From benchmarking optimization heuristics to dynamic algorithm configuration

Vermetten, D.L.

Acknowledgements

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Curriculum Vitae

Diederick Vermetten was born on August 23rd, 1996 in Maastricht, the Netherlands. He completed high school at Maaseik, Belgium in 2014 and then went on to study at Leiden University. There, he completed Bachelor's degrees in both Computer Science and Mathematics in 2017. He went on to complete the Master's degree in Computer Science, with distinction, in 2019. His Master's thesis introduced him to IOHprofiler, and he was subsequently hired as a part-time scientific developer on this project, as well as as a teaching assistant, before starting his PhD in January 2020. As a PhD, Diederick was involved in teaching the courses Natural Computing (Bsc) and Introduction to Machine Learning (Msc). In 2022, he was awarded a SPECIES scholarship to visit Dr. Kevin Sim and Prof. Emma Hart at Edinburgh Napier University, Schotland.

Publications

Journal Publications

1. Diederick Vermetten, Furong Ye, Thomas Bäck, Carola Doerr. MA-BBOB: A Problem Generator for Black-Box Optimization Using Affine Combinations and Shifts. *Transactions on Evolutionary Learning and Optimization.* ACM, 2024

2. Ana Kostovska, Diederick Vermetten, Peter Korošec, Sašo Džeroski, Carola Doerr, Tome Eftimov. Using Machine Learning Methods to Assess Module Performance Contribution in Modular Optimization Frameworks. *Evolutionary Computation Journal.* MIT Press, 2024.

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7. Hao Wang, Diederick Vermetten, Furong Ye, Carola Doerr, Thomas Bäck. IOHanalyzer: Detailed Performance Analyses for Iterative Optimization Heuristics. *ACM Transactions on Evolutionary Learning and Optimization*. 2(1): 3:1-3:29. 2022.

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Peer-reviewed Conference Publications: Main Tracks

1. Diederick Vermetten, Johannes Lengler, Dimitri Rusin, Thomas Bäck, Carola Doerr. Empirical Analysis of the Dynamic Binary Value Problem with IOHprofiler. *In Proc. of International Conference on Parallel Problem Solving from Nature (PPSN'24)*, 20-35. Springer, 2024.

2. Jacob de Nobel, Diederick Vermetten, Anna V. Kononova, Ofer M. Shir, and Thomas Bäck. Avoiding Redundant Restarts in Multimodal Global Optimization. *In Proc. of International Conference on Parallel Problem Solving from Nature (PPSN'24)*, 268-283. Springer, 2024.

3. Diederick Vermetten, Carola Doerr, Hao Wang, Anna V. Kononova, Thomas Bäck. Large-Scale Benchmarking of Metaphor-Based Optimization Heuristics. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'24)*, 41–49. ACM, 2024.

4. Konstantin Dietrich, Diederick Vermetten, Carola Doerr, Pascal Kerschke. Impact of Training Instance Selection on Automated Algorithm Selection Models for Numerical Black-box Optimization. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'24)*, 1007–1016. ACM, 2024.

5. Shuaiqun Pan, Diederick Vermetten, Thomas Bäck, Manuel López-Ibáñez, Hao Wang. Transfer Learning of Surrogate Models via Domain Affine Trans-

formation. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'24)*, 385–393. ACM, 2024.

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7. Maarten C. Vonk, Diederick Vermetten, Jacob de Nobel, Sebastiaan Brand, Ninoslav Malekovic, Thomas Bäck, Alfons Laarman, and Anna V. Kononova. Optimizing Causal Interventions in Hybrid Bayesian Networks: A discretization, knowledge compilation, and heuristic optimization approach. *International Conference on Information Processing and Management of Uncertainty in Knowledge-Based Systems (IPMU' 24)*

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10. François Clément, Diederick Vermetten, Jacob de Nobel, Alexandre D. Jesus, Luís Paquete, Carola Doerr. Computing Star Discrepancies with Numerical Black-Box Optimization Algorithms. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23)*, 1330-1338. ACM, 2023.

11. Diederick Vermetten, Furong Ye, Carola Doerr. Using Affine Combinations of BBOB Problems for Performance Assessment. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23)*, 873-881. ACM, 2023. (**Best paper award in ENUM track**)

12. Diederick Vermetten, Fabio Caraffini, Anna V. Kononova, Thomas Bäck. Modular Differential Evolution. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23)*, 864-872. ACM, 2023.

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14. Roman Kalkreuth, Zdenek Vasícek, Jakub Husa, Diederick Vermetten, Furong Ye, Thomas Bäck. General Boolean Function Benchmark Suite. *In Proc. of Foundations of Genetic Algorithms (FOGA'23)*, 84-95. ACM, 2023.

15. Fu Xing Long, Diederick Vermetten, Bas van Stein, Anna V. Kononova. BBOB Instance Analysis: Landscape Properties and Algorithm Performance Across Problem Instances. *International Conference on the Applications of Evolutionary Computation (EVOSTAR'23)*, 380-395. Springer, 2023. (**Fu Xing Long and Diederick Vermetten received outstanding student awards for this paper.**)

16. Diederick Vermetten, Hao Wang, Kevin Sim, Emma Hart. To Switch or Not to Switch: Predicting the Benefit of Switching Between Algorithms Based on Trajectory Features. *International Conference on the Applications of Evolutionary Computation (EVOSTAR'23)*, 335-350. Springer, 2023.

17. Ana Kostovska, Diederick Vermetten, Saso Dzeroski, Pance Panov, Tome Eftimov, Carola Doerr. Using Knowledge Graphs for Performance Prediction of Modular Optimization Algorithms. *International Conference on the Applications of Evolutionary Computation (EVOSTAR'23)*, 253-268. Springer, 2023.

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proaches in Noiseless Numerical Black-Box Optimization Contexts. *The International Conference on Automated Machine Learning (AutoML'23)*, 2023.

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Peer-reviewed Conference Publications: Workshop or Companion Track

1. Martijn Halsema, Diederick Vermetten, Thomas Bäck, Niki van Stein. A Critical Analysis of Raven Roost Optimization. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'24), Companion Volume*, 1993–2001. ACM, 2024.

2. Diederick Vermetten, Manuel López-Ibáñez, Olaf Mersmann, Richard Allmendinger, Anna V. Kononova. Analysis of modular CMA-ES on strict box-constrained problems in the SBOX-COST benchmarking suite. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23), Companion Volume*, 2346-2353. ACM, 2023.

3. Roman Kalkreuth, Zdenek Vasícek, Jakub Husa, Diederick Vermetten, Furong Ye, Thomas Bäck. Towards a General Boolean Function Benchmark Suite. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23), Companion Volume*, 591-594. ACM, 2023.

4. Ana Kostovska, Anja Jankovic, Diederick Vermetten, Saso Dzeroski, Tome Eftimov, Carola Doerr. Comparing Algorithm Selection Approaches on Black-Box Optimization Problems. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23), Companion Volume*, 495-498. ACM, 2023.

5. Bas van Stein, Diederick Vermetten, Fabio Caraffini, Anna V. Kononova. Deep BIAS: Detecting Structural Bias using Explainable AI. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23), Companion Volume*, 455-458. ACM, 2023.

6. Ana Nikolikj, Gjorgjina Cenikj, Gordana Ispirova, Diederick Vermetten, Ryan Dieter Lang, Andries Petrus Engelbrecht, Carola Doerr, Peter Korosec, Tome Eftimov. Assessing the Generalizability of a Performance Predictive Model. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'23), Companion Volume*, 311-314. ACM, 2023.

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10. Ana Kostovska, Diederick Vermetten, Carola Doerr, Saso Dzeroski, Pance Panov, Tome Eftimov. OPTION: optimization algorithm benchmarking ontology. *In Proc. of Genetic and Evolutionary Computation Conference (GECCO'21), Companion Volume*, 239-240. ACM, 2021.

Book Chapters

1. Diederick Vermetten, Bas van Stein, Anna V. Kononova, Fabio Caraffini. Analysis of Structural Bias in Differential Evolution Configurations. *Differential Evolution: From Theory to Practice*. 1-22, Springer, 2022.

To Appear

1. Manuel López-Ibáñez, Diederick Vermetten, Johann Dreo, Carola Doerr. Using the Empirical Attainment Function for Analyzing Single-objective Blackbox Optimization Algorithms. *Accepted at IEEE Transactions on Evolutionary Computation*

2. Diederick Vermetten, Jeroen Rook, Oliver L. Preuß, Jacob de Nobel, Carola Doerr, Manuel López-Ibañez, Heike Trautmann, Thomas Bäck. MO-IOHinspector: Anytime Benchmarking of Multi-Objective Algorithms using IOHprofiler. *Accepted at International Conference on Evolutionary Multi-criterion Optimization.*

3. Anna V. Kononova, Diederick Vermetten, Niki van Stein. XAI for benchmarking black-box metaheuristics. *Chapter to appear in: Explainable AI for Evolutionary Computation And Vice Versa*

Under Review

1. Niki van Stein, Diederick Vermetten, Anna V. Kononova, Thomas Bäck. Explainable Benchmarking for Iterative Optimization Heuristics.

2. Niki van Stein, Diederick Vermetten, Thomas Bäck. In-the-loop Hyper-Parameter Optimization for LLM-Based Automated Design of Heuristics.

3. Sarah L. Thomson, Quentin Renau, Diederick Vermetten, Emma Hart, Niki van Stein, Anna V. Kononova. Stalling in Space: Attractor Analysis for any Algorithm.