



DR. THOMAS CHRISTIAN VAN DIJK

POSTDOC

UNIVERSITÄT WÜRZBURG, LEHRSTUHL FÜR INFORMATIK I, ALGORITHMEN & KOMPLEXITÄT

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PERSONAL INFORMATION

Date of birth January 9, 1984 (age 36)
Birthplace Amsterdam
Nationality Dutch (The Netherlands)
Languages Dutch: native
English: fluent
German: C1 level (grade 90%), resident since 2012 (8 years), in lectures since 2015

RESEARCH GRANTS

Jan. '20 Jan. '23 **DFG** – *Eigene Stelle*, three years. (**Approximately 2½ years remaining.**)
Principal investigator; independently developed and wrote proposal. “Algorithmic Quality Assurance: Theory and Practice” (Di 2161/2-2) in Priority Programme 1894 “Volunteered Geographic Information.” This funds my current position in Würzburg. (**≈304 k€**)

Fall '16 Jan. '20 **DFG** – *Eigene Stelle*, three years.
Principal investigator; developed proposal; co-wrote with Prof. Alexander Wolff. “Algorithmically-guided User Interaction: Smart Crowdsourcing and the Extraction of Metadata from Old Maps” (Di 2161/2-1) in Priority Programme 1894 “Volunteered Geographic Information.” This funded my own position in Würzburg. (**≈291 k€**)

Nov. '14 Nov. '17 Developed and co-wrote Benedikt Budig’s proposal for his *Promotionsstipendium der **Studienstiftung des deutschen Volkes***. This funded him for three years as my PhD student. Thesis: “Extracting Spatial Information from Historical Maps: Algorithms and Interaction.” (ISBN [978-39-5826092-4](https://www.isbn-international.org/product/978-39-5826092-4)) (**≈60 k€**)

EMPLOYMENT AS RESEARCHER

Jan. '15 present Independent postdoc at **Universität Würzburg** at Prof. Alexander Wolff’s Lehrstuhl für Informatik I: Algorithmen und Komplexität, working on algorithms for geographic information systems (GIS), information visualisation, historical information, and algorithmically-guided user interaction.

Jan. '12 Jan '15 Postdoc on DFG project at **Universität Würzburg**: “Algorithms for Interactive Variable-Scale Maps” (Ha 5451/3-1). Principal investigator: Jan-Henrik Haurert.

Sept. '07 Sept. '11 PhD project at **Universiteit Utrecht**. Thesis: “Wireless Sensor Networks: Structure and Algorithms.” (ISBN [978-90-9028684-6](https://www.isbn-international.org/product/978-90-9028684-6)). Advisor: Jan van Leeuwen. Universiteit Utrecht does not give a grade for computer science PhD theses. Degree awarded in 2014.

EDUCATION

'05 '07 MSc, **Applied Computing Science**, Universiteit Utrecht, **with honour**.
Thesis: “Fixed Parameter Complexity of Feedback Set Problems.”

'02 '05 BSc, **Computer Science**, minor Software Engineering, Universiteit Utrecht, **with honour**.

'96 '02 Gymnasium, Cals College, Nieuwegein. Profile “Nature & Technology,” with Latin and Computer Science.

JOURNAL PUBLICATIONS

Bundled Crossings Revisited. S. Chaplick, TvD, M. Kryven, J.-W. Park, A. Ravsky, A. Wolff. Journal of Graph Algorithms & Applications JGAA. 35 pages, volume, issue and page numbers pending, 2020.

Block Crossings in Storyline Visualizations TvD, M. Fink, N. Fischer, F. Lipp, P. Markfelder, A. Ravsky, S. Suri, A. Wolff. Journal of Graph Algorithms & Applications JGAA, 21 p. 873, 2017.

Matching Labels and Markers in Historical Maps: an Algorithm with Interactive Post-processing. [Best of Computing - Notable Article, ACM Computing Review] B. Budig, TvD, A. Wolff. ACM Transactions on Spatial Algorithms and Systems TSAS, 2(4) article 13, 2016.

Simultaneous Drawing of Planar Graphs with Right-Angle Crossings and Few Bends M. A. Bekos, TvD, P. Kindermann, A. Wolff. Journal of Graph Algorithms and Applications JGAA, 20(1) p. 133, 2016.

Interactive Focus Maps using Least-Squares Optimization. TvD, J.-H. Haurert. International J. of Geographical Information Science IJGIS, 28(10) p. 2052, 2014.

Inclusion/Exclusion Meets Measure and Conquer. J. Nederlof, J. M. M. van Rooij, TvD. Algorithmica, 69(3) p. 685, 2014.

A Cubic Kernel for Feedback Vertex Set and Loop Cutset. H. L. Bodlaender, TvD. Theory of Computing Systems TCS, 46, p. 566, 2010.

SELECTED CONFERENCE PUBLICATIONS (REFEREED)

Practical Topologically Safe Rounding of Geographic Networks. TvD, A. Löffler. Proceedings of the 27th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, p. 239, 2019.

Realtime Linear Cartograms and Metro Maps. TvD, D. Lutz. Proceedings of the 26th ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, p. 488, 2018.

Putting User Reputation on the Map: Unsupervised Quality Control for Crowdsourced Historical Data. B. Barz, TvD, B. Spaan, J. Denzler. 2nd ACM SIGSPATIAL Workshop on Geospatial Humanities, 6 pages, 2018.

Block Crossings in Storyline Visualizations. [Best Paper award, Theory Track] TvD, M. Fink, N. Fischer, F. Lipp, P. Markfelder, A. Ravsky, S. Suri, A. Wolff. Proceedings of the 24th International Symposium on Graph Drawing and Network Visualization, LNCS vol. 9801, p. 382, 2016.

Location-dependent Generalization of Road Networks Based on Equivalent Destinations. TvD, J.-H. Haurert, J. Oehrlein. Computer Graphics Forum, 35(3), p. 451.

Active Learning for Classifying Template Matches in Historical Maps. [Best Applied Paper award] B. Budig, TvD. Proceedings of the 18th International Conference on Discovery Science, LNCS vol. 9356, p. 33, 2015.

There and Back Again: Using Fréchet-Distance Diagrams to Find Trajectory Turning Points. L. Beckmann, B. Budig, TvD, J. Schamel. Proceedings of the 23rd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, p. 238, 2015.

How to Eat a Graph: Computing Selection Sequences for the Continuous Generalization of Road Networks. M. Chimani, TvD, J.-H. Haurert. Proceedings of the 22nd ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems, p. 243, 2014.

Improved Approximation Algorithms for Box Contact Representations. M. A. Bekos, TvD, M. Fink, P. Kindermann, S. G. Kobourov, S. Pupyrev, J. Spoerhaase, A. Wolff.

Proceedings of the 22th Annual European Symposium on Algorithms ESA, p. 87, 2014.

Schematization with Circular Arcs. TvD, A. van Goethem, J.-H. Haurert, W. Meulemans, B. Speckmann. Proceedings of GIScience 2014: Geographic Information Science, LNCS vol. 8728, 2014.

A Probabilistic Model for Road Selection in Mobile Maps. [Best Short Presentation award] TvD, J.-H. Haurert. Proceedings of Web and Wireless GIS W2GIS, p. 214, 2013.

[Full publication list is attached separately.]

SELECTED INVITED TALKS

Extracting Data from Historical Maps. AI and Cultural Heritage session, 2nd International Conference on AI for Libraries, Archives and Museums. **Stanford Libraries**, December 2019.

Aktives Lernen für Informationsextraktion aus historischen Karten. 10. Dresdner Flächennutzungssymposium, May 2018.

Smart Crowdsourcing: Improving Crowdsourced Data with Algorithms! **New York Public Library (NYPL)**, November 2014.

AWARDS

2nd place out of 15 submissions (\$300), **ACM SIGSPATIAL Cup 2018**. For “Wüpstream: efficient enumeration of upstream features (GIS cup),” with T. Greiner, B. den Heijer, N. Henning, F. Klesen, and A. Löffler.

Best Fast-forward Presentation at ACM SIGSPATIAL International Conference on Advances in Geographic Information Systems 2018. For “Realtime linear cartograms and metro maps,” with D. Lutz.

Shortlisted for membership of the **Young Academy of the Bavarian Academy of Sciences**, class of 2017.

Included on the **ACM Computing Review’s “Best of Computing”** list of notable publications in 2016. For “Matching Labels and Markers in Historical Maps: An Algorithm with Interactive Postprocessing,” with B. Budig and A. Wolff.

Best Paper award (Theory track), at the International Conference on Graph Drawing and Network Visualization (GD) 2016. For “Block Crossings in Storyline Visualizations,” with M. Fink, N. Fischer, F. Lipp, P. Markfelder, A. Ravsky, S. Suri, A. Wolff.

Best Applied Paper award, at the International Conference on Discovery Science (DS) 2015. For “Active Learning for Classifying Template Matches in Historical Maps,” with B. Budig.

Runner-up **Best Poster award** at ACM SIGSPATIAL 2015. For “There and Back Again: Using Fréchet-Distance Diagrams to Find Trajectory Turning Points,” with L. Beckmann, B. Budig and J. Schamel.

Best student contribution award at Schematic Mapping 2014, sponsored by the British Cartographic Society. For “An Automated Method for Circular-Arc Metro Maps,” with A. van Goethem and W. Meulemans.

Best Fast-forward Presentation & Runner-up **Best Poster** awards at ACM SIGSPATIAL 2013. For “Accentuating Focus Maps via Partial Schematization,” with A. van Goethem, J.-H. Haurert, W. Meulemans and B. Speckmann.

Best Short Presentation at Web and Wireless GIS 2013 (W2GIS). For “A Probabilistic Model for Road Selection in Mobile Maps,” with J.-H. Haurert.

Honourable mentions at the International Collegiate Programming Contest (ICPC), North-West European regional finals, 2005 & 2006, Stockholm.

TEACHING

- **Video demo reel:** <https://go.uniwue.de/tvd-video>
- Candidate of the Institute for Mathematics and Computer Science for the “Award for Good Teaching at State Universities in Bavaria” 2014; see attachment.
- Main supervisor for one PhD student (Grade: *sehr gut*); regularly supervise MSc and BSc theses, listed below under [Students](#).

Universität Würzburg, teaching mostly in German:

2020	Summer	Lecture Algorithms for Geographic Information Systems Seminar Algorithms for Programming Competitions
2019	Winter	Lecture Algorithmic Geometry
	Summer	Lecture Algorithms for Geographic Information Systems Seminar Algorithms for Programming Competitions
2018	Summer	Lecture Algorithms for Geographic Information Systems Seminar Graph Visualisation
2017	Winter	Lecture Exact Algorithms [completely redesigned and expanded content]
	Summer	Lecture Algorithms for Geographic Information Systems Seminar Algorithms for Programming Competitions [new design including regular practice and a competition; now a popular seminar]
2016	Winter	Seminar Algorithms for Information Extraction from Historical Maps [new]
	Summer	Lecture Algorithms for Geographic Information Systems
2015	Summer	Lecture Algorithms for Geographic Information Systems
2014	Winter	Seminar Visualisation of Geographic Networks

Universität Würzburg, teaching mostly in English:

	Summer	Lecture Algorithms for Geographic Information Systems
2013	Winter	Tutorial Approximation Algorithms
2012	Winter	Tutorial Algorithms for Geographic Information Systems
	Summer	Tutorial Exact Algorithms

Universiteit Utrecht, teaching mostly in Dutch:

2007 – 2011	Tutorial leader & organisation as PhD student, various courses
2004 – 2007	Student assistant, various courses

(Algorithms; Algorithms & Networks; Search Algorithms; Computer Architecture and Networks; Computer Graphics; Logic & Sets. Designed and developed multiple programming assignments for the Algorithms and the Computer Graphics course.)

SERVICE

Program Committee member for the ACM SIGSPATIAL main conference (since 2019); regular reviewer for various conferences and journals on algorithms, visualisation, and geographic information systems, such as ESA, FCT, GD, IPEC, SODA, EuroVis, InfoVis, et cetera (since 2012). A selection:

t.b.d.	2021	Scientific Co-Chair & local organisation. 3rd Schematic Mapping Workshop, Würzburg.
April	2018	Project lead for “Interaction with historical data”, VGIScience Hackathon, Heidelberg, April 2018.
Sept.	2017	Organisation and scientific supervision of Student Research Projects. VGIScience Summer School 2017, Dresden.

July 2017	German Collegiate Programming Contest, local organisation for Würzburg contest.
April 2017	Scientific Program Committee Chair & local organisation. 2nd International Workshop on Exploring Old Maps, Würzburg.
Nov. 2016	Local organisation. Kick-off meeting for the DFG priority programme Volunteered Geographic Information, Würzburg.
June 2016	Founding Scientific Program Committee Chair. International Workshop on Exploring Old Maps, Luxembourg.
2003 – 2007	Education Quality Control Committee (“Opleidingscommissie”), student member, Universiteit Utrecht.

SOFTWARE

Available at github.com/tcvdijk unless otherwise noted.

Information visualisation

armstrong	Topologically safe rounding of geographic networks to a grid using two-stage simulated annealing. C++
fast-linear-carto	Realtime spatially-informative linear cartograms using least squares adjustment. Also useful for drawing metro maps in realtime. C++
story-bc	Optimal block crossings in Storyline Visualisation: efficient fixed parameter tractable algorithm and a SAT-solver based solution. C++, Python

Historical and crowdsourced data analysis

glyph-miner	Fully production-ready system for rapidly extracting glyph occurrences from early type-set prints. Interactive user interface based on active learning. Python, Javascript, C++ (github.com/benedikt-budig/glyph-miner)
jigglr	Interactive local search to improve crowdsourced building footprints from historical maps. C#
lineman	Tool for aligning GeoJSON LineStrings to bitmap images such as old maps; optimal alignment using an hidden Markov models. C++
building-sleuth	Smart crowdsourcing workflow system for extracting building footprints: smart user interface for data entry and algorithmic data integration. Python, Javascript

Graph algorithms

wupstream	Very fast calculation of upstream features in utility networks. Developed for the ACM SIGSPATIAL GIS Cup 2018. [Second place of 15 in SIGSPATIAL Cup.] C++
fvsk	Kernelisation, approximation and exact algorithms for Feedback Vertex Set. C++

Utility & Teaching

frechet-demo	Interactive visualisation of Fréchet-distance parameter space. Javascript (go.uniwue.de/frechet)
mini-ipe	An easy, no-dependencies package for writing IPE files from Python. Ipe is an “extensible drawing editor” that is excellent for making diagrams for scientific papers and presentations. This makes its file format ideal as output from computational experiments. Python
haelight	Syntax highlighting for C++ code in Adobe After Effects text layers. Useful for making lecture videos involving code. Javascript
azimut-tool	Website for determining the direction (azimuth) of rooftops from open digital orthophoto imagery. This is relevant for estimating the yield of solar panels. Javascript (azimut.polka-umwelt.de)

STUDENTS

PhD Student	Extracting Spatial Information from Historical Maps: Algorithms and Interaction. Benedikt Budig. ISBN 978-39-5826092-4 (Grade: <i>sehr gut</i>)
MSc Thesis	Algorithmische Analyse historischer Landkarten. Benedikt Budig Snapping Graph Drawings to the Grid. Andre Löffler. [Resulted in paper at GD 2016] Realtime Linear Cartograms using Least-Squares Optimisation. Dieter Lutz [Results included in SIGSPATIAL 2018 paper]
MSc "Practical"	Tourenplanung unter Berücksichtigung heterogener Metriken. Maximilian Schmitt (These are ungraded projects that are similar in size to a MSc thesis; often used for computational experiments.) Optimal Port Assignment for Realtime Metro Maps [in progress]. Annika Förster. Improved SAT-based solutions for block-crossing optimisation [in progress]. Peter Markfelder. Implementierung von Algorithmen für das Minimum Convex Partition Problem (CG:SHOP 2020 Competition). David Fischer. Algorithmic Improvement of Crowdsourced Data: Local search and clustering. Norbert Fischer. [Results included in SIGSPATIAL 2020 paper] Improving Smart Crowdsourcing Results with Derived Parameters and Clustering. Bernhard Häussner [Results included in SIGSPATIAL 2020 paper]
BSc Thesis	String Matching von historischen Toponymen. Martin Becker Analyse von Umkehrpunkten auf GPS-Trajektorien unter Verwendung der Fréchet-Distanz. Lukas Beckmann [Results included in SIGSPATIAL 2015 paper] From Many User-Contributed Polygons to One Polygon Consensus. Fabian Feitsch [Results included in SIGSPATIAL 2016 paper] Optimale Zeichnungen von Storylines mit Blockkreuzungen. Peter Markfelder [Results included in GD 2016 paper; Best Paper award] Zuweisung von Kantenrichtungen in Metronetzen. Fabian Sieper Rotation and scale invariant template matching for historical maps. Julian Walter

OTHER WORK EXPERIENCE

Summer 2016	Part-time Scientific Programmer . Digitisation Centre, Würzburg University Library. Developed prototype OCR algorithm for Greek papyri.
Fall 2005 – Spring 2007	Part-time Web Programmer / Designer , Research Institute for History and Culture, Department of Humanities, Universiteit Utrecht & Royal Library of the Netherlands. Designed and implemented the web-based "literature guide Dutch history." (No longer online.)
Summer 2001	Summer job as Helpdesk Employee and Reporting Automation . Gildevaart vocational school, Nieuwegein.