Ralf Rantzau

Software Engineer, Researcher, Teacher

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github.com/xralf/resume

Professional interests

- **Databases (SQL / NoSQL)**
- **Distributed systems**
- **Real-time analytics / AI**
- **IoT**
- **Blockchain**

Tech skills

- Golang, C/C++, Python, Java, TypeScript, SQL
- PostgreSQL, MySQL, DB2, MongoDB, DynamoDB, Cassandra, Kafka, Snowflake
- AWS, GCP

Work experience

Tradewing | *Senior Software Engineer* | 9/2023-7/2024

- Designed No-SQL MongoDB data models and ETL workflows to migrate customer data
- Built GraphQL APIs and services to manage payment information in Stripe
- Improved and redesigned services for in-person and online event management
- Added metrics for real-time video stream analytics and built data models to collect and aggregate metrics

Lark Health | *Senior Software Engineer — Backend* | 4/2021-7/2022

- Built micro-services in Golang for on-boarding partners to allow patients to order health devices in the Lark app in Golang
- Created relational and No-SQL database models for new backend services (MySQL, DynamoDB)
- Deployments using Docker & Kubernetes

Lacework | *Senior Software Engineer — Data platform* | 6/2020-11/2020

- Enhanced query processing feature for the cloud security data pipeline using Java

Cisco | 2012-2019

1. *Tech Lead — Blockchain platform* | 2018-9/2019

- Cisco Blockchain — Platform backend programming in Golang
- Helped design, build, and deliver a green-field enterprise DLT platform inspired by Hyperledger Fabric
- Built blockchain ledger components
- Built blockchain state store services (based on ArangoDB)
- Built services to enable an industry-first privacy-preserving No-SQL ledger in Golang with role-based access control (RBAC)
- Built proofs-of-concept for prospective customers
- Deployments using Docker & Kubernetes

2. *Tech Lead — Cloud telemetry and log analytics* | 2014-2018

- Cisco Zeus — Database backend programming, built BI reports and tools, telemetry & logs crunching with Kafka, Storm, Cassandra
- Cisco Container Platform — Built infrastructure to capture telemetry & logs
- Cisco Cloud Center — Built infrastructure to capture telemetry and logs using containers
- Delivered analytics micro-services for product usage optimization and management
- Delivered product features based on stochastic streaming algorithms over telemetry data (count-min sketch, hyperloglog sketch)
- Managed team to deploy a multi-cloud version of Zeus with Spinnaker as well as Cisco Cloud Center
- Managed team to build a telemetry router for logs, metrics, alerts, and health checks
- Designed and built backend infrastructure for processing and metrics/time-series data
- Patents and publications

3. *Senior Software Engineer — Real-time analytics* | 2012-2014

- Cisco Connected Streaming Analytics (CSA) — Stream engine programming in C
- Customer PoCs with Cisco CSA
- ML algorithms integration into real-time analytics pipeline, algorithms were written in R
- Edge and fog computing — Analytics for IoT (retail, stadiums)
- Delivered customer solutions based on Connected Streaming Analytics based with machine learning
- Collaborated with large retail customer on store optimization problems (using lots of sensor technology)
- Predicted and optimized retail shopper checkout queues
- Optimized retail store layout based on purchase patterns and shopper tracking
- Integrated machine learning algorithms into stream database queries using R and user-defined-functions
- Patents & publications

Aalborg University, Denmark | *Assistant Professor — Database systems* | 2010-2011

- Internet technologies lecture
- Database introduction lecture
- Renewable energy data management research

Truviso (acquired by Cisco) | *Software Engineer — Data streams & real-time query processing* | 2009-2012

- Truviso TruCQ — Stream engine programming in C (think of PostgreSQL with data streams)
- PostgreSQL query optimization
- Built PostgreSQL database kernel features for real-time stream processing such as sessionization
- **Acquired by Cisco** in 2012

IBM Silicon Valley Lab | *Senior Software Engineer — RFID data management & BI* | 2006-2009

- IBM RFID Information Center — Database backend and middleware programming in Java
- IBM Cognos — Data governance in data warehouses, SQL query optimization
- Patents & publications

IBM Almaden Research Center | *Post-doctoral Scientist — Data privacy technology* | 2004-2006

- Hippocratic Database — Enforcing privacy policies in relational database (DBMS agnostic)
- Graph databases — Privacy technology for large multi-media streams
- Search engines — Context-sensitive ranking of web search results
- Patents & publications

Education

- *Ph.D. Computer Science* | University of Stuttgart, Germany | 2001-2004
- *M.S. Computer Science* | University of Stuttgart, Germany | 1991-1997

Certifications

- Blockchain Basics by University at Buffalo & The State University of New York, Coursera, 2/2020
- Neural Networks and Deep Learning, Coursera, 1/2018
- Improving Deep Neural Networks: Hyperparameter tuning, Regularization and Optimization, Coursera, 1/2018
- Serverless Data Analysis with Google BigQuery and Cloud Dataflow, Coursera, 1/2018

Awards

- Best Paper Award: Laws for Rewriting Queries Containing Division Operators (Ralf Rantzau, Christoph Mangold), 22nd International Conference on Data Engineering (ICDE), Atlanta, Georgia, USA, 2006
- Patent Achievement Award, IBM, 2009

Patent applications

1. Auditing compliance with a Hippocratic database
2. Security and privacy enforcement for discovery services in a network of electronic product code information repositories
3. Access control method and a system for privacy protection
4. Mitigating and managing privacy risks using planning
5. Providing security for queries to electronic product code information services
6. Entity-state relationship correlation
7. Multi-datacenter message queue
8. Efficient trickle updates in large databases using persistent memory
9. Inter-tenant workload performance correlation and recommendation
10. Using persistent memory to enable restartability of bulk load transactions in cloud databases
11. Traffic analytics service for telemetry routers and monitoring systems
12. Using persistent memory to enable consistent data for batch processing and streaming processing
13. Chained collection of information
14. Obfuscation and anonymization techniques for network data sets for machine learning
15. Self-organizing meshes using distributed ledger systems
16. Hop-by-hop authentication routing using distributed ledger systems
17. Dynamic Genesis and cold death of distributed ledger systems
18. Intent-based ad-hoc network meshes using distributed ledger systems

19. Group addressing using distributed ledger systems
20. Onion routing for obfuscating traffic using distributed ledger systems
21. Ad-hoc n-tier global overlay using distributed ledger systems
22. Public key based addressing using distributed ledger systems
23. Supply chain device provenance

Publications

1. Enhancing the functionality of the web, Peter Kutschera and Ralf Rantzau. ADBIS, September 1997.

2. Extended concepts for association rule discovery. Ralf Rantzau. Master thesis no. DIP-1554, University of Stuttgart, Faculty of Computer Science, Electrical Engineering, and Information Technology, December 1997.

3. A multi-tier architecture for high-performance data mining. Ralf Rantzau and Holger Schwarz. In Proceedings BTW, Freiburg, Germany, March 1999.

4. StreamJoin: A generic database approach to support the class of stream-oriented applications. Clara Nippl, Ralf Rantzau, and Bernhard Mitschang. In Proceedings IDEAS, Yokohama, Japan, September 2000.

5. SIES - An approach for a federated information system in manufacturing. Carmen Constantinescu, Uwe Heinkel, Ralf Rantzau, and Bernhard Mitschang. In Proceedings International Symposium on Information Systems and Engineering (ISE), Las Vegas, Nevada, USA, June 2001.

6. Universal quantification in relational databases: A classification of data and algorithms. Ralf Rantzau, Leonard Shapiro, Bernhard Mitschang, and Quan Wang. In Proceedings EDBT, Prague, Czech Republic, March 2002.

7. Frequent itemset discovery with SQL using universal quantification. Ralf Rantzau. In Proceedings DTDM, Prague, Czech Republic, March 2002.

8. A system for data change propagation in heterogeneous information systems. Carmen Constantinescu, Uwe Heinkel, Ralf Rantzau, and Bernhard Mitschang. In Proceedings ICEIS, Cuidad Real, Spain, April 2002.

9. Champagne: Data change propagation for heterogeneous information systems. Ralf Rantzau, Carmen Constantinescu, Uwe Heinkel, and Holger Meinecke. In Proceedings VLDB, software demonstration, Hong Kong, China, August 2002.

10. Query processing concepts and techniques to support business intelligence applications. Ralf Rantzau. In Proceedings VLDB, doctoral poster session, Hong Kong, China, August 2002.

11. Algorithms and applications for universal quantification in relational databases. Ralf Rantzau, Leonard Shapiro, Bernhard Mitschang, and Quan Wang. Information Systems, 28(1), January 2003.

12. Föderal: Management of engineering data using a semistructured data model. Christoph Mangold, Ralf Rantzau, and Bernhard Mitschang. In Proceedings ICEIS, Angers, France, April 2003.

13. Processing frequent itemset discovery queries by division and set containment join operators. Ralf Rantzau. In Proceedings DMKD, San Diego, California, USA, June 2003.

14. Divide et impera: A flexible integration of layout planning and logistics simulation through data change propagation. Bernhard Mitschang, Engelbert Westkämper, Carmen Constantinescu, Uwe Heinkel, Benno Löffler, Ralf Rantzau, and Ralph Winkler. In Proceedings CIRP International Seminar on Manufacturing Systems, Saarbrücken, Germany, June 2003.

15. Optimierung von Anfragesequenzen in Business-Intelligence-Anwendungen. Holger Schwarz, Tobias Kraft, Ralf Rantzau, and Bernhard Mitschang. Information Technology, 2003(4), August 2003.

16. Coarse-grained optimization: Techniques for rewriting SQL statement sequences. Tobias Kraft, Holger Schwarz, Ralf Rantzau, and Bernhard Mitschang. In Proceedings VLDB, Berlin, Germany, September 2003.

17. Frequent itemset discovery with SQL using universal quantification. Ralf Rantzau. In Rosa Meo, Pier L. Lanzi, and Mika Klemettinen, editors, Database support for data mining applications, volume 2682 of LNCS. Springer, 2004. ISBN: 3-540-22479-3.

18. Query processing concepts and techniques for set containment tests. Ralf Rantzau. Ph.D. thesis no. 2004/01, University of Stuttgart, Faculty of Computer Science, Electrical Engineering, and Information Technology, January 2004. Also published as book, ISBN 978-3-639-24439-7, VDM Verlag.

19. Auditing compliance with a Hippocratic database. Rakesh Agrawal, Roberto J. Bayardo Jr., Christos Faloutsos, Jerry Kiernan, Ralf Rantzau, and Ramakrishnan Srikant. In Proceedings VLDB, Toronto, Canada, August-September 2004.

20. Laws for rewriting queries containing division operators. Ralf Rantzau and Christoph Mangold. Technical report no. 2005/08, University of Stuttgart, Faculty of Computer Science, Electrical Engineering, and Information Technology, October 2005.

21. Laws for rewriting queries containing division operators. Ralf Rantzau and Christoph Mangold. In Proceedings ICDE, Atlanta, Georgia, USA, April 2006. Best paper award.

22. Context-sensitive ranking. Rakesh Agrawal, Ralf Rantzau, and Evimaria Terzi. In Proceedings SIGMOD, Chicago, Illinois, USA, June 2006.

23. Discovery services - Enabling RFID traceability in EPCglobal networks (demonstration paper). Steve Beier, Tyrone Grandison, Karin Kailing, and Ralf Rantzau. In Proceedings COMAD, Delhi, India, December 2006.

24. Theseos query engine for traceability networks. Tyrone Grandison, Karin Kailing, and Ralf Rantzau. In IBM alphaWorks, January 2007.

25. Security with WebSphere RFID Information Center 1.0. Ralf Rantzau and Dirk Wollscheid. In IBM developerWorks, March 2007.

26. An alert notification facility for RFID event data repositories. Valer-Alin Crisan and Ralf Rantzau. In Proceedings RFID Data Management (RFDM), Cancun, Mexico, April 2008.

27. Cost-based predictive spatio-temporal join. Wook-Shin Han, Jaehwa Kim, Byung Suk Lee, Yufei Tao, Ralf Rantzau, and Volker Markl. Transactions on Knowledge and Data Engineering, 28(2), February 2009.

Ongoing personal projects

Redleg: A privacy-preserving blockchain ledger (Golang)

- Goal: Build a time-series No-SQL database system on top of the ledger

Grizzly: A data stream query processor for real-time analytics (Golang)

- Aggregations and stochastic algorithms
- Uses Cap'n Proto, ANTRL4