perchet, N. Pustelnik, S. Vaiter.
- Reviewer for the 2019 edition of ICML (*International Conference on Machine Learning*, top 5% of reviewers).
- Reviewer for the 2018 editions of COLT (*Conference on Learning Theory*) and NeurIPS (*Neural Information Processing Systems*, top 30% of reviewers).
- Reviewer for journals *Computational Optimization and Applications*, *Optimization Methods and Software*, *Optimization Letters* and *SIAM Journal on Optimization*.

## 6 Teaching activities

From 2013 to 2016, I was a teaching assistant at the French engineering school ENSEEIHT, in the Computer Science and Applied Mathematics (IMA in French) department.

### Fall Semesters

2013-2015 Parallel programming with OpenMP (Practical in C)  
2013-2015 Numerical Optimization (Practical, Matlab project)  
*ENSEEIHT, 2<sup>nd</sup> year IMA*

2013-2014 Linear algebra (Practical, Introduction to Matlab)  
2015 Hilbertian analysis (Practical, Introduction to Matlab)  
2015 Analysis tutorials  
*ENSEEIHT, 1<sup>st</sup> year IMA*

### Spring Semesters

2014-2016 PDE Discretization Techniques (Practical, Matlab project)  
2014-2016 Krylov space methods (Practical, Matlab project)  
*ENSEEIHT, 2<sup>nd</sup> year IMA*

2014-2015 Differential calculus (Tutorials)  
*ENSEEIHT, 1<sup>st</sup> year IMA*

## 7 Research education and training

### July 2018

TRIPODS Summer School “Fundamentals in Data Analysis”  
*Wisconsin Institute for Discovery, Madison (WI, USA)*

A week of courses and hands-on sessions covering a range of techniques used in modern data science:

- Randomized numerical linear algebra

*M. Mahoney (UC Berkeley, USA)*

- High-dimensional statistics

*P. Loh, A. Zhang (Univ. Wisconsin-Madison, USA)*

- Interactive Machine Learning

*R. Nowak (Univ. Wisconsin-Madison, USA)*

- Graphs and Networks

*S. Roch (Univ. Wisconsin-Madison, USA)*

- Continuous Optimization

*D. Drusvyatskiy, M. Fazel (Univ. Washington, Seattle, USA)*

*S. Wright (Univ. Wisconsin-Madison, USA)*

- Deep Learning

*Z. Harchaoui (Univ. Washington, Seattle, USA)*

### August 2017

Autumn school on Optimization in Machine Learning and Data Science  
*ALOP Group, Trier Universität, Germany*

Three series of lectures with practical sessions:

- Fundamental algorithmic approaches relevant to data analysis

*S. Wright (Univ. Wisconsin-Madison, USA)*

- Optimization approaches for fitting the canonical tensor decomposition

*T. Kolda (Sandia National Labs., USA)*

- High performance simplex methods

*J. Hall (Univ. Edinburgh, UK)*

### September 2015

Summer school on machine learning and applications  
*CIMI, University of Toulouse, France*

One week course divided in four units:

- Reinforcement Learning

*B. Scherrer/A. Lazaric (INRIA, France)*

- Optimization methods for machine learning

*P. Richtárik (Univ. Edinburgh, UK)*

- Information Retrieval

*M. Melucci (Univ. Padua, Italy)*

- Dictionary Learning

*J. Mairal (INRIA, France)*

Two workshops on Optimization for Machine Learning and Sequential Learning.

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|----------------------|--|
| <b>May 2015</b>      | <p>Course on numerical optimization and applications<br/> <i>XLIM, University of Limoges, France</i></p> <p>Three short doctoral courses:</p> <ul style="list-style-type: none"> <li>- Bundle methods for nonsmooth optimization<br/> <i>D. Noll, (IMT, France)</i></li> <li>- Complementarity problems and applications<br/> <i>M. Haddou (INSA Rennes, France)</i></li> <li>- Nonsmooth, nonconvex optimization<br/> <i>M. Overton (Courant Institute, NY, USA)</i></li> </ul> |
| <b>December 2014</b> | <p>Introduction to probabilistic constraints<br/> <i>Institute of Mathematics of Toulouse, France</i></p> <p>Seminar and short course<br/> Lecturer: René Henrion (Weierstrass Institute, Germany)</p>   |
| <b>June 2014</b>     | <p>NATCOR Convex Optimization Course<br/> <i>The University of Edinburgh, Edinburgh, UK</i></p> <p>PhD Student Course<br/> Main lecturers: J. Hall, J. Gondzio, P. Richtárik.</p>  |
| <b>April 2014</b>    | <p>Uncertainty Quantification : Theory and Applications to<br/> Algorithms, Computational Fluid Dynamics and Geosciences<br/> <i>CERFACS, Toulouse, France</i></p> <p>CERFACS training course<br/> Lecturers: P. Sagaut, P. Congedo, V. Mallet.</p>  |
| <b>July 2013</b>     | <p>PDE-Constrained Optimization<br/> Sparse Optimization and Applications to Image Processing<br/> <i>Universidade Nova de Lisboa, Lisbon, Portugal</i></p> <p>Summer schools of the conference ICCOPT 2013<br/> Lecturers: S. Wright, M. Figueiredo, C. Meyer, M. Ulbrich.</p>  |

## 8 Education

|                  |   |
|------------------|---|
| <b>2013-2016</b> | PhD in applied mathematics<br>Topic: <i>Probabilistic properties and complexity analysis in derivative-free optimization</i><br>Supervisors: Serge Gratton (Univ. Toulouse) and Luis Nunes Vicente (Univ. Coimbra, Portugal)<br><i>Defended on November 4, 2016.</i><br>IRIT (Institute for Research in Computer Science of Toulouse)<br>Toulouse, France |
| <b>2012-2013</b> | Master Degree in Computer Science<br><i>Minor: Distributed Systems and Critical Software</i><br>INPT (National Polytechnical Institute of Toulouse)<br>Toulouse, France   |
| <b>2010-2013</b> | Engineer Degree in Computer Science and Applied Mathematics<br><i>Department: Computer Science and Applied Mathematics (IMA)</i><br><i>Minor: Applied Mathematics</i><br>ENSEEIH (National Engineering School of Electrotechnics, Electronics, Computer Science, Hydraulics and Telecommunications)<br>Toulouse, France                                   |

## 9 Programming skills

|                                    |                         |
|------------------------------------|-------------------------|
| <b>Imperative programming</b>      | C, Fortran              |
| <b>Object-oriented programming</b> | Java, C++               |
| <b>Functional programming</b>      | CamL                    |
| <b>Mathematical computations</b>   | Matlab, R, Maple, Julia |

## 10 Languages

|                   |  |
|-------------------|--|
| <b>French</b>     | Native speaker                                     |
| <b>English</b>    | Fluent speaker                                     |
| <b>Portuguese</b> | Intermediate level, good written understanding     |
| <b>Spanish</b>    | Scholar, basics in understanding and communication |