

# Dixin Tang

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## Research Areas

Query Processing, Cloud Database, Transaction Processing

## Education

- 2015-present Ph.D. Candidate in Computer Science - The University of Chicago  
Advisor: Aaron Elmore
- 2011-2014 M.S. in Computer Science - Institute of Computing Technology, Chinese Academy of Sciences  
Advisor: Wei Li
- 2007-2011 B.S. in Software Engineering - Huazhong University of Science & Technology

## Publications at UChicago

- Thrifty Query Execution via Incrementability  
**Dixin Tang**, Zechao Shang, Aaron J. Elmore, Sanjay Krishnan, Michael J. Franklin  
**SIGMOD 2020**
- CrocodileDB: Efficient Database Execution through Intelligent Deferment  
Zechao Shang, Xi Liang, **Dixin Tang**, Cong Ding, Aaron J. Elmore, Sanjay Krishnan, Michael J. Franklin  
**CIDR 2020**
- Intermittent Query Processing  
**Dixin Tang**, Zechao Shang, Aaron J. Elmore, Sanjay Krishnan, Michael J. Franklin  
**VLDB 2019**
- Socrates: The New SQL Server in the Cloud  
Panagiotis Antonopoulos, Alex Budovski, Cristian Diaconu, Alejandro Hernandez Saenz, Jack Hu, Hanuma Kodavalla, Donald Kossmann, Umar Farooq Minhas, Naveen Prakash, Hugh Qu, Chaitanya Sreenivas Ravella, Krystyna Reisteter, Sheetal Shrotri, **Dixin Tang**, Vikram Wakade  
**SIGMOD 2019**
- Toward Coordination-free and Reconfigurable Mixed Concurrency Control  
**Dixin Tang**, Aaron J. Elmore  
**USENIX'ATC 2018**
- Adaptive Concurrency Control: Despite the Looking Glass, One Concurrency Control Does Not Fit All  
**Dixin Tang**, Hao Jiang, Aaron J. Elmore  
**CIDR 2017**

## Earlier Publications

- A Case Study of Optimizing Big Data Analytical Stacks Using Structured Data Shuffling  
**Dixin Tang**, Taoying Liu, Rubao Lee, Hong Liu, Wei Li  
**BigData Congress 2016**
- SparkArray: An Array-Based Scientific Data Management System Built on Apache Spark  
Wenjuan Wang, Taoying Liu, **Dixin Tang**, Hong Liu, Wei Li, Rubao Lee  
**NAS 2016**

- A Case Study of Optimizing Big Data Analytical Stacks Using Structured Data Shuffling  
**Dixin Tang**, Taoying Liu, Rubao Lee, Hong Liu, Wei Li  
**CLUSTER 2015** (Short Paper)
- RHJoin: A Fast and Space-efficient Join Method for Log Processing in MapReduce  
**Dixin Tang**, Taoying Liu, Hong Liu, Wei Li  
**ICPADS 2014**
- Optimizing the Join Operation on Hive to Accelerate Cross-Matching in Astronomy  
Liang Li, **Dixin Tang**, Taoying Liu, Hong Liu, Wei Li, Chenzhou Cui  
**IPDPS Workshops 2014**

## Industrial Experience

- **Internship at Microsoft Research** June. 2018-Sep. 2018  
Project: Benchmarking Socrates Mentor: Umar Farooq Minhas

Socrates is a new cloud-native database that decouples computation from storage. My internship job is to test the new database architecture of Socrates in the industrial setting, understand its performance bottlenecks, and propose optimization opportunities.

## Research Projects at UChicago

- **CrocodileDB: Resource-efficient Database Execution** July. 2019-Present  
CrocodileDB exploits intelligent deferment to achieve low resource consumption and high query performance at the same time. In CrocodileDB, users can trade off between resource consumption and query performance by specifying a maximally allowed time slackness between the data is ready and the corresponding query result is returned. Our system integrates the slackness constraints along with information about new data and query structures into the underlying query optimizer to unlock new resource-efficient query execution plans.
- **Incrementability-aware Query Processing** Mar. 2019-Present  
This project studies how to efficiently maintain non-positive standing queries. Incrementally maintaining non-positive queries commonly involves wasted work because tuples output in earlier executions are removed by later executions. We define a metric, *incrementability*, to quantify the cost-effectiveness of incremental executions. To reduce the wasted work of incremental executions, we decompose a query plan into smaller pieces and selectively delay the parts of query with lower levels of incrementability.
- **Intermittent Query Processing** Dec. 2017-Sep. 2019  
This project studies how to maintain a standing query over an incomplete data set with the remaining data arriving in an intermittent yet predictable way. To process this data arrival pattern, we propose *Intermittent Query Processing* (IQP) that does not keep the query active all the time, but releases some memory resources when there is not data to process. By exploiting the knowledge of incoming data, IQP selectively keeps a subset of intermediate states when the query is inactive. Therefore, with limited memory consumption IQP can achieve low latency of updating query results for new data.
- **Adaptive Concurrency Control for Main-memory Database** Sep. 2015-Nov. 2017  
We build a main-memory database that supports adaptively mixing multiple forms of concurrency control with minimal overhead. Our system can decompose the workload into partitions and selects a concurrency control protocol for each partition of workload that the protocol is optimized for, and during workload changes adaptively reconfigure the protocols online.

## Earlier Projects

- **Structured Data Shuffling for Big Data Analytical Stacks** Nov. 2013-Jan. 2015  
We build a structured data shuffling procedure that can leverage the semantics of SQL queries to apply efficient compression algorithms and discard unnecessary data during data shuffling.
- **A Fast and Space-efficient Join Method for Log Processing in MapReduce** Sep. 2012-Nov. 2013  
We design a join method that achieves high query performance with a small extra storage cost for log processing. It shuffles the log table to avoid huge storage consumption and optimizes the shuffle procedure to achieve high query performance.

## Honors & Awards

2018	USENIX ATC'18 Student Travel Grant
2016	University Unrestricted (UU) Fellowship - The University of Chicago
2016	CERES 1st year Graduate Research Award - The University of Chicago

## Teaching Assistant

Fall 2015	MPCS 51040 - C programming
Spring 2016	MPCS 52040 - Distributed Systems
Winter 2017	CMSC 23500 - Introduction to Database
Winter 2018	CMSC 23500 - Introduction to Database
Winter 2019	CMSC 23500 - Introduction to Database
Winter 2020	CMSC 23500 - Introduction to Database

## Referees

**Name** Aaron Elmore  
**Affiliate** University of Chicago  
**Position** Assistant Professor  
**Contact** aelmore@cs.uchicago.edu

**Name** Michael Franklin  
**Affiliate** University of Chicago  
**Position** Liew Family Chairman of Computer Science  
**Contact** mjfranklin@uchicago.edu

**Name** Sanjay Krishnan  
**Affiliate** University of Chicago  
**Position** Assistant Professor  
**Contact** skr@cs.uchicago.edu

**Name** Umar Farooq Minhas  
**Affiliate** Microsoft Research  
**Position** Principle Researcher  
**Contact** ufminhas@microsoft.com

**Name** Wei Li  
**Affiliate** Institute of Computing Technology  
**Position** Associate Professor  
**Contact** liwei@ict.ac.cn