Short Curriculum Vitae: Benjamin Doerr

Area of expertise: Design and analysis of algorithms, in particular, randomized, distributed, and heuristic algorithms. Among the latter, genetic algorithms, multi-objective evolutionary algorithms, estimation-of-distribution algorithms.

Employment history:

07/2013– Full professor (professeur de classe exceptionnelle) at École Polytechnique, France.

05–06/2012 Visiting professor at the Danish Technical University (DTU).

2005–2013 Senior researcher (W2 level) at the Max Planck Institute for Informatics, Saarbrücken, Germany. Tenured in 2007 in response to offers for professorships at RWTH Aachen and TU Dortmund.

2001–2005 Research assistant, University of Kiel, Germany. Research stays at New York University (3 months) and at the Rényi Institute of the Hungarian Academy of Sciences (2 months).

Education:

2005 Habilitation in Mathematics, University of Kiel, Germany. Thesis: *Integral Approximation*.

2000 PhD in Mathematics, University of Kiel, Germany. Thesis: *Multi–Color Discrepancies*. Referees: Prof. Dr. Anand Srivastav, Prof. Dr. Dieter Betten, Prof. Dr. Joel Spencer.

1998 Diploma in Mathematics, University of Kiel, Germany. Thesis: *Nichtauflösbare J(T)-Komponenten* (Algebra). Advisor: Prof. Dr. Bernd Stellmacher.

Teaching: Design and analysis of algorithms (undergraduate), randomized methods in computer science (graduate), distributed algorithms for network (MPRI Master program, with P. Fraigniaud and A. Kosowski).

Editorial boards: *Artificial Intelligence*, *Evolutionary Computation*, *Information Processing Letters*, *Journal of Complexity*, *Natural Computing*, *RAIRO—Theoretical Informatics and Applications*, and *Theoretical Computer Science*.

Selected invited talks: SEMCCO-FANCCO 2019, SSSI 2016, KolKom 2008, Diskrete Mathematik 2002. Regular tutorial speaker at GECCO, CEC, and PPSN.

PhD students: Quentin Yang (2022), Denis Antipov (2020, IP Paris best dissertation award in CS, SIGEVO best thesis award (honorable mention)), Jing Yang (2018), Anatolii Kostrygin (2017), Marvin Künnemann (2016, awarded with the *Otto-Hahn-Medal* of the Max-Planck society), Christian Klein (2014), Mahmoud Fouz (2012, awarded with the *Dr. Eduard Martin prize*, nominated for the *GI-Dissertation Award 2012*), Carola Winzen (2011, awarded with the *Otto-Hahn-Medal* of the Max-Planck society, nominated for the *GI-Dissertation Award 2011*), Anna Huber (2010), Daniel Johannsen (2010), Edda Happ (2009), Tobias Friedrich (2007, nominated for the *GI-Dissertation Award 2007*).

Publications: Around 120 journal publications and 170 conference publications in selective international venues. Please consult `http://dblp.uni-trier.de/pers/hd/d/Doerr:Benjamin.html` (some mathematical works missing) or `http://scholar.google.de/citations?user=aXWFB2UdJUUC&hl=de&oi=ao` for the details.

Best paper awards: GECCO 2020, EvoCOP 2020, GECCO 2019, GECCO 2017, GECCO 2015, GECCO 2013, GECCO 2012, GECCO 2010, GECCO 2008, GECCO 2007.

Research Internship: Design and Analysis of Evolutionary Algorithms

This is an offer for a 3-month research internship in the 2022 call for SPECIES scholarships `http://species-society.org/scholarships-2022/`. Please see that webpage for all formalities.

Host institution: Laboratoire d'informatique de l'École polytechnique (LIX), Palaiseau, Île de France, France.

Supervisor: Benjamin Doerr (LIX, École Polytechnique), `lastname@lix.polytechnique.fr`

Keywords: Evolutionary algorithms, heuristic optimization, artificial intelligence, theory.

Context: Runtime analyis of evolutionary algorithms. Evolutionary algorithms such as genetic algorithms, genetic programming, estimation-of-distribution algorithms or ant colony optimers are successfully used in many application areas. Their theoretical understanding, which could guide the design of such algorithms, is still little developed. Nevertheless, for a good twenty years now there have been increased attempts to shed some light on the working principles of evolutionary algorithms, mostly with the methods that have been used successfully in classic algorithms for more than hundred years. The fruits of these efforts have become visible in the last years. Not only we understand much better how evolutionary algorithms work, we also have some rigorous advice how to choose their parameters. Based on theoretical considerations, even new algorithms have been developed.

Topic of this internship: In this internship, we shall try to continue this recent line of research of first analyzing a particular aspect of evolutionary computation and then using the new understanding to improve the existing algorithms or designing superior ones. Since on the one hand in this young and fast-changing area it is difficult to decide on a research topic far ahead and on the other hand there is much work to be done in different subareas, we shall decide the particular topic of the internship together with the student at the start of the internship, taking into account the student's background and interests as well as what are at that moment the most interesting research questions. Areas in which the supervisor has successfully worked and supervised student projects include evolutionary multi-objective algorithms (EMO), estimation-of-distribution algorithms (EDAs), and self-adjusting parameter settings. Examples of recent papers stemming from student projects or

internships include [DR22, ZLD22, WZD21, DK20], which all can also be found on the arXiv preprint server.

Prerequisites: As should be clear from the description above, this is a topic with a strong connection to recent research. As such, the intern should have a keen interest in doing excellent research, and consequently, a pronounced scientific curiosity. A solid background in computer science, mathematics, or applied mathematics is necessary. Having attended an algorithms course with joy and very good marks is a clear indication that this is a suitable topic for your internship.

Research environment: This research internship will be carried out in the *Algorithms and Complexity (AlCo) team* of the computer science lab (LIX) of the French École Polytechnique. The AlCo team consists of four permanent full-time researchers and professors from four different countries, all conducting research of the highest international level on various topics of classic algorithms, evolutionary algorithms, and complexity theory. We always have several interns and PhD students. The default language in the team is English, but all permanent members are also happy to speak French or German. We are well-connected internationally, in the area of this internship we had recent collaborations, among others, with DTU Copenhagen, Hasso-Plattner-Institut Potsdam, SUSTECH Shenzen, and ETH Zurich.

References

[DK20]   Benjamin Doerr and Martin S. Krejca. The univariate marginal distribution algorithm copes well with deception and epistasis. In *Evolutionary Computation in Combinatorial Optimization, EvoCOP 2020*, pages 51–66. Springer, 2020.

[DR22]   Benjamin Doerr and Amirhossein Rajabi. Stagnation detection meets fast mutation. In *Evolutionary Computation in Combinatorial Optimization, EvoCOP 2022*, pages 191–207. Springer, 2022.

[WZD21] Shouda Wang, Weijie Zheng, and Benjamin Doerr. Choosing the right algorithm with hints from complexity theory. In *International Joint Conference on Artificial Intelligence, IJCAI 2021*, pages 1697–1703. ijcai.org, 2021.

[ZLD22] Weijie Zheng, Yufei Liu, and Benjamin Doerr. A first mathematical runtime analysis of the Non-Dominated Sorting Genetic Algorithm II (NSGA-II). In *Conference on Artificial Intelligence, AAAI 2022*. AAAI Press, 2022. Preprint at `https://arxiv.org/abs/2112.08581`.