



Curriculum Vitae

Anton Dignös

Personal Information

First Name: Anton
Last Name: Dignös
Office Address: Free University of Bozen-Bolzano
Faculty of Computer Science
Dominikanerplatz - Piazza Dominicani 3
39100 Bozen - Bolzano, Italy
Phone: +39 0471 016142
Email: dignoes@inf.unibz.it
Website: <https://www.inf.unibz.it/~dignoes/>

Education

Nov. 2010 – Nov. 2014: PhD studies in Computer Science, Database Technology Research Group, Department of Informatics, University of Zurich, Zurich, Switzerland;
Thesis: *Interval-Dependent Attributes in Relational Database Systems*; advisor: Prof. Dr. Michael H. Böhlen; co-advisor: Prof. Dr. Christian S. Jensen, Aalborg University, Denmark.

Sep. 2008 – Oct. 2010: MSc studies in Computer Science, Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy;
Thesis: *Temporal Unification for Database Management Systems*; advisor: Prof. Dr. Johann Gamper.

Sep. 2005 – Oct. 2008: BSc studies in Applied Computer Science, Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy;
Thesis: *Temporal Multi-Dimensional Aggregation for Almost Sorted Data*; advisor: Prof. Dr. Johann Gamper.

2000 – 2003: Gewerbeoberschule “Max Valier” (technical institute), specialization in electrical engineering and automation systems, Bozen, Italy.

1997 – 2000: Lehranstalt für Industrie und Handwerk “Johann Kravogl” (professional institute), specialization in electrical engineering, Bozen, Italy.

Degrees

2014: PhD in Computer Science (Dr. sc.) with “summa cum laude”, University of Zurich, Zurich, Switzerland.

2010: MSc in Computer Science, Free University of Bozen-Bolzano, Bozen, Italy.

2008: BSc in Applied Computer Science, Free University of Bozen-Bolzano, Bozen, Italy.

Language knowledge

- German: mother tongue
- Italian: level C1 (Esame di bilinguismo A, Province of Bozen-Bolzano, July 1, 2015)
- English: level C1 (Certificate in Advanced English, Cambridge English, June, 2015)

Professional Experience

Dec. 2014 – present: Assistant Professor (RTD), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy.

Nov. 2010 – Nov. 2014: Research and Teaching Assistant, Database Technology Research Group, Department of Informatics, University of Zurich, Zurich, Switzerland.

Feb. 2010 – May 2010: Teaching Assistant, Database Technology Research Group, Department of Informatics, University of Zurich, Zurich, Switzerland.

Jul. 2009 – Oct. 2009: Researcher with Project Contract, Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy. Topic: *Temporal/Spatial Aggregation*.

Jul. 2008 – Sep. 2008: Researcher with Project Contract, Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy. Topic: *Temporal Aggregation*.

Nov. 2003 – Nov. 2005: Help Desk employee for Microsoft Office and SAP, Brennercom Inc., Bozen, Italy.

Research Statement

My main research focus is on interval-timestamped temporal databases, time-series data, and data analytics. My research is driven by data and problems that emerge from real world applications and my research method combines foundational studies with system engineering and empirical evaluations. The obtained research results have been published in the most prestigious conferences and journals of the database community (2 SIGMOD, 2 PVLDB, 2 ICDE, 1 TODS, 3 IS, 1 EDBT). In my work I developed temporal primitives that allow querying interval-timestamped data in relational database systems, in a principled way, and an approach to scale attribute values that are interval-dependent. I implemented and integrated this work into the kernel of the open source database system PostgreSQL (available at <http://tpg.inf.unibz.it>) and submitted it as a patch to the PostgreSQL community. The primary line of research in the next future will be to progress current research activities and to address new challenges in the area of data-centric applications for temporal and spatial databases. I will continue to strengthen the principle of quality and target top tier international conferences and journals for publishing my research results. Finally, I plan to establish a competence center for open source database systems in the territory to increase the technology transfer with local companies.

Honors and Awards

2017: Best paper award at ADBIS 2017 for the paper “Sparse Prefix Sums” [c8].

2016: Article “Extending the Kernel of a Relational DBMS with Comprehensive Support for Sequenced Temporal Queries” [j1] selected as part of the 21st Annual Best of Computing - Notable Books and Articles of 2016 by ACM Computing Reviews (<http://www.computingreviews.com>).

Research Projects and Funds

Project: SDST
Period: 01.04.2019 – 30.06.2019
Funding: € 10,000
Funded by: NOI Techpark Südtirol / Alto Adige
Role: Principal investigator
Objectives: Design, development and execution of a survey on database technology in South Tyrol.

Project: ISMarD
Period: 01.08.2018 – 01.05.2020
Funding: € 120,000
Funding Agency: Free University of Bozen-Bolzano
Role: Co-investigator

Objectives: Development of an intelligent platform for stock market (timeseries) data.

Project: VCTP
 Period: 16.06.2017 – 15.06.2020
 Funding: €19,000
 Funding Agency: Free University of Bozen-Bolzano
 Role: Principal investigator from 01.02.2019 onwards
 Objectives: Development of visualization techniques for comparing interval-timestamped data.

Project: TASMA
 Period: 01.01.2018 – 30.09.2020
 Funding: €66,000
 Funding Agency: Free University of Bozen-Bolzano
 Role: Co-investigator
 Objectives: Development of a time series processing framework for industry 4.0.

Project: DaSTS
 Period: 01.06.2017 – 31.05.2018
 Funding: \$ 88,000
 Funded by: Oracle Inc.
 Role: Co-investigator for Unibz
 Objectives: Design and development to deeply integrate comprehensive time series support in database systems.

Project: EMMA
 Period: 01.01.2017 – 31.12.2018
 Funding: €70,000
 Funding Agency: Free University of Bozen-Bolzano
 Role: Co-investigator
 Objectives: Development of models and algorithms for efficient route planning in multi-modal transportation networks.

Project: periodVis
 Period: 01.08.2016 – 30.11.2017
 Funding: €20,000
 Funding Agency: Free University of Bozen-Bolzano
 Role: Principal investigator
 Objectives: Design and development of visualization techniques for interval-timestamped data.

Project: TPG
 Period: 01.11.2015 – 31.10.2017
 Funding: €50,000
 Funding Agency: Free University of Bozen-Bolzano
 Role: Principal investigator
 Objectives: Design and development to boost relational database technology to support the processing of interval-timestamped data.

Publications

International Journal Publications

- [j8] V. Del Fatto, A. Dignös, G. Raimato, L. Maccioni, Y. Borgianni, and J. Gamper. Visual Time Period Analysis: a Multimedia Analytics Application for Summarizing and Analyzing Eye-tracking Experiments. In *Multimedia Tools and Applications*, in press, 2019.

DOI: <https://doi.org/10.1007/s11042-019-07950-1>

- [j7] A. Dignös, B. Glavic, X. Niu, J. Gamper, and M. H. Böhlen. Snapshot Semantics for Temporal Multiset Relations. In *Proceedings of the VLDB Endowment*, PVLDB '19, 12(6): 639–652, February 2019.
DOI: <https://doi.org/10.14778/3311880.3311882>
- [j6] G. Mahlknecht, A. Dignös, and N. Kozmina. Modeling and Querying Facts with Period Timestamps in Data Warehouses. *International Journal of Applied Mathematics and Computer Science*, Volume 29, Number 1, pp. 31-49, March 2019.
DOI: <https://doi.org/10.2478/amcs-2019-0003>
- [j5] D. Piatov, S. Helmer, A. Dignös, and J. Gamper. Interactive and Space-Efficient Multi-Dimensional Time Series Subsequence Matching. *Information Systems*, Volume 82, pp. 121-135, May 2019.
DOI: <https://doi.org/10.1016/j.is.2018.08.002>
- [j4] M. Shekelyan, A. Dignös, and J. Gamper. Sparse Prefix Sums: Constant-Time Range Sum Queries Over Sparse Multidimensional Data Cubes. *Information Systems*, Volume 82, pp. 136-147, May 2019.
DOI: <https://doi.org/10.1016/j.is.2018.06.009>
- [j3] M. Shekelyan, A. Dignös, and J. Gamper. DigitHist: a Histogram-Based Data Summary with Tight Error Bounds. In *Proceedings of the VLDB Endowment*, PVLDB '17, 10(11): 1514–1525, August 2017.
DOI: <https://doi.org/10.14778/3137628.3137658>
- [j2] G. Mahlknecht, A. Dignös, and J. Gamper. A Scalable Dynamic Programming Scheme for the Computation of Optimal k-Segments for Ordered Data. *Information Systems*, Volume 70, pages 2–17, October 2017.
DOI: <http://dx.doi.org/10.1016/j.is.2016.08.002>
- [j1] A. Dignös, M. H. Böhlen, J. Gamper, and C. S. Jensen. Extending the Kernel of a Relational DBMS with Comprehensive Support for Sequenced Temporal Queries. *ACM Transactions on Database Systems*, TODS 2016, 41(4), Article 26, 46 pages, ACM, November 2016.
DOI: <http://dx.doi.org/10.1145/2967608>

International Conference Publications

- [c13] A. Behrend, A. Dignös, J. Gamper, P. Schmiegelt, H. Voigt, M. Rottmann, and K. Kahl. Period Index: A Learned 2D Hash Index for Range and Duration Queries. In *Proceedings of the 16th International Symposium on Spatial and Temporal Databases*, SSTD '19, Vienna, Austria, pages 100–109, 2019.
DOI: <https://doi.org/10.1145/3340964.3340965>
- [c12] N. Duran, G. Mahlknecht, A. Dignös, and J. Gamper. HotPeriods: Visual Correlation Analysis of Interval Data. In *Proceedings of the 16th International Symposium on Spatial and Temporal Databases (Demo track)*, SSTD '19, Vienna, Austria, pages 178–181, 2019.
DOI: <https://doi.org/10.1145/3340964.3340989>
- [c11] M. H. Böhlen, A. Dignös, J. Gamper, and C. S. Jensen. Database Technology for Processing Temporal Data (Invited Paper). In *Proceedings of the 25th International Symposium on Temporal Representation and Reasoning*, TIME '18, Warsaw, Poland, pages 2:1–2:7, 2018.
DOI: <https://doi.org/10.4230/LIPIcs.TIME.2018.2>
- [c10] M. H. Böhlen, A. Dignös, J. Gamper, and C. S. Jensen. Temporal Data Management – An Overview. In *Business Intelligence and Big Data, eBISS '17, Lecture Notes in Business Information Processing*, pages 51–83, 2018.
DOI: https://doi.org/10.1007/978-3-319-96655-7_3
- [c9] V. Del Fatto, A. Dignös, and J. Gamper. TIME^oDIFF: a Visual Approach to Compare Period Data. In *Proceedings of the 22nd International Conference on Information Visualisation, IV '18*, Salerno, Italy, pages 38–43, 2018.
DOI: <https://doi.org/10.1109/iV.2018.00017>

- [c8] M. Shekelyan, A. Dignös, and J. Gamper. Sparse Prefix Sums. In *Proceedings of the 21st European Conference on Advances in Databases and Information Systems*, ADBIS '17, Nicosia, Cyprus, pages 120–135, 2017.
DOI: https://doi.org/10.1007/978-3-319-66917-5_9
- [c7] G. Mahlknecht, M. H. Böhlen, A. Dignös, and J. Gamper. VISOR: Visualizing Summaries of Ordered Data. In *Proceedings of the 29th International Conference on Scientific and Statistical Database Management (Demo track)*, SSDBM '17, Chicago, IL, USA, pages 40:1–40:5, 2017.
DOI: <http://dx.doi.org/10.1145/3085504.3091115>
- [c6] K. Wellezohn, M. H. Böhlen, A. Dignös, J. Gamper, and H. Mitterer. Continuous Imputation of Missing Values in Streams of Pattern-Determining Time Series. In *Proceedings of the 20th International Conference on Extending Database Technology*, EDBT '17, Venice, Italy, pages 330–341, 2017.
DOI: <http://dx.doi.org/10.5441/002/edbt.2017.30>
- [c5] D. Piatov, S. Helmer, and A. Dignös. An Interval Join Optimized for Modern Hardware. In *Proceedings of the 2016 IEEE 32nd International Conference on Data Engineering*, ICDE '16, Helsinki, Finland, pages 1098–1109, IEEE Computer Society, 2016.
DOI: <http://dx.doi.org/10.1109/ICDE.2016.7498316>
- [c4] G. Mahlknecht, A. Dignös, and J. Gamper. Efficient Computation of Parsimonious Temporal Aggregation. In *Proceedings of the 19th East European Conference on Advances in Databases and Information Systems*, ADBIS '15, Poitiers, France, pages 320–333, Springer, 2015.
DOI: http://dx.doi.org/10.1007/978-3-319-23135-8_22
- [c3] A. Dignös, M. H. Böhlen, and J. Gamper. Overlap Interval Partition Join. In *Proceedings of the 2014 ACM SIGMOD International Conference on Management of Data*, SIGMOD '14, Snowbird, UT, USA, pages 1459–1470, ACM, 2014.
DOI: <http://dx.doi.org/10.1145/2588555.2612175>
- [c2] A. Dignös, M. Böhlen, and J. Gamper. Query Time Scaling of Attribute Values in Interval Timestamped Databases. In *Proceedings of the 2013 IEEE 29th International Conference on Data Engineering (Demo track)*, ICDE '13, Brisbane, Australia, pages 1304–1307, IEEE Computer Society, 2013.
DOI: <http://dx.doi.org/10.1109/ICDE.2013.6544930>
- [c1] A. Dignös, M. H. Böhlen, and J. Gamper. Temporal Alignment. In *Proceedings of the 2012 ACM SIGMOD International Conference on Management of Data*, SIGMOD '12, Scottsdale, AZ, USA, pages 433–444, ACM, 2012.
DOI: <http://dx.doi.org/10.1145/2213836.2213886>

Program Committee Member

International Conference on Data Engineering (ICDE) 2020, International Conference on Web Information Systems Engineering (WISE) 2019, International Conference on Extending Database Technology (EDBT) 2019, International Conference on Extending Database Technology (EDBT) 2018, International Conference on Current Trends in Theory and Practice of Computer Science (SOFSEM) 2018, International Symposium on Temporal Representation and Reasoning (TIME) 2016, International Provenance and Annotation Workshop (IPAW) 2016.

Reviewing Activity

TODS 2019, TKDE 2018, Distributed and Parallel Databases 2018, Journal of Computer Science and Technology 2018, Informatica 2018, Journal of Computer Science and Technology 2017, Distributed and Parallel Databases 2017, ICDE 2017 (external reviewer), DASFAA 2017 (external reviewer), ICDE 2016 (external reviewer), Information Systems 2015, ADBIS 2015 (external reviewer), ICDE 2014 (external reviewer), SIGMOD Record 2014, TODS 2013, VLDB Journal 2012, TKDE 2011 (external reviewer), VLDB Journal 2011.

Other Activities and Services

2018: Substitute president and member of the commission for the selection procedure of the MSc in Computer Science program for the academic year 2018/2019 at the Free University of Bozen-Bolzano, Italy.

2018: Local arrangements chair of SSDBM 2018 held on July, 9–11, 2018 at the Free University of Bozen-Bolzano, Italy.

2017–present: Member of the teaching committee of the MSc in Computer Science, Faculty of Computer Science, Free University of Bozen-Bolzano.

2016–2019: Second reader for PhD student Elem Güzel of the Free University of Bozen-Bolzano that is supervised by Diego Calvanese and Guohui Xiao.

2015–2018: Study plan advisor and tutor for the curriculum Data and Knowledge Engineering of the Master in Computer Science, Faculty of Computer Science, Free University of Bozen-Bolzano.

2014–2018: Member of the teaching committee of the PhD in Computer Science, Faculty of Computer Science, Free University of Bozen-Bolzano.

2017, 2018, 2019: Organization of a hub for Google Hash Code at the Free University of Bozen-Bolzano.

2016: Support the Bachelor Council at the Free University of Bozen-Bolzano in the revision of the bachelor program. The main activities included the development of the study program, specialization areas, course syllabi, and didactic documents for the university and ministry.

Contribution to Open Source Software

2016–present: Patch and work on PostgreSQL to provide temporal query processing capabilities with range types (<https://commitfest.postgresql.org/11/839/>). Ongoing work.

2018: Bug fix patch for PostgreSQL to prevent memory leakage with SP-GiST indices (<https://commitfest.postgresql.org/17/1555/>). Integrated into the PostgreSQL release in May 2018 (<https://www.postgresql.org/docs/9.6/static/release-9-6-9.html>).

Training Courses

2015: Academic Teaching Excellence - English as a Medium of Instruction, British Council, September 28 - October 2, 2015 (35h), Free University of Bozen-Bolzano, Bozen, Italy.

2012: Teaching in English in a non-English speaking environment, September 24 and October 15, 2012 (14h), University of Zurich, Zurich, Switzerland.

Teaching Activity

Courses

2019: *Advanced Database Management Technologies* (MSc level), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy

2019: *Research Methods – Empirical/experimental CS research methods* (PhD level), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy

2019: *Database Management Systems* (BSc level), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy

2016, 2017, 2018: *Temporal and Spatial Database* (MSc level, together with Vincenzo Del Fatto), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy

2015: *Temporal and Spatial Database* (BSc level), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy

Teaching Assistant

2019: *Database Management Systems* (BSc level), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy

2016, 2017, 2018, 2019: *Advanced Database Management Technologies* (MSc level), Faculty of Computer Science, Free University of Bozen-Bolzano, Bozen, Italy; held by Prof. Johann Gamper.

2010, 2011, 2012, 2013, 2014: *Database Systems* (BSc level), Department of Informatics, University of Zurich, Zurich, Switzerland; held by Prof. Michael H. Böhlen.

2012: *Nonstandard Database Systems* (MSc level), Department of Informatics, University of Zurich, Zurich, Switzerland; held by Prof. Michael H. Böhlen.

2011: *Distributed Database Systems* (BSc level), Department of Informatics, University of Zurich, Zurich, Switzerland; held by Prof. Michael H. Böhlen.

Student Advisor

PhD students

2015-present: Giovanni Mahlknecht, co-advisor with Prof. Johann Gamper.
Topic: *Temporal Aggregation Operators for Data Analytics*.

2017-2018: Michael Shekelyan, co-advised with Prof. Johann Gamper.
Topic: *Reliable Multidimensional Data Summaries Using Histograms*.

MSc/BSc students

2018-present: MSc thesis by Daniel Rampanelli, co-advisor with Prof. Johann Gamper.
Title: *Predictive Maintenance based on the Analysis of Multivariate Time Series*.

2017: BSc thesis by Matthias Keim.
Title: *Automated Traffic Sign Recognition for Street Videos*.

2017: MSc thesis by Peter Moser, co-advised with Prof. Johann Gamper.
Title: *Range Merge Joins for Temporal Data*.

2015: MSc thesis by Kevin Wellenzohn, co-advised with Prof. Johann Gamper.
Title: *Imputation of Missing Values in Highly Correlated Streams of Time Series Data*.

2015: BSc thesis by Tobias Bernard, co-advised with Prof. Johann Gamper.
Title: *Interactive Visualization of Temperature Data Over Time*.

2013: BSc thesis by Oliver Leumann, co-advised with Prof. Michael H. Böhlen.
Title: *Query Compilation of Statement Modifiers*.

2012: BSc thesis by Jonas Schmid, co-advised with Prof. Michael H. Böhlen.
Title: *Implementation and Evaluation of a Key-Value Store for Flash-based Storage*.

Others

2013: Term paper (Facharbeit) by Michael Hartmann, co-advised with Prof. Michael H. Böhlen.
Title: *Implementation of a relational algebra based graphical user-interface for the execution of temporal queries*.

2013: Term paper (Facharbeit) by Marius Wolfensberger, co-advised with Prof. Michael H. Böhlen.
Title: *Quadrees*.

2013: Self-Study (Vertiefung) by Oliver Leumann, co-advised with Prof. Michael H. Böhlen.
Title: *SQL Mapping of Statement Modifiers*.

2011: Term paper (Facharbeit) by Ekateriana Kuleshova, co-advised with Prof. Michael H. Böhlen.
Title: *Provenance in Temporal Databases*.

2011: Self-Study (Vertiefung) by Jonas Schmid, co-advised with Prof. Michael H. Böhlen.
Title: *A Database System's Storage Layer Implementation*.

Talks

2019: *Snapshot Semantics for Temporal Multiset Relations*. VLDB, Los Angeles, CA, USA.

- 2019:** *Period Index: A Learned 2D Hash Index for Range and Duration Queries.* SSTD, Vienna, Austria.
- 2014:** *Overlap Interval Partition Join.* SIGMOD Conference, Snowbird, UT, USA.
- 2013:** *Towards a Temporal PostgreSQL.* SFScon13, Free Software Conference, Bozen, Italy.
- 2012:** *Temporal Alignment.* DIS Seminar Series, Free University of Bozen-Bolzano, Bozen, Italy.
- 2012:** *Temporal Alignment.* SIGMOD Conference, Scottsdale, AZ, USA.
- 2011:** *Curbing Time Intervals in Database Systems.* DIS Seminar Series, Free University of Bozen-Bolzano, Bozen, Italy.

October 2, 2019

Anton Dignös