# Curriculum Vitae of Carola DOERR (updated April 2021)

## Personal Data

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| Name: | Doerr (formerly Winzen), Carola |
| Date of birth: | March 05, 1984, in Würselen, Germany |
| Nationality: | German |
| Family status: | Married, two kids (born 04/2013 and 09/2015) |
| Homepage: | http://www-ia.lip6.fr/~doerr/ |
| Publications: | Complete list, Google Scholar profile, DBLP entry |

## Education

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| 2020 | **Habilitation** (HDR), highest French diploma, necessary to supervise PhD students. Sorbonne Université, France. Title of the manuscript: *Theory of Iterative Optimization Heuristics: From Black-Box Complexity over Algorithm Design to Parameter Control* |
| 2010-2011 | **Ph.D.** studies in Computer Science (Dr.-Ing., with distinction, **summa cum laude**) **Max Planck Institute for Informatics** and **Saarland University**, Germany Supervised by Prof. Dr. phil. Dr. hc. mult. Kurt Melhorn. Title of the thesis: *Toward a complexity theory for randomized search heuristics: black-box models* |
| 2003-2007 | **Diploma** in Mathematics (Dipl.-Math., **"very good"**). Kiel University, Germany |
| 2001-2002 | AFS Intercultural Programs High-School Exchange in Tobatí, Paraguay |

## Current and Previous Academic and Industrial Positions

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| since 2013 | Full-time permanent **CNRS researcher** (chargée de recherche) at the computer science department LIP6 of **Sorbonne Université**, Paris, France |
| 2012-2013 | PostDoc at LIAFA (now IRIF), Paris Diderot University (now Université de Paris), France |
| 2012-2013 | PostDoc at Max Planck Institute for Informatics, Saarbrücken, Germany |
| 2007-2012 | **Business Consultant** with McKinsey & Co., leading consulting firm. Munich, Germany. (on educational leave from 01/2010 and working part-time 10/2011-01/2012) |
| 2006 | Internship with Deutsche Lufthansa AG, Frankfurt, Germany. 3 months |

## Selected Awards, Distinctions, and Fellowships

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| 2021 | Best paper award at EvoApplications |
| 2020 | 1st and 3rd prize at the NeurIPS 2020 black-box challenge |
| 2019 | Nomination for the CNRS bronze medal |
| 2016 | Best paper award at ACM Genetic and Evolutionary Computation Conference (GECCO), leading conference in Evolutionary Computation, with J. Lengler |
| 2014 | Offer for an Independent Minerva Research Group Leadership Position (5 years, W2 equivalent) within the Max Planck Society (declined) |
| 2013 | Best paper award at GECCO, with B. Doerr and F. Ebel |
| 2013 | Otto Hahn Medal of the Max Planck Society (honoring ≈30 scientists across all disciplines per year) |
| 2012–13 | Feodor Lynen PostDoc fellowship of the Alexander von Humboldt foundation |
| 2012–13 | Offers for highly selective PostDoc fellowships by the German Academic Exchange Service (DAAD) and École Polytechnique (both declined) |
| 2012–14 | Selected participant in the Fast Track Program of the Robert Bosch Foundation as only Computer Scientist among the 20 awardees |
| 2012 | Best paper award at GECCO, with B. Doerr |
| 2010–12 | Google Europe PhD Fellowship covering my salary, travel costs, and other expenses |
| 2010 | Best paper award at GECCO, with B. Doerr and D. Johannsen |
| 2004–07 | Fellow of the Foundation of German Business (SDW), undergraduate stipend |

## Research Group

We are a small subteam within the Operations Research team at the Computer Science department LIP6 of Sorbonne Université. Our research covers several aspects of heuristic optimization, ranging from the theoretical analysis of randomized search heuristics for discrete and numerical optimization problems over sound empirical benchmarking to applications of black-box optimization techniques in academic and industrial applications.

Our current team members are:

- Carola Doerr (CNRS researcher)
- Martin Krejca (PostDoc, working on running time analysis of black-box optimization techniques)
- Elena Raponi (PostDoc, doing a co-supervised internship with Facebook between 05/2021 and 09/2021 and joining us as PostDoc in 12/2021. Elena works on efficient optimization techniques for expensive high-dimensional problems in structural mechanics)
- Anja Jankovic (PhD student, working on supervised learning techniques for automated algorithm selection and configuration)
- Quentin Renau (PhD student, in co-supervision with École Polytechnique and Thales, working on landscape-aware algorithm selection for a sensor network problem)
- Océane Fouquet (Master student, in co-supervision with Institut Pasteur, working on monotonic classifiers for systems biology)

Together with Thomas Bäck and his team at Leiden University we develop and actively maintain IOHprofiler, a highly versatile benchmarking platform for the interactive performance evaluation of iterative optimization heuristics (IOHs). We also have a strong collaborations with the development team of Facebook's Nevergrad benchmarking platform.

Sorbonne Université is located in the heart of Paris. Our lab is on the Jussieu campus, next to the Seine river, in the 5th arrondissement.

## Project Description

Benchmarking experiments are needed to evaluate, to compare, and to understand optimization algorithms, especially in the case when real-world optimization problems are not readily available, where they are not sufficiently understood to allow for generailzations or when it is computationally inefficient to perform comparative analyses on them. Over the last decades, we have seen a plethora of benchmarking studies and systems being proposed. However, current benchmark systems have many limitations especially with respect to their capabilities of reproducibility and data reuse. **Storing, sharing, and making the benchmark optimization data reusable is challenging, because of the existence of different data formats that are weakly compatible.** To tackle these problems, we have designed the OPTimization Algorithm Benchmarking ONtology (OPTION) [KVD+21].

The current version of the OPTION ontology has been developed from a performance-centric perspective. This allows it to effectively deal with the most common types of queries faced during the analysis of benchmark data. However, this also means that the information about the specific optimization problems and algorithms is rather limited. In order to further expand the ontology, **we aim to expand the knowledge base with problem and algorithm specific details,** for example by including classes which describe the algorithm space to represent knowledge about the algorithm family, operators, hyperparameters, and other internal characteristics of the algorithms. Recently, several studies have attempted unification of the taxonomies of the algorithm space (see [SEBB20] and references mentioned therein), but more work is needed to develop a general structure to include in the OPTION ontology.

Our approach would be to represent problems and algorithms in a modular fashion and then use ontology reasoners to infer the taxonomies based on the description logics rules that we will provide. **This would enable introduction of new algorithms or problems by simply answering a set of predefined questions allowing the ontology to grow organically. The creation of reproducible and easily available data will eventually benefit the optimization community as a whole, so the efforts needed to achieve this goal would be very much worthwhile.**

Once we extend the OPTION ontology with rich description of benchmark data, optimization problems and algorithms, we plan to employ it in a machine learning study. First, we will create a knowledge graph by "pruning" the ontology (ontologies can also be interpreted as graphs). The knowledge graph will be composed of two types of nodes, problem instances and optimization algorithms. An edge/link between two such nodes would mean that the optimization algorithm was able to reach a given target precision for a given budget. Our task would be to predict links between new optimization algorithms and problem instances by employing state-of-the-art graph-based and knowledge graph embedding methods. We consider this to be a novel approach to performing meta learning that addresses a timely question that has not yet been explored in this manner.

## References


[KVD+21] Ana Kostovska, Diederick Vermetten, Carola Doerr, Saso Dzeroski, Pance Panov, and Tome Eftimov. Option: Optimization algorithm benchmarking ontology. In *Proc. of Genetic and Evolutionary Computation Conference (GECCO'21, Companion Material)*. ACM, 2021. To appear. Available at https://arxiv.org/abs/2104.11889.

[SEBB20] Jörg Stork, Ágoston Endren Eiben, and Thomas Bartz-Beielstein. A new taxonomy of global optimization algorithms. *Natural Computing*, Nov 2020. Available at https://doi.org/10.1007/s11047-020-09820-4.