

# Mathias Weller

## Curriculum Vitae

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*"The greatest glory in living lies not in never falling, but in rising  
every time we fall." - Nelson Mandela*

### Education

- 2009–2012 **PhD in Theoretical Computer Science**, *Technische Universität*, Berlin, Germany.
- 2003–2009 **Diploma in Computer Science, minor in Physics**, *Friedrich Schiller Universität*, Jena, Germany.
- 1995–2003 **German Abitur (A-level equivalent)**, *Friedrich-Willhelm Gymnasium*, Königs Wusterhausen, Germany.

### Pre-Diploma Thesis

- Title *Counting, Generating, and Solving Sudoku*
- Supervisors Prof. Dr. Rolf Niedermeier
- Description This thesis contributes a new rule to solve Sudoku by hand without branching and uses it to solve and grade puzzles. Available [online](#).

### Diploma Thesis

- Title *Finding Transitive Approximations of Directed Graphs*
- Supervisors Prof. Dr. Rolf Niedermeier, Christian Komusiewicz, Johannes Uhlmann
- Description This thesis considers the TRANSITIVITY EDITING problem and develops new parameterized algorithms to cope with its hardness. Available [online](#).

### PhD Thesis

- Title *Aspects of Preprocessing Applied to Combinatorial Graph Problems*
- Referees Prof. Dr. Rolf Niedermeier, Prof. Dr. Gerhard Woeginger, Prof. Dr. Christophe Paul
- Description This thesis discusses different forms of preprocessing used in algorithm design using problems from various fields. Special emphasis is put on practical applications. Available [online](#).

## Professional Experience

- 2018– **Full-Time Researcher**, *CNRS, LIGM*, Paris, France.  
Algorithm engineering and research in context of bioinformatics, from sequence analysis to phylogenetic reconstruction.
- 2015–2017 **Post-doctoral position**, *IBC, LIRMM*, Montpellier, France.  
Design and implementation of parameterized, approximation, and ILP-based algorithms dealing with massive sequencing data (“Next Generation Sequencing”), in particular, contig scaffolding. Analysis of evolutionary trees and networks.
- 2013–2014 **Post-doctoral position**, *AIGCo, LIRMM*, Montpellier, France.  
Development of parameterized algorithms for hard graph problems with emphasis on preprocessing in general and parallelizable (“Truth-table”) kernelization in particular.

## Scientific Progress

25	Articles in conference proceedings	403	Citations
17	Articles in international journals	11	<i>h</i> -index
1	Book chapters	6	Students co-supervised
		7	OS software packages written

### Conferences Attended

- 2018 CTW, SGT, Recomb'CG  
2017 COCOA, SeqBio, IWOCA  
2016 COCOA, European Study Group With Industry, JGA, Workshop on Genomics  
2015 Recomb'CG, GROW, COCOA  
2013 SEA, Worker  
2012 ISAAC, LATIN  
2011 IPEC, IWOCA, WG, Worker  
2010 ACID, CPM, ISAAC, TAMC, WG, Worker  
2009 AGAPE Summer School on algorithms, WADS

### Reviews

- Conferences CiE, ESA, FAW, ICALP, IPEC, ISAAC, IWOCA, STACS, TAMC, WABI, WG, ...  
Journals ACM Transactions on Algorithms, Discrete Applied Math, Discrete Optimization, JOMB, JCSS, TCS, Theory of Computing Systems, SIAM Journal on Discrete Mathematics

### External Collaboration

- Magnus Bordewich – Durham University  
Andrew Goldberg – Microsoft Research  
Haim Kaplan – Tel Aviv University  
Steven Kelk – Maastricht University  
Eun Jung Kim – University Paris-Dauphine  
Vincent Moulton – University of East Anglia

### Industry Collaboration

- 2016 N-SIDE (Belgium) – Drafting optimal capacitated routing in patient transportation.  
2012 BSR (Berlin) – Collaboration to optimize vehicle routing in street sweeping service.

### Other

- 2016 co-chair of PACE 2017

## Academic Progress

### Qualifications

2015 Maître de Conférences – Qualification to teach at French universities

### Teaching

2018 Low-level programming with C, Université Paris Est, 24h

2016 Networks, tutorial / recitation class, Université Montpellier, 54h

2012 Parameterized Complexity Theory, tutorial / recitation class, TU Berlin, 21h

### Co-Supervision

2018 Internship of Pierre Cazals: Approximation Algorithms for Power Edge Set

2018 Internship of Dorine Tabary: Linearization of Scaffolds with Multiplicities

2015 Internship of Clément Dallard: Special Cases of Scaffolding

2015 Internship of Valentin Pollet: Complexity of Problems with Partial Solutions

2011 Diploma Thesis of Manuel Sorge: On Making Directed Graphs Eulerian

2010 Diploma Thesis of André Nichterlein: On Tractable Cases of Target Set Selection

### Grants

2016 contribution to ANR project proposal “Complexité et Algorithmes d’Approximation pour la Bioinformatique (COALAB)” (applied for  $\approx 300\text{k€}$ , in progress)

2013 contribution to DFG project proposal “Datenreduktion in der parameterisierten Algorithmik: neue Modelle & Methoden (DAMM)” ( $\approx 150\text{k€}$  approved)

2011 contribution to DFG project proposal “Datenreduktion & Problemkerne (DARE)” ( $\approx 150\text{k€}$  approved)

## Certificates

2014 Internet Security (openHPI)

2014 Parallel Programming Concepts (openHPI)

2013 Web-Technologies (openHPI)

## Computer skills

Basic Java, HTML, OpenGL, OpenCL, KVM virtualisation

Intermediate Perl, Python, Cmake, versioning with git & svn, GUI programming with GTK+, OpenMP, pthreads, CPLEX, cryptography with gpg

Advanced Linux administration, networking, bash/zsh scripting, C++, boost,  $\text{\LaTeX}$

## Languages

German Native speaker

English Near native

French Very good command

## Interests

- Programming – [github page](#)

- Tinkering

- Music

- Martial Arts

## List of Publications

All peer-reviewed (except arXiv articles). See also [Google Scholar](#) or [DBLP](#).

### Journal Articles

- [1] Mathias Weller, Annie Chateau, Clément Dallard, and Rodolphe Giroudeau. Scaffolding problems revisited: complexity, approximation and fixed parameter tractable algorithms, and some special cases. *Algorithmica*, 80(6):1771–1803, 2018.
- [2] Nathann Cohen, Daniel Gonçalves, Eun Jung Kim, Christophe Paul, Ignasi Sau, Dimitrios M. Thilikos, and Mathias Weller. A polynomial-time algorithm for outerplanar diameter improvement. *J. Comput. Syst. Sci.*, 89:315–327, 2017.
- [3] Edwin Jacox, Mathias Weller, Eric Tannier, and Céline Scornavacca. Resolution and reconciliation of non-binary gene trees with transfers, duplications and losses. *Bioinformatics*, 33(7):980–987, 2017.
- [4] Magnus Bordewich, Celine Scornavacca, Nihan Tokac, and Mathias Weller. On the fixed parameter tractability of agreement-based phylogenetic distances. *Journal of Mathematical Biology*, pages 1–19, 2016.
- [5] Valentin Garnero and Mathias Weller. Parameterized certificate dispersal and its variants. *Theoretical Computer Science*, 622:66–78, 2016.
- [6] Steven Kelk, Leo van Iersel, Celine Scornavacca, and Mathias Weller. Phylogenetic incongruence through the lens of monadic second order logic. *Journal of Graph Algorithms and Applications*, 20(2):189–215, 2016.
- [7] René van Bevern, Matthias Mnich, Rolf Niedermeier, and Mathias Weller. Interval scheduling and colorful independent sets. *Journal of Scheduling*, 18(5):449–469, 2015.
- [8] Jiehua Chen, Christian Komusiewicz, Rolf Niedermeier, Manuel Sorge, Ondrej Suchý, and Mathias Weller. Polynomial-time data reduction for the subset interconnection design problem. *SIAM Journal on Discrete Mathematics*, 29(1):1–25, 2015.
- [9] Mathias Weller, Annie Chateau, and Rodolphe Giroudeau. Exact approaches for scaffolding. *BMC Bioinformatics*, 16(Suppl 14):S2, 2015.
- [10] Morgan Chopin, André Nichterlein, Rolf Niedermeier, and Mathias Weller. Constant thresholds can make target set selection tractable. *Theory of Computing Systems*, 55(1):61–83, 2014.
- [11] Martin Dörnfelder, Jiong Guo, Christian Komusiewicz, and Mathias Weller. On the parameterized complexity of consensus clustering. *Theoretical Computer Science*, 542:71–82, 2014.
- [12] Manuel Sorge, Hannes Moser, Rolf Niedermeier, and Mathias Weller. Exploiting a hypergraph model for finding golomb rulers. *Acta Informatica*, 51(7):449–471, 2014.
- [13] Frederic Dorn, Hannes Moser, Rolf Niedermeier, and Mathias Weller. Efficient algorithms for Eulerian extension and rural postman. *SIAM Journal on Discrete Mathematics*, 27(1):75–94, 2013.
- [14] Johannes Uhlmann and Mathias Weller. Two-layer planarization parameterized by feedback edge set. *Theoretical Computer Science*, 494:99–111, 2013.
- [15] André Nichterlein, Rolf Niedermeier, Johannes Uhlmann, and Mathias Weller. On tractable cases of target set selection. *Social Network Analysis and Mining*, pages 1–24, 2012.
- [16] Manuel Sorge, René van Bevern, Rolf Niedermeier, and Mathias Weller. A new view on rural postman based on Eulerian extension and matching. *Journal of Discrete Algorithms*, 16:12–33, 2012.
- [17] Mathias Weller, Christian Komusiewicz, Rolf Niedermeier, and Johannes Uhlmann. On making directed graphs transitive. *Journal of Computer and System Sciences*, 78(2):559–574, 2012.

### Conference Papers

- [18] Mathias Weller. Linear-time tree containment in phylogenetic networks. In *Proceedings of RECOMB Comparative Genomics (RECOMB’CG’18)*, volume abs/1702.06364 of *LNBI*, page ??? Springer, 2018.
- [19] Matthias Bentert, Josef Malík, and Mathias Weller. Tree containment with soft polytomies. In *Proceedings of the 16th Scandinavian Symposium and Workshops on Algorithm Theory (SWAT’18)*, volume 101 of *LIPIcs*, pages 9:1–9:14. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2018.
- [20] Cédric Chauve, Mark Jones, Manuel Lafond, Céline Scornavacca, and Mathias Weller. Constructing a consensus phylogeny from a leaf-removal distance (extended abstract). In *Proceedings of the 24th International Symposium on String Processing and Information Retrieval (SPIRE’17)*, volume 10508 of *LNCS*, pages 129–143. Springer, 2017.
- [21] Holger Dell, Christian Komusiewicz, Nimrod Talmon, and Mathias Weller. The PACE 2017 parameterized algorithms and computational experiments challenge: The second iteration. In *Proceedings of the 12th International Symposium on Parameterized and Exact Computation (IPEC’17)*, volume 89 of *LIPIcs*, pages 30:1–30:12. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, 2017.
- [22] Benoît Darties, Annie Chateau, Rodolphe Giroudeau, and Mathias Weller. Improved complexity for power edge set problem. In *Proceedings of the 28th International Workshop on Combinatorial Algorithms (IWOCA’17), Revised Selected Papers*, volume 10765 of *Lecture Notes in Computer Science*, pages 128–141. Springer, 2017.
- [23] Mathias Weller, Annie Chateau, and Rodolphe Giroudeau. On the linearization of scaffolds sharing repeated contigs. In *Proceedings of the 11th International Conference on Combinatorial Optimization and Applications (COCOA’17), Part III*, volume 10628 of *Lecture Notes in Computer Science*, pages 509–517. Springer, 2017.

- [24] Benoît Darties, Annie Chateau, Rodolphe Giroudeau, and Mathias Weller. New insights for power edge set problem. In *Proceedings of the 11th International Conference on Combinatorial Optimization and Applications (COCOA'17)*, Part I, volume 10627 of *Lecture Notes in Computer Science*, pages 180–194. Springer, 2017.
- [25] Mathias Weller, Annie Chateau, Rodolphe Giroudeau, Jean-Claude König, and Valentin Pollet. On residual approximation in solution extension problems. In *Proceedings of the 10th International Conference on Combinatorial Optimization and Applications (COCOA '16)*, Lecture Notes in Computer Science. Springer, 2016.
- [26] Clement Dallard, Mathias Weller, Annie Chateau, and Rodolphe Giroudeau. Instance guaranteed ratio on greedy heuristic for genome scaffolding. In *Proceedings of the 10th International Conference on Combinatorial Optimization and Applications (COCOA '16)*, Lecture Notes in Computer Science. Springer, 2016.
- [27] Maxim A. Babenko, Andrew V. Goldberg, Haim Kaplan, Ruslan Savchenko, and Mathias Weller. On the complexity of hub labeling. In *Proceedings of the 40th International Symposium on Mathematical Foundations of Computer Science (MFCS '15)*, Part II, volume 9235 of *Lecture Notes in Computer Science*, pages 62–74. Springer, 2015.
- [28] Nathann Cohen, Daniel Gonçalves, Eunjung Kim, Christophe Paul, Ignasi Sau, Dimitrios M. Thilikos, and Mathias Weller. A polynomial-time algorithm for outerplanar diameter improvement. In *Proceedings of the 10th International Computer Science Symposium in Russia (CSR '15)*, volume 9139 of *Lecture Notes in Computer Science*, pages 123–142. Springer, 2015. An extended version was published in *Journal of Computer and System Sciences* [2].
- [29] Mathias Weller, Annie Chateau, and Rodolphe Giroudeau. On the complexity of scaffolding problems: From cliques to sparse graphs. In *Proceedings of the 9th International Conference on Combinatorial Optimization and Applications (COCOA '15)*, volume 9486 of *Lecture Notes in Computer Science*, pages 409–423. Springer, 2015.
- [30] Jiehua Chen, Christian Komusiewicz, Rolf Niedermeier, Manuel Sorge, Ondrej Suchý, and Mathias Weller. Effective and efficient data reduction for the subset interconnection design problem. In *Proceedings of the 24th International Symposium on Algorithms and Computation (ISAAC '13)*, volume 8283 of *Lecture Note in Computer Science*, pages 361–371. Springer, 2013. An extended version was published in *SIAM Journal of Discrete Mathematics* [8].
- [31] Mathias Weller. An improved branching algorithm for two-layer planarization parameterized by the feedback edge set number. In *Proceedings of the 12th International Symposium on Experimental Algorithms (SEA '13)*, volume 7933 of *Lecture Notes in Computer Science*, pages 337–353. Springer, 2013.
- [32] René van Bevern, Rolf Niedermeier, Matthias Mnich, and Mathias Weller. Interval scheduling and colorful independent sets. In *Proceedings of the 23rd International Symposium on Algorithms and Computation (ISAAC '12)*, volume 7676 of *Lecture Notes in Computer Science*, pages 247–256. Springer, 2012. An extended version was published in *Journal of Scheduling* [7].
- [33] Morgan Chopin, André Nichterlein, Rolf Niedermeier, and Mathias Weller. Constant thresholds can make target set selection tractable. In *First Mediterranean Conference on Algorithms (MedAlg '12)*, pages 120–133, 2012. An extended version was published in *Theory of Computing Systems* [10].
- [34] Manuel Sorge, Hannes Moser, Rolf Niedermeier, and Mathias Weller. Exploiting a hypergraph model for finding Golomb rulers. In *Proceedings of the 2nd International Symposium on Combinatorial Optimization (ISCO '12)*, volume 7422 of *Lecture Note in Computer Science*, pages 368–379. Springer, 2012. An extended version was published in *Acta Informatica* [12].
- [35] René van Bevern, Sepp Hartung, Frank Kammer, Rolf Niedermeier, and Mathias Weller. Linear-time computation of a linear problem kernel for dominating set on planar graphs. In *Proceedings of the 6th International Symposium on Parameterized and Exact Computation (IPEC '11)*, volume 7112 of *Lecture Note in Computer Science*, pages 194–206. Springer, 2011.
- [36] Martin Dörnfelder, Jiong Guo, Christian Komusiewicz, and Mathias Weller. On the parameterized complexity of consensus clustering. In *Proceedings of the 22nd International Symposium on Algorithms and Computation (ISAAC '11)*, pages 624–633, 2011. An extended version was published in *Theoretical Computer Science* [11].
- [37] Manuel Sorge, René van Bevern, Rolf Niedermeier, and Mathias Weller. A new view on rural postman based on Eulerian extension and matching. In *Proceedings of the 22nd International Workshop on Combinatorial Algorithms (IWOCA '11)*, volume 7056 of *Lecture Notes in Computer Science*, pages 310–323. Springer, 2011. An extended version was published in *Journal of Discrete Algorithms* [16].
- [38] Manuel Sorge, René van Bevern, Rolf Niedermeier, and Mathias Weller. From few components to an Eulerian graph by adding arcs. In *Proceedings of the 37th International Workshop on Graph-Theoretic Concepts in Computer Science (WG '11)*, volume 6986 of *Lecture Notes in Computer Science*, pages 307–318. Springer, 2011. An extended version was published in *Journal of Discrete Algorithms* [16].
- [39] Frederic Dorn, Hannes Moser, Rolf Niedermeier, and Mathias Weller. Efficient algorithms for Eulerian extension. In *Proceedings of the 36th International Workshop on Graph Theoretic Concepts in Computer Science (WG '10)*, volume 6410 of *Lecture Notes in Computer Science*, pages 100–111. Springer, 2010. An extended version was published in *SIAM Journal on Discrete Mathematics* [13].
- [40] Rudolf Fleischer, Jiong Guo, Rolf Niedermeier, Johannes Uhlmann, Yihui Wang, Mathias Weller, and Xi Wu. Extended islands of tractability for parsimony haplotyping. In *Proceedings of the 21st Annual Symposium on Combinatorial Pattern Matching (CPM '10)*, volume 6129 of *Lecture Note in Computer Science*, pages 214–226. Springer, 2010.
- [41] André Nichterlein, Rolf Niedermeier, Johannes Uhlmann, and Mathias Weller. On tractable cases of target set selection. In *Proceedings of the 21st International Symposium on Algorithms and Computation (ISAAC '10)*, Part I, volume 6506 of *Lecture Notes in Computer Science*, pages 378–389. Springer, 2010. An extended version was published in *Social Network Analysis and Mining* [15].

- [42] Johannes Uhlmann and Mathias Weller. Two-layer planarization parameterized by feedback edge set. In *Proceedings of the 7th Annual Conference on Theory and Applications of Models of Computation (TAMC '10)*, volume 6108 of *Lecture Notes in Computer Science*, pages 431–442. Springer, 2010. An extended version was published in *Theoretical Computer Science* [14].
- [43] Mathias Weller, Christian Komusiewicz, Rolf Niedermeier, and Johannes Uhlmann. On making directed graphs transitive. In *Proceedings of the 11th International Symposium on Algorithms and Data Structures (WADS '09)*, volume 5664 of *Lecture Notes in Computer Science*, pages 542–553. Springer, 2009. An extended version was published in *Journal of Computer and System Sciences* [17].

### Book Chapters

- [44] René van Bevern, Rolf Niedermeier, Manuel Sorge, and Mathias Weller. *Arc Routing: Problems, Methods and Applications*, chapter Complexity of arc routing problems. SIAM, 2014.

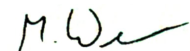
### Theses

- [45] Mathias Weller. *Aspects of Preprocessing Applied to Combinatorial Graph Problems*. PhD thesis, Fakultät für Elektrotechnik und Informatik, Technische Universität Berlin, 2012.
- [46] Mathias Weller. Finding transitive approximations of directed graphs. Master's thesis, Friedrich-Schiller-Universität Jena, Germany, 2009.
- [47] Mathias Weller. Counting, generating, and solving Sudoku. Studienarbeit, 2008.

### Techreports, arXiv Articles and Unpublished Work

- [48] Annie Chateau, Rodolphe Giroudeau, Michael Poss, and Mathias Weller. Scaffolding with multiplicities using ILP. In preparation.
- [49] Stephan Bessy, Alexander Grigoriev, Christophe Paul, Dimitrios Thilikos, and Mathias Weller. Reconstructing trees using status sequences. Unpublished manuscript, 2014.
- [50] Manuel Sorge and Mathias Weller. The graph parameter hierarchy. Unpublished manuscript, available at <http://lirmm.fr/~weller/parameter-hierarchy.pdf>, 2014.
- [51] Mathias Weller. Optimal hub labeling is NP-complete. *CoRR*, abs/1407.8373, 2014.
- [52] Manuel Sorge Mathias Weller, Rolf Niedermeier. Novel directions in data reduction for NP-hard problems: Truth-table kernelizations. Unpublished manuscript, 2013.

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