ZILU TIAN

Researcher Scientist

Andreasstrasse 15
8050 Zurich, Switzerland
(+41) 0789674532
zilu.tian@uzh.ch
Google Scholar: Zilu Tian *Github* *Linkedin*

I am a system researcher with a background in compilers and distributed systems. My experience focuses on system design and performance optimizations. I am a Scala enthusiast with a general knowledge of functional languages like DrRacket, Haskell, OCaml, and Agda. I also know scripting languages, system languages, and object-oriented languages. I enjoy writing compilers and want to work on compilers and system-related projects.

Experience

Oct. 2023 – Sept. 2024 **Using process calculus for optimizing data and computation sharing in complex stateful parallel computations**, *DaST*, UZH.
- Designed a novel paradigm based on π-calculus for complex stateful computations that simplify compiler optimizations to exploit data and computation sharing through partial evaluation.
- Implemented the proposed programming paradigm as a Scala prototype.
- Our techniques can be 2× faster than hand-optimized implementations (SIGMOD'25, to appear).

Sept. 2021 – Sept. 2023 **Generalizing bulk-synchronous parallel processing for data science: From data to threads and agent-based simulations (CloudCity)**, *DATA*, EPFL.
- Designed an efficient and scalable architecture for distributed agent-based simulations.
- Implemented the architecture using Scala/Akka as the runtime for our DSL.
- Designed an ABS benchmark with workloads from epidemiology, economics, and population dynamics.
- Implemented the ABS benchmark in CloudCity, Giraph, Flink, Spark, and GraphX respectively.
- Evaluated the benchmark performance (Spark and GraphX are 1000× slower than other systems) and analyzed how system design features affect the performance (SIGMOD'23).

May 2020 – Sept. 2021 **Multi-Stage Vertex-Centric Programming for Agent-Based Simulations**, *DATA*, EPFL.
- Designed a domain-specific language for large-scale agent-based simulations in Scala (GPCE'23).
- Implemented the DSL compiler in different approaches, using Scala macro and the Scala meta-programming library Squid respectively.
- Evaluated the staging-based approach with a coroutine-based approach and showed that staging optimizations can lead to better performance.

May 2019 – May 2020 **Evaluating the suitability of ARM servers for data center workloads**, *PARSA*, EPFL.
- Containerized server workloads in a benchmark for aarch64 using Docker.
- Profiled and identified performance bottlenecks for a wide range of server workloads, including data analytics (Spark, Hadoop, Memcached, Cassandra), web serving (NGinX), web searching (Solr), using Perf, FlameGraph, and VTune.
- Analyzed and compared micro-architectural efficiency for aarch64 and x86 servers.

May 2018 – Oct. 2019 **Designing a hardware accelerator for SER/DES**, *PARSA*, EPFL.
- Designed an ISA for a hardware accelerator that reduces the computation overhead and improves the energy efficiency of network serialization/deserialization (ASPLOS'20).

Technical Skills

Fields	distributed systems, compilers, computer hardware, performance optimizations
Languages	Scala, Akka, DrRacket, Python, Java, C/C++, TensorFlow, Scikit-learn
Frameworks	MySQL, Spark, Hadoop, Flink, Giraph, GraphX, Cassandra, Kafka, Memcached
Others	Perf, VTune, FlameGraph, NginX, Solr, ProtoBuf, gRPC, Docker, QEMU

Education

2017 – 2023 **PhD, Computer and Communication Sciences**, *École Polytechnique Fédérale de Lausanne (EPFL)*, Lausanne, Switzerland.

2013 – 2017 **Bachelor of Science, Electrical and Computer Engineering & Mathematics**, *Worcester Polytechnic Institute (WPI)*, Massachusetts, USA, GPA 3.94/4.0, top 1%.

Peer-Reviewed Publications

In Conference Proceedings / Under Review

2025 **Zilu Tian**, Dan Olteanu, and Christoph Koch. Using process calculus for optimizing data and computation sharing in complex stateful parallel computations. *Proc. ACM Manag. Data (SIGMOD)*, 2025.

2023 **Zilu Tian**, Peter Lindner, Markus Nissl, Christoph Koch, and Val Tannen. Generalizing bulk-synchronous parallel processing for data science: From data to threads and agent-based simulations. *Proc. ACM Manag. Data (SIGMOD)*, volume 1, pages 151:1–151:28, 2023.

2023 **Zilu Tian**. Multi-stage vertex-centric programming for agent-based simulations. In Coen De Roover, Bernhard Rumpe, and Amir Shaikhha, editors, *Proceedings of the 22nd ACM SIGPLAN International Conference on Generative Programming: Concepts and Experiences, GPCE 2023, Cascais, Portugal, October 22-23, 2023*, pages 100–112. ACM, 2023.

2020 Arash Pourhabibi Zarandi, Siddharth Gupta, Hussein Kassir, Mark Sutherland, **Zilu Tian**, Mario Paulo Drumond, Babak Falsafi, and Christoph Koch. Optimus prime: Accelerating data transformation in servers. In James R. Larus, Luis Ceze, and Karin Strauss, editors, *ASPLOS '20: Architectural Support for Programming Languages and Operating Systems, Lausanne, Switzerland, March 16-20, 2020*, pages 1203–1216. ACM, 2020.

Fellowships & Awards

2024 Recipient of **Postdoc Grant** at UZH.

2017 Recipient of **Salisbury Prize**, awarded to 20 out of over 1000 graduating students.

2016 Recipient of **SIAM Student Chapter Certificate of Recognition** as the SIAM President.

2016 Recipient of **Undergraduate Research Award** at WPI.

2013–2017 Recipient of merit-based **Presidential Scholarship** at WPI.

Teaching and Supervised Student Projects

2018-2022 **Analysis I-IV, Computer Architecture, Advanced Databases**, EPFL.

Spring 2024 **Learning agent-based simulations through automatic differentiation**.

Fall 2023 **Financial market simulation based on Binance (Bitcoin exchange)**.

Spring 2023 **Type-based transformations to remove messages through partial evaluation**.

Spring 2023 **Distributed map library in CloudCity**.

Fall 2022 **Traffic simulation with frontend visualization support**.

Spring 2022 **NetLogo compiler that compiles sequential programs into parallel CloudCity programs**.

Spring 2022 **Real-time visualization during a simulation**.

Spring 2022 **Simulate different trading strategies**.

2020–2022 **Simulate the impact of policies on regulating farmer behaviors**.