Martin Aumüller

Curriculum Vitae: November, 2019

Email:	maau@itu.dk
Address:	IT University of Copenhagen
	Algorithms Group
	Rued Langgaards Vej 7
	Office 4B05
	DK-2300 København S
	Denmark
Birth:	January 12th, 1986 in Gera, Germany
Citizenship:	Germany
Website:	http://www.itu.dk/people/maau

Areas of interest

Broad interests:	algorithms and data structures, algorithm engineering
Specific interests:	• design of randomized algorithms for massive data sets
	• analysis of algorithms
	• efficient hash functions
	• algorithm engineering for sorting & similarity search algorithms

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Academic positions

Aug. 2018–current	Assistant Professor in Computer Science at IT University of Copenhagen
Sep. 2017– May 2018	Affiliated with BARC (Basic Algorithms Research Center in Copenhagen), http://barc.ku.dk/
Jan. 2016–Jul. 2018	Postdoctoral researcher in the ERC funded project "Scalable Similarity Search" of Prof. Rasmus Pagh at ITU Copenhagen (3 months paternity leave)
Apr. 2010–Dec. 2015	Research and Teaching Assistant at the Chair of Complexity Theory and Efficient Algorithms (headed by Prof. Martin Dietzfelbinger), Ilmenau University of Technology

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Previous working experience

Jan. 2010	Student Research Assistant at the Institute of Sociology at the Friedrich-Schiller-Universität Jena.
Mar. 2009–Jul. 2009	Software Developer at Opera Software ASA in Linköping, Sweden.
Oct. 2008–Feb. 2009	Internship Software Developer at Opera Software ASA.
Oct. 2005–Sep. 2008	Various positions as a Student Research Assistant at TU Ilmenau.

Education

Apr. 2010–Jun. 2015	Dr. rer. nat. in Theoretical Computer Science (equivalent to a Ph.D.), Ilmenau, University of Technology, Dissertation: On the Analysis of Two Fundamental Randomized Algorithms: Multi-Pivot Quicksort and Efficient Hash Functions, Reviewer: Martin Dietzfelbinger, Rasmus Pagh, Philipp Woelfel. Grade: summa cum laude ("graduated with highest honors")
Oct. 2004 – Mar. 2010	Dipl.-Inf. in Computer Science (equivalent to a Master's degree), Ilmenau, University of Technology, Major: Computer Science, Minor: Mathematics, Thesis: An Alternative Analysis of Cuckoo Hashing with a Stash and Realistic Hash Functions. Grade: 1.2 ("graduated with distinction")

Research Key Metrics

- Citation count: 176[*]

- H-Index: 7[*]

- Orchid: http://orcid.org/0000-0002-7212-6476

([*]according to https://scholar.google.dk/citations?user=TNJYIYoAAAAJ)

Publications

Journal publications

2019   M. Aumüller, E. Bernhardsson, A. Faithfull, *ANN-Benchmarks: A Benchmarking Tool for Approximate Nearest Neighbor Algorithms*, Information Systems.

2018   M. Aumüller, M. Dietzfelbinger, C. Heuberger, D. Krenn, H. Prodinger, *Dual-Pivot Quicksort: Optimality, Analysis and Zeros of Associated Lattice Paths*, Combinatorics, Probability, and Computing.

2016   M. Aumüller, M. Dietzfelbinger, P. Klaue, *How Good is Multi-Pivot Quicksort?*, ACM Transactions on Algorithms 13(1).

2015   M. Aumüller, M. Dietzfelbinger, *Optimal Partitioning for Dual-Pivot Quicksort*, ACM Transactions on Algorithms 12(2).

2014   M. Aumüller, M. Dietzfelbinger, P. Woelfel, *Explicit and Efficient Hash Families Suffice for Cuckoo Hashing with a Stash*, *Algorithmica (70)*, 2014. Special Issue on Selected Papers from ESA 2012.

Journal submissions

2016   *A Simple Hash Class with Strong Randomness Properties in Graphs and Hypergraphs*, M. Aumüller, M. Dietzfelbinger, P. Woelfel.

Peer-reviewed conference papers

2019   M. Aumüller, M. Ceccarello, *The Role of Local Intrinsic Dimensionality in Benchmarking Nearest Neighbor Search*, Best Paper Award, SISAP 2019.

2019   M. Aumüller, T. Christiani, R. Pagh, M. Vesterli, *PUFFINN: Parameterless and Universally Fast FInding of Nearest Neighbors*, ESA 2019.

2019   M. Aumüller, N. Hass, *Simple and Fast BlockQuicksort using Lomuto's Partitioning Scheme*, ALENEX 2019.

2018   M. Aumüller, T. Christiani, R. Pagh, F. Silvestri, *Distance-sensitive Hashing*, PODS 2018

2017   M. Aumüller, E. Bernhardsson, A. Faithfull, *ANN-Benchmarks: A Benchmarking Tool for Approximate Nearest Neighbor Algorithms*, SISAP 2017, Invited to a special issue on selected papers (see above)

2017   T. D. Ahle, M. Aumüller, R. Pagh, *Parameter-free Locality Sensitive Hashing for Spherical Range Reporting*, SODA 2017

2016   M. Aumüller, M. Dietzfelbinger, C. Heuberger, D. Krenn, H. Prodinger. *Counting Zeros in Random Walks on the Integers and Analysis of Optimal Dual-Pivot Quicksort*, AofA 2016, 27th International Conference on Probabilistic, Combinatorial and Asymptotic Methods for the Analysis of Algorithms, 2016.

2013   M. Aumüller, M. Dietzfelbinger, *Optimal Partitioning for Dual Pivot Quicksort*, ICALP 2013, 40th International Colloquium on Automata, Languages, and Programming, 2013.

2012   M. Aumüller, M. Dietzfelbinger, P. Woelfel, *Explicit and Efficient Hash Families Suffice for Cuckoo Hashing with a Stash*, ESA 2012, 20th Annual European Symposium on Algorithms, 2012.

2009   M. Aumüller, M. Dietzfelbinger, M. Rink, *Experimental Variations of a Theoretically Good Retrieval Data Structure*, ESA 2009, 17th Annual European Symposium on Algorithms, 2009.

Peer-reviewed workshop papers

2019   M. Aumüller, M. Ceccarello, *Benchmarking Nearest Neighbor Search: Influence of Local Intrinsic Dimensionality and Result Diversity in Real-World Datasets*

Theses

2015   *On the Analysis of Two Fundamental Randomized Algorithms: Multi-Pivot Quicksort and Efficient Hash Functions*, Dissertation, TU Ilmenau.

2010   *An Alternative Analysis of Cuckoo Hashing with a Stash and Realistic Hash Functions*, Master's thesis, TU Ilmenau.

Presentations

Conference presentations

2019 *The Role of Local Intrinsic Dimensionality in Benchmarking Nearest Neighbor Search*, SISAP 2019, Newark, October 2019.

2019 *PUFFINN: Parameterless and Universally Fast FInding of Nearest Neighbors*, ESA 2019, Munich, September 2019.

2019 *Benchmarking Nearest Neighbor Search: Influence of Local Intrinsic Dimensionality and Result Diversity in Real-World Datasets*, EDML 2019 (co-located with SDM 2019), Calgary, May 2019.

2018 *Distance-Sensitive Hashing*, PODS 2018, Houston, June 2018

2017 *Parameter-free Locality Sensitive Hashing for Spherical Range Reporting*, SODA 2017, Barcelona, January 2017

2013 *Optimal Partitioning for Dual Pivot Quicksort*, ICALP 2013, Riga, July 2013

2012 *Explicit and Efficient Hash Families Suffice for Cuckoo Hashing with a Stash*, ESA 2012, Ljubljana, September 2012

Invited presentations

2018 *Recent Advances in Quicksort*, Institute Seminar, University of Padova, October 2018.

2017 *Distance-sensitive Hashing*, Dagstuhl, Seminar 17181, May 2017

2016 *News on Multi-Pivot Quicksort*, Dagstuhl Seminar 16101, March 2016

2015 *Optimal Partitioning for Multi-Pivot Quicksort*, Algorithm seminar, ITU Copenhagen, October 2015

2015 *Strong Randomness Properties of (Hyper-)Graphs Generated by Simple Hash Functions*, Analysis of Algorithms 2015, Strobl, Austria, June 2015

2014 *Optimal Partitioning for Multi-Pivot Quicksort*, Dagstuhl Seminar 14091, February 2014

2011 *Strong Randomness Properties of Graphs and Hypergraphs Generated by Simple Hash Functions*, Research seminar, Ilmenau, December 2011

Workshop presentations

2016 *Multi-Pivot Quicksort: Comparison-Optimal Algorithms and Beyond*, ARCO'16, April 2016

2013 *Optimal Partitioning for Dual Pivot Quicksort*, 66. Theorietag der Fachgruppe Algorithmen und Komplexität, Hannover, Germany, June 2013

2010 *Cuckoo Hashing with a Stash and Realistic Hash Functions*, 60. Theorietag der Fachgruppe Algorithmen und Komplexität, Kiel, Germany, June 2010

Advising

IT University of Copenhagen

Master thesis advising

- O. Kristiansen, "Similarity Search in Large Image Data Sets", 2019.
- A. Bourgeat, J. Schmurr, "Privacy-Preserving Similarity Search", 2019.
- F. Bakke, S. Petursson, "Locality Sensitive Hashing on the GPU" , 2019.
- F. Buch, A. Lauridsen, "Frequent Item Mining - Introducing a hybrid differential privacy model", 2019.
- K. Nielsen, "Evaluation of improved ANN framework", 2018.
- D. Leszkowicz, "Interactive Data Visualization for a better understanding of Recommender Systems", 2018.
- V. Limbean, "Audio Feature Extraction and Fingerprinting", 2018
- N. Hass, "Design and experimental evaluation of Multi-Pivot BlockQuickSort on Lomuto based partitioning", 2017
- R. Dobre, C. Matrakou, R. Themsen, "Image similarity search using Locality Sensitive Hashing (LSH)", 2016

Bachelor thesis advising

- M. Peterson, "Introduction to the adaptive sorting algorithms Peek Sort and Power Sort in C#"
- F. Stauning, M. Krøse, "Implementing multi-pivot quicksort algorithms in C#", 2018

Student project advising

- I. Hemmingsen,"Visualizing data using Python", 2018.
- M. Rasmussen, N. Hass, "Investigating branch-free and equal-element aware multi-pivot quicksort variants", 2016

TU Ilmenau

Master thesis advising

- P. Klaue, "Optimal Partitioning for Multi-Pivot Quicksort", 2014

Bachelor thesis advising

- D. Knacker, "Theoretical Considerations in Route Planning Algorithms", 2014
- A. Chemissov, "Performance Evaluation of Efficient Hashing Methods", 2014
- A. Seifert, "Modern Algorithms for Route Planning", 2012

Teaching

At ITU Copenhagen (as main instructor)

Autumn 2019	*Introduction to Programming* (undergraduate level)
Autumn 2019	*Applied Algorithms* (graduate level)
Autumn 2018	*Introduction to Programming* (undergraduate level)
Autumn 2018	*Applied Algorithms* (graduate level)
Spring 2018	*First-Year Project: Map of Denmark. Visualization, Navigation, Searching, and Route Planning* (undergraduate)
Autumn 2017	*Programming workshop* (graduate level)
Spring 2017	*Algorithm design project* (graduate level)
Autumn 2016	*Programming workshop* (graduate level)
Spring 2016	*Advanced algorithm seminar* (graduate level)

At TU Ilmenau (teaching in German)

2015	*Algorithms and Data Structures*[*]: tutorial Summer 2015
2010–2015	*Efficient Algorithms 2*[*]: tutorial Winter 2010–2015
2010–2015	*Project seminar*: supervised students writing literature papers on topics in algorithms, data structures and complexity theory (13 students supervised)
2010–2014	*Efficient Algorithms*[*]: main instructor in Summer 2012, tutorial Summer 2010–2014
2011, 2013	*Complexity Theory*[*]: tutorial Summer 2011 and 2013
2011–2012	*Approximation Algorithms*[*]: tutorial Winter 2011 and 2012
2010	*Computability and Complexity*: tutorial Winter 2010

As a student T.A.

2006–2007	tutorials for foreign students on introductory programming courses

(* indicates that around 20% of lectures were given as a replacement for the official teacher)

Awards and Prizes

Prizes

Oct. 2015	Awarded "Lehrpreis 2015" from Technische Universität Ilmenau (one out of ten university-wide awards for excellent teaching)
Oct. 2013	Awarded "Lehrpreis 2013" from Technische Universität Ilmenau

Awards[*]

Oct. 2019	Best Paper Award at SISAP 2019.
Dec. 2014	2 Awards: "best tutorial" ("Efficient Algorithms" & "Efficient Algorithms 2")
Dec. 2012	3 Awards: "best lecture" ("Efficient Algorithms") and "best tutorial" ("Efficient Algorithms" & "Efficient Algorithms 2")
Dec. 2011	1 Award: "best tutorial" ("Efficient Algorithms")

(* teaching awards based on mandatory faculty-wide student evaluations)

Affiliations

- Association for Computing Machinery, since 2016

Professional Service

- General Co-Chair of SISAP 2020 at ITU Copenhagen

- PC Service: SEA 2018, ESA 2018 (Track B), MMM 2019, ACM MM Reproducibility 2019, EDML 2019, SISAP 2019

- Reviewer: WADS 2011, ICALP 2013, ESA 2013, Information Processing Letters, CSR 2016, MFCS 2016, STOC 2017, PODS 2017, Algorithmica 2017, WADS 2017, SODA 2018, ANALCO 2018, Software: Practice and Experience, PPoPP 2018, Artificial Intelligence, ICALP 2019, ESA 2019, Mathematics in Computer Science, SODA 2020, Transactions on Knowledge and Data Engineering.

- Coordinator: 2017, Dagstuhl Seminar 17181, "Theory and Applications of Hashing"

- Organizer: ARCO 2018, IT University of Copenhagen

- Co-organizer: 69. Workshop über Algorithmen und Komplexität at TU Ilmenau, 2015

- Local organizer: On a regular basis, I presented my research work and practical applications of algorithms at workshops for pupils and at open house days. Moreover, I organized and fund-raised the "summer festival" of the faculty in Ilmenau in 2015.

Invited workshop participation

- Dagstuhl Seminars on "Data Structures and Advanced Models of Computation on Big Data" in 2014 & 2016

- Analysis of Algorithms 2015, Strobl (by invitation only in odd years)

Languages

- German (native), English (fluent), Danish (conversational)

- Basic knowledge in Russian, Swedish, Japanese

Additional Skills

Programming languages:	Proficient in C++, Java, Python, Ruby, experienced in Javascript, PHP, SQL (Postgres)
Operation systems:	GNU/Linux, Windows, Mac OS X