

Sebastian Wild

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Employment

- since 2019** **Lecturer** (Assistant Professor)
Department of Computer Science · University of Liverpool
- 2017–2019** **Postdoctoral Fellow and Sessional Instructor**
David R. Cheriton School of Computer Science · University of Waterloo
- 2012–2017** **Wissenschaftlicher Mitarbeiter** (research assistant)
Department of Computer Science · University of Kaiserslautern

Education

- Dr. rer. nat.** Department of Computer Science · University of Kaiserslautern · 2016
(equiv. to **Ph.D.**)
Dissertation
Title: *Dual-Pivot Quicksort and Beyond: Analysis of Multiway Partitioning and Its Practical Potential*
Supervisor: Prof. Dr. Markus Nebel
2nd Reviewer: Prof. Robert Sedgewick (Princeton University)
3rd Reviewer: Univ.-Prof. Dr. Martin Dietzfelbinger (TU Ilmenau)
- M. Sc.** Department of Computer Science · University of Kaiserslautern · 2012
- B. Sc.** Department of Computer Science · University of Kaiserslautern · 2010
- Abitur** Kurfürst-Ruprecht-Gymnasium · Neustadt a. d. Weinstraße · 2006
(equiv. to **A-levels**)

Publications

NB: The convention in algorithms for author lists
is in alphabetic order by last name.

Preprints and details at
www.wild-inter.net/publications.
(Titles are clickable links).

Peer-Reviewed Conference Proceedings

- [c20] *Finding the saddlepoint faster than sorting*
Justin Dallant, Frederik Haagenzen, Riko Jacob, László Kozma, and Sebastian Wild
Symposium on Simplicity in Algorithms (SOSA) 2024
to be presented
- [c19] *Funnelselect: Cache-oblivious multiple selection*
Gerth Stølting Brodal and Sebastian Wild
European Symposium on Algorithms (ESA) 2023
I. L. Gørtz, M. Farach-Colton, S. Puglisi, G. Herman (eds.): ESA 2023, LIPIcs 274, pp 25:1–25:17
- [c18] *RNA secondary structures: from ab initio prediction to better compression, and back*
Evarista Onokpasa, Sebastian Wild, and Prudence W. H. Wong
Data Compression Conference (DCC) 2023
DCC 2023, IEEE, pp 278–287
- [c17] *Multiway Powersort*
William Cawley Gelling, Markus Nebel, Benjamin Smith, and Sebastian Wild
Symposium on Algorithm Engineering and Experiments (ALENEX) 2023
ALENEX 2023, ACM, pp 190–200
- [c16] *Randomized Communication and Implicit Graph Representations*
Nathaniel Harms, Sebastian Wild, and Viktor Zamaraev
Symposium on Theory of Computing (STOC) 2022
STOC 2022, ACM, pp 1220–1233
- [c15] *Towards the 5/6-Density Conjecture of Pinwheel Scheduling*
Leszek Gąsieniec, Benjamin Smith, and Sebastian Wild
Symposium on Algorithm Engineering and Experiments (ALENEX) 2022
C. A. Phillips and B. Speckmann (eds.): ALENEX 2022, pp 91–103
- [c14] *Succinct Euler-Tour Trees*
Travis Gagie and Sebastian Wild
Canadian Conference on Computational Geometry (CCCG) 2021
M. He and D. Sheehy (eds.): CCCG 2021, pp 368–376
- [c13] *Hypersuccinct Trees – New universal tree source codes for optimal compressed tree data structures and range minima*
J. Ian Munro, Patrick K. Nicholson, Louisa Seelbach Benkner, and Sebastian Wild
European Symposium on Algorithms (ESA) 2021
P. Mutzel, R. Pagh, G. Herman (eds.): ESA 2021, LIPIcs 204, pp 70:1–70:18

- [c12] *Lazy Search Trees*
Bryce Sandlund and Sebastian Wild
Foundations of Computer Science (FOCS) 2020
S. Irani (ed.): FOCS 2020, IEEE, pp 704–715
- [c11] *Distance Oracles for Interval Graphs via Breadth-First Rank/Select in Succinct Trees*
Meng He, J. Ian Munro, Yakov Nekrich, Sebastian Wild, and Kaiyu Wu
International Symposium on Algorithms and Computation (ISAAC) 2020
Y. Cao, SW. Cheng, M. Li (eds.): ISAAC 2020, LIPIcs 181, pp 25:1–25:18
- [c10] *Efficient Second-Order Shape-Constrained Function Fitting*
David Durfee, Yu Gao, Anup B. Rao, and Sebastian Wild
Algorithms and Data Structures Symposium (WADS) 2019
Z. Friggstad, JR. Sack, M. Salavatipour (eds.): WADS 2019, LNCS 11646, Springer, pp 395–408
- [c9] *Sesquiselect: One and a half pivots for cache-efficient selection*
Conrado Martínez, Markus E. Nebel, and Sebastian Wild
Meeting on Analytic Algorithmics and Combinatorics (ANALCO) 2019
M. Mishna and J.I. Munro (eds.): ANALCO 2019, SIAM, pp 54–66
- [c8] *Median-of-k Jumplists and Dangling-Min BSTs*
Markus E. Nebel, Elisabeth Neumann, and Sebastian Wild
Meeting on Analytic Algorithmics and Combinatorics (ANALCO) 2019
M. Mishna and J.I. Munro (eds.): ANALCO 2019, SIAM, pp 74–86
- [c7] *Nearly-Optimal Mergesorts: Fast, Practical Sorting Methods That Optimally Adapt to Existing Runs*
J. Ian Munro and Sebastian Wild
European Symposium on Algorithms (ESA) 2018
Y. Azar, H. Bast, G. Herman (eds.): ESA 2018, LIPIcs 112, pp 63:1–63:16
- [c6] *Average Cost of QuickXsort with Pivot Sampling*
Sebastian Wild
International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA) 2018
MD. Ward, JA. Fill (eds.): AofA 2018, LIPIcs 110, pp 36:1–36:19
- [c5] *Quicksort Is Optimal for Many Equal Keys*
Sebastian Wild
Meeting on Analytic Algorithmics and Combinatorics (ANALCO) 2018
M. Nebel, S. Wagner (eds.): ANALCO 2018, SIAM, pp 8–22
- [c4] *Analysis of Branch Misses in Quicksort*
Conrado Martínez, Markus E. Nebel, and Sebastian Wild
Meeting on Analytic Algorithmics and Combinatorics (ANALCO) 2015
R. Sedgewick, MD. Ward (eds.): ANALCO 2015, SIAM, pp 114–128

- [c3] *Pivot Sampling in Dual-Pivot Quicksort*
Markus E. Nebel and Sebastian Wild
International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA) 2014
M. Bousquet-Mélou, M. Soria (eds.): DMTCS-HAL Proceedings Series, vol. BA, pp 325–338
- [c2] *Engineering Java 7's Dual Pivot Quicksort Using MALIJAN*
Sebastian Wild, Markus E. Nebel, Raphael Reitzig, and Ulrich Laube
Meeting on Algorithm Engineering and Experiments (ALENEX) 2013
P. Sanders, N. Zeh (eds.): ALENEX 2013, SIAM, pp 55–69
- [c1] *Average Case Analysis of Java 7's Dual Pivot Quicksort*
Sebastian Wild and Markus E. Nebel
European Symposium on Algorithms (ESA) 2012
L. Epstein and P. Ferragina (eds.): ESA 2012, LNCS 7501, Springer, pp 825–836.

Peer-Reviewed Journal Articles

- [j9] *A Simple and Fast Linear-Time Algorithm for Divisor Methods of Apportionment*
Raphael Reitzig and Sebastian Wild
***Mathematical Programming B*, 2023**
- [j8] *Succinct Permutation Graphs*
Konstantinos Tsakalidis, Sebastian Wild, and Viktor Zamaraev
***Algorithmica* 85, 2, pp 509–543, 2022**
- [j7] *QuickXsort – A Fast Sorting Scheme in Theory and Practice*
Stefan Edelkamp, Armin Weiß, and Sebastian Wild
***Algorithmica* 82, 3, pp 509–588, 2020**
- [j6] *Dual-pivot and beyond: The potential of multiway partitioning in quicksort*
Sebastian Wild
Distinguished Dissertations in ***it – Information Technology***, 60, 3, pp 173–177, 2018
- [j5] *Building Fences Straight and High: An Optimal Algorithm for Finding the Maximum Length You Can Cut k Times from Given Sticks*
Raphael Reitzig and Sebastian Wild
***Algorithmica* 80, 11, pp 3365–3396, 2018**
- [j4] *Analysis of Pivot Sampling in Dual-Pivot Quicksort*
Markus E. Nebel, Sebastian Wild, and Conrado Martínez
***Algorithmica* 75, 4, pp 632–683, 2016**
- [j3] *Analysis of Quickselect under Yaroslavskiy's Dual-Pivoting Algorithm*
Sebastian Wild, Markus E. Nebel, and Hosam Mahmoud
***Algorithmica* 74, 1, pp 485–506, 2016**
- [j2] *Average Case and Distributional Analysis of Dual Pivot Quicksort*
Sebastian Wild, Markus E. Nebel, and Ralph Neininger
***ACM Transactions on Algorithms* 11, 3, article 22, 2015**

- [J1] *JAGuc – A Software Package for Environmental Diversity Analyses*
 Markus E. Nebel, Sebastian Wild, Michael Holzhauser, Lars Hüttenberger,
 Raphael Reitzig, Matthias Sperber, and Thorsten Stoeck
Journal of Bioinformatics and Computational Biology 9, 6, pp 749–773, 2011

Textbooks

- [B1] *Entwurf und Analyse von Algorithmen*
 (Design and Analysis of Algorithms)
 Markus Nebel and Sebastian Wild · **Springer Vieweg** · 2018

Theses

- [T3] *Dual-Pivot Quicksort and Beyond: Analysis of Multiway Partitioning and Its Practical Potential*
Dissertation · University of Kaiserslautern · 2016
- [T2] *Java 7's Dual Pivot Quicksort*
Master's Thesis · University of Kaiserslautern · 2012
- [T1] *An Earley-style Parser for Solving the RNA-RNA Interaction Problem*
Bachelor's Thesis · University of Kaiserslautern · 2010

Working Papers & Technical Reports

- [M4] *A House Divided: Cooperation, Polarization, and the Power of Reputation*
 Sebastian Wild, Phillip Keldenich, Jann Spiess, Maximilian Schlund, Jano Costard,
 Jonas Radbruch, Paul Stursberg, and Sándor Fekete · Research Square, *In Review*
- [M3] *Dynamic Optimality Refuted – For Tournament Heaps*
 J. Ian Munro, Richard Peng, Sebastian Wild, and Lingyi Zhang
- [M2] *Entropy Trees and Range-Minimum Queries In Optimal Average-Case Space*
 J. Ian Munro, and Sebastian Wild
- [M1] *A Practical and Worst-Case Efficient Algorithm for Divisor Methods of Apportionment*
 Raphael Reitzig and Sebastian Wild

Other Publications

- [O2] *Quicksort mit zwei Pivots und mehr* · Sebastian Wild
 GI LNI Dissertations Band 17 – Ausgezeichnete Informatikdissertationen 2016
- [O1] *Why is Dual-Pivot Quicksort Fast?* · Sebastian Wild
 extended abstract for *Theorietage 2015* (GI Workshop on Algorithms)

Awards and Honors

- 2023 **Guild Awards 2023 – Teacher of the Year (Science & Engineering)**
 Prize awarded by the Guild of Students of University of Liverpool by nomination
 awarded to one academic in each of the three Faculties

- 2017** *GI Dissertationspreis 2016* · [T3]
Prize for **best dissertation** in computer science 2016 in Germany, Austria, and Switzerland, jointly awarded by GI, SI, and OCG
- 2017** Nominated for *Distinguished Teaching Award 2017* of *University of Kaiserslautern* for the design of the interactive course *Training für Programmierwettbewerbe*
- 2013** *Preis des Freundeskreises der TU Kaiserslautern* · [T2]
Best Master's Thesis in the Department of Computer Science 2012
- 2012** **Best Paper Award** at the *European Symposium on Algorithms 2012* · [C1]
- 2009–2012** **Scholarship** of the German National Academic Foundation

Grants and Funding

Principal Investigator

- 2023–2026** **New Investigator Award** · Engineering and Physical Sciences Research Council (EPSRC)
Computing over Compressed Graph-Structured Data
volume £ 519 180 (full economic cost)
- 2022–2023** **Impact Accelerator Fund** for developing impact case
Improved Sorting Algorithms for programming libraries
funded by School of Electrical Engineering, Electronics, and Computer Science, University of Liverpool · volume £ 16 000
- 2022** **Visiting Fellowship** for hosting Gerth Stølting Brodal
funded by Department of Computer Science, University of Liverpool
1 of 4 funded Visiting Fellows · volume £ 700
- 2021–2022** **International Exchanges Program** · The Royal Society
Lazy Finger Search Trees
travel grant for research visit to Kostas Tsichlas (Patras, Greece) · volume £ 2 900
- 2020–2023** **PhD studentship** for Benjamin Smith
funded by School of Electrical Engineering, Electronics, and Computer Science, University of Liverpool · 1 of 2 studentships in the department · volume £ 59 076
- 2021** **Workshop** *Algorithmic and probabilistic aspects of space efficiency*
funded by London Mathematical Society, Department of Computer Science, and the EECS School NeST Initiative of University of Liverpool · volume £ 940
- 2020** **Travel Grant** for research visit to Markus Lohrey
EECS School NeST Initiative of University of Liverpool · volume £ 940

Co-Investigator

- 2021–2022** **International Exchanges Program** · The Royal Society
Decomposition techniques for graphs classes of bounded width parameters and their applications
PI Viktor Zamaraev; part of project team · volume £ 12 000

Talks

Slides available at www.wild-inter.net/publications.

Invited Talks

- 2023 “Quicksort, Timsort, Powersort” · [c7], [c17]
Warwick CS Colloquium · University of Warwick · 15 Nov. 2023
- 2023 “Quicksort, Timsort, Powersort”
CS Lectures · IT University of Copenhagen · 9 Nov. 2023
- 2023 “Quicksort, Timsort, Powersort: Algorithmic ideas, engineering tricks, and trivia behind CPython’s new sorting algorithm” · [c7], [c17]
PyCon US 2023 · 22 Apr. 2023
- 2021 “Hypersuccinct Trees”
International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms (AofA) 2021 · 14 Jun. 2021
- 2021 “Quicksorts of the 21st Century”
Workshop Verified software: tools and experiments · Special event celebrating quicksort’s 60th birthday · Isaac Newton Institute · 7 Jun. 2021
- 2019 “Dual-Pivot Quicksort and Beyond: An Analysis-of-Algorithms Perspective on Multiway Quicksort”
Computability in Europe 2019 · Special Session Smoothed and Probabilistic Analysis of Algorithms Durham University · 17 Jul. 2019
- 2018 “Succinct Data Structures For Range Minimum Problems”
NSF Center for Science of Information · Purdue University · 24 Oct. 2018
- 2017 “Dual-Pivot Quicksort and Beyond”
Annual SPP Meeting of the DFG Schwerpunktprogramm Algorithms for Big Data 19 Oct. 2017
- 2016 “Dual-Pivot Quicksort and Beyond”
Research Seminar · **Hasso-Plattner-Institut Potsdam** · 6 Sep. 2016

Conference & Workshop Presentations

- 2023 “Funneselect: Cache-Oblivious Multiple Selection” · [c19]
ESA 2023 · 6 Sept. 2023
- 2023 “Quicksort, Timsort, Powersort”
Dagstuhl Seminar 23 211 (Scalable Data Structures) · 22 May 2023
- 2022 “On the combinatorics of space-efficient data structures”
Banff International Research Station Workshop 22w5004 (Analytic and Probabilistic Combinatorics) · 15 Nov. 2022
- 2022 “Demystifying Neural Networks (and outreach during lockdown)” · tiny.cc/ai-course
Creative Mathematical Science Communication 2022 · 20 Apr. 2022
- 2021 “Lazy Search Trees” · [c12]
Dagstuhl Seminar 21 071 (Scalable Data Structures) · 16 Feb. 2021
- 2019 “Second-Order Shape-Constrained Function Fitting” · [c10]
WADS 2019 · 6 Aug. 2019

- 2019 “Compressed Range-Minimum Queries: Average-Case Analysis of Search Trees Meets Space-Efficient Data Structures” · [M2]
AofA Meeting · 24 Jun. 2019
- 2019 “Entropy Trees & Range-Minimum Queries In Optimal Average-Case Space” · [M2]
Dagstuhl Seminar 19 051 (Data Structures for the Cloud and External Memory Data)
28 Jan. 2019
- 2019 “Sesquiselect: One and a half pivots for cache-efficient selection” · [C9]
ANALCO Conference · 06 Jan. 2019
- 2018 “Nearly-optimal Mergesorts” · [C7]
ESA Conference · 20 Aug. 2018
- 2018 “Average Cost of QuickXsort with Pivot Sampling” · [C6]
AofA Conference · 28 June 2018
- 2018 “Quicksort Is Optimal for Many Equal Keys” · [C5]
ANALCO Conference · 8 Jan. 2018
- 2017 “Median-of-k Quicksort is optimal for many equal keys”
AofA Meeting · 19 June 2017
- 2016 “Quicksort with Equal Keys”
Dagstuhl Seminar 16 101 (Data Structures and Advanced Models of Computation on Big Data)
7 March 2016
- 2015 “Why is Dual-Pivot Quicksort Fast?” · [O1]
GI Theorietage (Workshop) · 29 Sept. 2015
- 2015 “Analysis of Branch Misses in Quicksort” · [C4]
ANALCO Conference · 4 Jan. 2015
- 2014 “Pivot Sampling in Dual-Pivot Quicksort” · [C3]
AofA Conference · 16 June 2014
- 2014 “Dual-Pivot Quicksort – Asymmetries in Sorting”
Dagstuhl Seminar 14 091 (Data Structures and Advanced Models of Computation on Big Data)
25 March 2014
- 2013 “Engineering Java 7’s Dual Pivot Quicksort Using MALIJAN” · [C2]
ALENEX Conference · 7 Jan. 2013
- 2013 “Quickselect Under Yaroslavskiy’s Dual-Pivoting Algorithm”
AofA Meeting · 28 May 2013
- 2013 “Java 7’s Dual Pivot Quicksort”
FORMAT Workshop · 9 April 2013
- 2012 “Average Case Analysis of Java 7’s Dual Pivot Quicksort” · [C1]
ESA Conference · 11 Sept. 2012

Departmental & Seminar Talks

- 2023 “Quicksort, Timsort, Powersort”
SSLC Distinguished Lecture Series · University of Liverpool · 17 Apr. 2023

- 2022** *"Putting your graphs on a diet"*
Durham-Liverpool Synergy Networks Seminar · 27 Oct. 2022
- 2019** *"Dual-Pivot Quicksort and Beyond"* · University of Liverpool · 10 Dec. 2019
- 2017** *"Dual-Pivot Quicksort and Beyond"* · University of Waterloo · 1 Nov. 2017
- 2015** *"Dual-Pivot Quicksort"* · University of Kaiserslautern · 24 Mar. 2015

Teaching Experience

Details on courses and teaching evaluations at www.wild-inter.net/teaching.

(Titles are clickable links).

Instructor of Record

Sole responsibility for module (give lectures, design assignments, take/design exams).

- 2024** *Advances in Theoretical Computer Science (COMP 555)* · postgraduate level
- 2023** *Efficient Algorithmics (COMP 526)* · postgraduate level
- 2023** *Advances in Theoretical Computer Science (COMP 555)* · postgraduate level
- 2022** *Efficient Algorithmics (COMP 526)* · postgraduate level
- 2022/23** *Communicating Computer Science (COMP 335)* · third-year undergraduate
- 2022** *Applied Algorithmics (COMP 526)* · postgraduate level
- 2021/22** *Communicating Computer Science (COMP 335)* · third-year undergraduate
- 2021** *Applied Algorithmics (COMP 526)* · postgraduate level
- 2020** *Applied Algorithmics (COMP 526)* · postgraduate level
- 2018** *Data Structures and Data Management (CS 240)* · undergraduate level
- 2017** *Advanced Algorithmics: Strategies for Hard Problems* · advanced postgraduate level
- 2017** *Competitive Programming* · undergraduate level
- 2016/17** *Algorithms and Data Structures* · undergraduate level, non-CS majors

Teaching Assistance

Responsible for tutorials (recruit student tutors, design assignments and exams, give exercise classes).

- 2015/16** *Introduction to the Mathematical Analysis of Algorithms*
- 2014** (original title: *Algorithm Engineering*) · advanced postgraduate level
- 2013/14** *Computational Biology I: Alignments and Sequencing*
advanced undergraduate level
- 2015/16** *Computational Biology II: Signals, Phylogenetics and Structure Prediction*
- 2014** postgraduate level
- 2012/13**
- 2014/15** *Design and Analysis of Algorithms* · intermediate undergraduate level

2013 *Combinatorial Algorithms: String Search, Compression, Networks, and Random Generation* · advanced undergraduate level

2013/14 *Proof Techniques* · tutorial at introductory undergraduate level
2012/13

Student Tutor

(grade assignments, give exercise class).

Formal Foundations of Programming · *Software Development I: Introduction to Programming* ·
Software Development III: Concurrency and Parallel Programming

Supervised Students

PhD Students

2020–2024 Benjamin Smith

2021–2025 Eva Onokpasa

Selected Master's Theses

2021 William Cawley Gelling · Title: *4-way Peeksrt & 4-way Powersort* · [c17]

2020 Benjamin Smith · Title: *Exact Solutions for the Bamboo Garden Trimming Problem* · [c15]

Selected Bachelor's Theses

2016 Marvin Peterson · Title: *Experimental View on Cache Behavior of Search Trees*

2015 Elisabeth Neumann · Title: *Randomized Jumplists With Several Jump Pointers* · [c8]

Service

To Profession

Program committees AofA 2024 (Co-Chair)
 SOFSEM 2023 · LATIN 2022 · AofA 2022 · ESA 2019 · ANALCO 2019 ·
 ANALCO 2018

Reviews (journals) *ACM Journal of Experimental Algorithmics* · *ACM Transactions on Algorithms* ·
Algorithmica · *Bulletin of Mathematical Biology* ·
Combinatorics, Probability & Computing · *Discrete Applied Mathematics* ·
IEEE Transactions on Computers · *Information Processing Letters* ·
International Journal of Computer Mathematics · *Journal of Experimental Algorithmics* ·
Mathematical Programming · *Mathematics in Computer Science* ·
Software: Practice and Experience · *The Computer Journal* ·
Theoretical Computer Science ·
Stochastics (Intern. J. of Probability and Stochastic Processes)

Reviews (conferences) ESA 2023 · MFCS 2023 · IWOCa 2023 · WABI 2022 · ICALP 2022 · SODA 2022 · SODA 2022 · ISAAC 2021 · STACS 2021 · ESA 2021 · SoCG 2020 · SODA 2020 · SOFSEM 2020 · SPAA 2019 · SEA 2018 · WADS 2017 · SEA 2017 · ANALCO 2017 · AofA 2016 · SWAT 2014 · ANALCO 2014 · ESA 2013

To Department

since 2022 **Lead** of the **Recruitment, Outreach, and Public Relations** group of the School of Electrical Engineering, Electronics, and Computer Science University of Liverpool

since 2020 **Coordinator** of **Outreach Activities** of the Department of Computer Science University of Liverpool

2012 – 2017 Representative of Scientific Employees in **Board of Examiners** (*Prüfungsausschuss*) · TU Kaiserslautern

Additional Training

2023 *Knowledge Transfer Training Programme*
Skillfluence & The Academy, University of Liverpool

2020 *Fellow of the Higher Education Academy*
Recognition of teaching experience through the ULTRA program
Advance HE & The Academy, University of Liverpool

2017 *Teaching Development Seminar Series for Postdocs*
Centre for Teaching Excellence, University of Waterloo · 6 – 10 Nov. 2017

2016 *Lehre 2.0 – Lehren mit dem Internet*
Workshop on including social media in teaching · 13 June 2016

2015 *Meetings und Projektbesprechungen effizient und zielgerichtet leiten*
Workshop on how to effectively chair a group meeting · 9 – 10 April 2015

Nonacademic Work Experience

Java Developer *marketmaker Software AG* (since 2012 part of *vwd Vereinigte Wirtschaftsdienste GmbH*)
Jul 2010 – Apr 2012 in term breaks
Developed server components for a web-based financial market-data solution.

Languages

German	native
English	fluent
French	elementary
Spanish	elementary