# Jonathan Mace

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*Researcher and engineer with deep expertise in distributed systems, observability, and agentic AI. I lead high-impact, internationally recognized projects building reliable, observable, self-managing cloud systems.*

## CURRENT

**Senior Researcher** 01/2023 – present
Microsoft Research, Redmond, Washington, USA

As part of the Cloud Reliability group, my research focuses on improving the runtime reliability of large-scale cloud systems through efficient observability and agentic techniques for automated analysis and mitigation. I currently lead the *Telemeta* project, which extracts and indexes semantic models from observability data to enable accurate and reliable AI agents.

## PREVIOUS

**Faculty and Head of Cloud Software Systems Group** 09/2018 – 09/2022
Max Planck Institute for Software Systems
University of Saarland, Saarbruücken, Germany

As tenure-track faculty at MPI-SWS, I led the Cloud Software Systems group, researching cloud and distributed systems, ML systems, and operating systems, with a focus on end-to-end reliability. I held a dual appointment at the University of Saarland, where I advised graduate students and taught courses on distributed and cloud systems.

**Research Contractor.** Facebook, Cambridge MA 03/2017 – 03/2018
**Research Intern.** Facebook, New York NY 07/2016 – 10/2016
**Research Contractor.** Microsoft Research, Cambridge MA 09/2013 – 05/2016
**Research Intern.** Microsoft Research, Redmond WA 06/2015 – 09/2015
**Research Intern.** Microsoft Research, Redmond WA 05/2013 – 08/2013
**Research Intern, Willow Garage** 05/2012 – 08/2012
**Software Engineer, IBM UK** 09/2009 – 08/2011

## EDUCATION

**Ph.D. Computer Science** — Brown University, USA May 2018
- Dissertation: *A Universal Architecture for Cross-Cutting Tools in Distributed Systems*
- Advisor: Prof. Rodrigo Fonseca
- *Honorable Mention for the 2018 ACM Dennis M. Ritchie Doctoral Dissertation Award*

**M.Sc. Computer Science** — Brown University, USA May 2014
- GPA: 4.0/4.0

**MMathComp Mathematics & Computer Science** — Oxford University, UK May 2009
- 1st Class (Honors)

## HONORS AND AWARDS

**2020** **Distinguished Artifact Award**, 14th USENIX Symposium on Operating Systems Design and Implementation (OSDI '20)
*Serving DNNs like Clockwork: Performance Predictability from the Bottom Up*

**2018** **Honorable Mention**, Dennis M. Ritchie Doctoral Dissertation Award

**2016** **"Best of the Rest" Invited Speaker**, USENIX Annual Technical Conference (ATC)
*Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems*

**2016** **Facebook PhD Fellowship in Distributed Systems**
*Pervasive Monitoring, Diagnostics, and Analytics of Distributed Systems*
*One of twelve fellowship recipients worldwide and the only recipient for distributed systems.*

**2015** **Best Paper Award**, 25th ACM Symposium on Operating Systems Principles (SOSP '15)
*Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems*

**2015** **Student Scholar**, 3rd Heidelberg Laureate Forum

**2015** **Great TA Award**, Brown University Computer Science Department
*Nominated by students of CS138: Distributed Systems, Spring 2015*

**2006** **Hertford College Scholarship**, Oxford University

## SERVICE

### Program Committees

*USENIX Symposium on Networked Systems Design and Implementation (NSDI)* — 2022, 2026
*USENIX Symposium on Operating Systems Design and Implementation (OSDI)* — 2021-2024
*USENIX Annual Technical Conference (ATC)* — 2021
*ACM Symposium on Operating Systems Principles (SOSP)* — 2021-2025
*ACM European Conference on Computer Systems (EuroSys)* — 2021
*ACM Symposium on Cloud Computing (SoCC)* — 2020
*and various workshops and journals.*

### Mentorship

SOSP 2023, OSDI 2021, Eurosys 2021, OSDI 2020

### Committees

European Research Council 2025 Starting Grant External Reviewer
EuroSys Roger Needham PhD Award Committee 2022

### Organization

*Co-Organizer*, Blueprint Workshop, SOSP 2024
*Co-General Chair*, SOSP 2023
*Lead Organizer*, Cornell, Maryland, Max Planck Summer School 2022
*Web Chair*, SOSP 2021
*Systems Trivia Event*, HotOS 2021 and SOSP 2021

## PUBLICATIONS

### Books

**Distributed Tracing in Practice**
A. Parker, D. Spoonhower, J. Mace, and R. Isaacs
*O'Reilly 2020*

**PUBLICATIONS CONT.**

## Refereed Conference Publications

**AIOpsLab: A Holistic Framework for Evaluating AI Agents for Enabling Autonomous Cloud**
Y. Chen, M. Shetty, G. Somashekar, M. Ma, Y. Simmhan, J. Mace, C. Bansal, R. Wang, S. Rajmohan
*8th Annual Conference on Machine Learning and Systems (MLSys), May 2025*

**Building AI Agents for Autonomous Clouds: Challenges and Design Principles**
M. Shetty, Y. Chen, G. Somashekar, M. Ma, Yogesh. Simmhan, X. Zhang, J. Mace, P. Las-Casas, S. Gupta, S. Nath, C. Bansal, S. Rajmohan
*15th ACM Symposium on Cloud Computing (SoCC), November 2024*

**If At First You Don't Succeed, Try, Try, Again…? Insights and LLM-informed Tooling for Detecting Retry Bugs in Software Systems**
B. Stoica, U. Sethi, Y. Su, C. Zhou, S. Lu, J. Mace, M. Musuvathi, S. Nath
*30th ACM Symposium on Operating Systems Principles (SOSP), October 2024*

**Detection Is Better Than Cure: A Cloud Incidents Perspective**
V. Ganatra, A. Parayil, S. Ghosh, Y. Kang, M. Ma, C. Bansal, S. Nath, J. Mace
*31st ACM Joint European Software Engineering Conference and Symposium on the Foundations of Software Engineering (ESEC/FSE), December 2023*

**Blueprint: A Toolchain for Highly-Reconfigurable Microservice Applications**
V. Anand, D. Garg, A. Kaufmann, J. Mace
*29th ACM Symposium on Operating Systems Principles (SOSP), October 2023*

**Antipode: Enforcing Cross-Service Causal Consistency in Distributed Applications**
J. Loff, D. Porto, J. Garcia, J. Mace, R. Rodrigues
*29th ACM Symposium on Operating Systems Principles (SOSP), October 2023*

**GroundHog: Reconciling Efficiency and Request Isolation in FaaS**
M. Alzayat, J. Mace, P. Druschel, D. Garg
*18th ACM European Conference on Computer Systems (EuroSys), May 2023*

**The Benefit of Hindsight: Tracing Edge-Cases in Distributed Systems**
L. Zhang, Z. Xie, V. Anand, Y. Vigfusson, J. Mace
*20th USENIX Symposium on Networked Systems Design and Implementation (NSDI), April 2023*

**See it to Believe it? The Role of Visualisation in Systems Research**
T. Davidson, J. Mace
*13th ACM Symposium on Cloud Computing (SoCC), November 2022*

**Serving DNNs like Clockwork: Performance Predictability from the Bottom Up**
A. Gujarati, R. Karimi, S. Alzayat, W. Hao, A. Kaufmann, Y. Vigfusson, J. Mace
*14th USENIX Symposium on Operating Systems Design and Implementation (OSDI), October 2020*
***Distinguished Artifact Award***

**Sifter: Scalable Sampling for Distributed Traces, without Feature Engineering**
P. Las-Casas, G. Papakerashvili, V. Anand, J. Mace
*10th ACM Symposium on Cloud Computing (SoCC), November 2019*

**Weighted Sampling of Execution Traces: Capturing More Needles and Less Hay**
P. Las-Casas, J. Mace, D. Guedes, R. Fonseca
*9th ACM Symposium on Cloud Computing (SoCC), October 2018*

**PUBLICATIONS CONT.**

**Universal Context Propagation for Distributed System Instrumentation**
J. Mace and R. Fonseca
*13th ACM European Conference on Computer Systems (EuroSys), April 2018*

**Canopy: An End-to-End Performance Tracing And Analysis System**
J. Kaldor, J. Mace, M. Bejda, E. Gao, W. Kuropatwa, J. O'Neill, K. Ong, B. Schaller, P. Shan, B. Viscomi, V. Venkataraman, K. Veeraraghavan, Y. Song
*26th ACM Symposium on Operating Systems Principles (SOSP), October 2017*

**Principled Workflow-Centric Tracing of Distributed Systems**
R.R. Sambasivan, I. Shafer, J. Mace, B.H. Sigelman, R. Fonseca, and G.R. Ganger
*7th ACM Symposium on Cloud Computing (SoCC), October 2016*

**2DFQ: Two-Dimensional Fair Queuing for Multi-Tenant Cloud Services**
J. Mace, P. Bodik, R. Fonseca, M. Musuvathi, and K. Varadarajan
*ACM SIGCOMM Conference, August 2016*

**Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems**
J. Mace, R. Roelke, R. Fonseca
*25th ACM Symposium on Operating Systems Principles (SOSP), October 2015*
***Best Paper Award***

**Retro: Targeted Resource Management in Multi-Tenant Distributed Systems**
J. Mace, P. Bodik, R. Fonseca, and M. Musuvathi
*12th USENIX Symposium on Networked Systems Design and Implementation (NSDI), May 2015*

**Refereed Workshop Publications**

**Generating Representative Macrobenchmark Microservice Systems from Distributed Traces with Palette**
V. Anand, M. Stolet, J. Mace, A. Kaufmann
*16th ACM SIGOPS Asia-Pacific Workshop on Systems (APSys), October 2025*

**Intent-based System Design and Operation**
V. Anand, Y. Li, A. Kumbhare, C. Irvene, C. Bansal, G. Somashekar, J. Mace, P. Las-Casas, R. Bianchini, R. Fonseca
*Practical Adoption Challenges of ML for Systems (PACMI, co-located with SOSP), October 2025*

**Automated Service Design with Cerulean**
V. Anand, A. Kumbhare, C. Irvene, C. Bansal, G. Somashekar, J. Mace, P. Las-Casas, R. Fonseca
*6th International Workshop on Cloud Intelligence (AIOps), May 2025*

**The Odd One Out: Energy is not like Other Metrics**
V. Anand, Z. Xie, M. Stolet, R. De Viti, T. Davidson, R. Karimipour, S. Alzayat, and J. Mace
*1st Workshop on Sustainable Computer Systems Design and Implementation (HotCarbon), July 2022*

**We are Losing Track: a Case for Causal Metadata in Distributed Systems**
R. Fonseca and J. Mace
*15th International Workshop on High Performance Transaction Systems (HPTS), October 2015*

**Towards General-Purpose Resource Management in Shared Cloud Services**
J. Mace, P. Bodik, R. Fonseca, and M. Musuvathi
*10th Workshop on Hot Topics in System Dependability (HotDep), October 2014*

**PUBLICATIONS CONT.**

## Refereed Journal Publications

**Fair, Practical, and Efficient Carbon Accounting for LLM Serving**
Y.L. Li, L. Han, G.E. Suh, C. Delimitrou, F. Kazhamiaka, E. Choukse, R. Fonseca, L. Yu, J. Mace, U. Gupta
*ACM SIGMETRICS Performance Evaluation Review, 2025*

**The Odd One Out: Energy is Not Like Other Metrics**
V. Anand, Z. Xie, M. Stolet, R. De Viti, T. Davidson, R. Karimipour, S. Alzayat, and J. Mace
*ACM SIGENERGY Energy Informatics Review, Volume 3, Issue 3, October 2023*

**A Qualitative Interview Study of Distributed Tracing Visualisation: A Characterisation of Challenges and Opportunities**
T. Davidson, E. Wall, J. Mace
*IEEE Transactions on Visualization and Computer Graphics, February 2023*

**Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems**
J. Mace, R. Roelke, R. Fonseca
*Communications of the ACM (CACM), Volume 63 Issue 3, March 2020*

**Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems**
J. Mace, R. Roelke, R. Fonseca
*ACM Transactions on Computer Systems (TOCS), Volume 35 Issue 4, December 2018*

## Theses

**A Universal Architecture for Cross-Cutting Tools in Distributed Systems**
J. Mace
*Ph.D. Thesis, Brown University, May 2018*

**Revisiting End-to-End Trace Comparison with Graph Kernels**
J. Mace
*Master's Project, Brown University, May 2014*

## Non-Refereed Publications and Pre-Prints

**Argos: Agentic Time-Series Anomaly Detection with Autonomous Rule Generation via Large Language Models**
Y. Gu, Y. Xiong, J. Mace, Y. Jiang, Y. Hu, B. Kasikci, P. Cheng
*arXiv preprint arXiv:2501.14170, January 2025*

**ACT now: Aggregate Comparison of Traces for Incident Localization**
K. Ramasubramanian, A. Raina, J. Mace, P. Alvaro
*arXiv preprint arXiv:2205.06933, May 2022*

**I Don't Know What You Did Last Summer: The Missing Role of Humans in Systems Research**
T. Davidson, J. Mace
*Technical Report, February 2021*

**Aggregate-driven trace visualizations for performance debugging**
V. Anand, M. Stolet, T. Davidson, I. Beschastnikh, T. Munzner, J. Mace
*arXiv preprint arXiv:2010.13681, October 2020*

**No DNN left behind: Improving inference in the cloud with Multi-Tenancy**
A. Samanta, S. Shrinivasan, A. Kaufmann, J. Mace
*arXiv preprint arXiv:1901.06887, January 2019*

**PUBLICATIONS CONT.**

**End-to-End Tracing: Adoption and Use Cases**
J. Mace
*Survey, Brown University, March 2017*

**Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems**
J. Mace, R. Roelke, R. Fonseca

- *USENIX ;login: Magazine, Spring 2016*
- *Brown University Conduit Magazine, Spring 2016*

### Patents

A. Bridgen, A. Flatt, J. Mace, R. Pilot. **Multi-Modal Journey Planner** *US Patent 9,594,772, 2017*

Representing a Graphical User Interface using a Topic Tree Structure **S. Horsman, M. Kockott, J. Mace, and A. Moger.** *US Patent 9,046,982, 2015*

Dynamic Setting of Increments on an Amplitude Scale **A. Armstrong, J. Mace, and R. Pilot.** *US Patent 9,037,276, 2015*

Presenting a Custom View in an Integrated Development Environment based on a Variable Selection **A. Armstrong, J. Mace, and R. Pilot.** *US Patent 8,959,479, 2015*

Flattening a Subset of Configuration UI Panels in a Hierarchy of UI Panels **A. Bridgen, A. Flatt, J. Mace, and R. Pilot.** *US Patent 8,898,589, 2014*

Method for modifying a User Interface **A. Armstrong, J. Mace, and R. Pilot.** *US Patent 8,751,871, 2014*

Configuration of Widgets in a Mashup Environment **A. Armstrong, S. Burns, and J. Mace.** *US Patent App. 13/943,450, 2013*

Dynamic File Retrieving for Web Page Loading **A. Bridgen, A. Flatt, J. Mace, and R. Pilot.** *US Patent App. 13/679,103, 2012*

Translating User Interface Sounds into 3D Audio Space **A. Armstrong, J. Mace, and M. Whitbourne.** *US Patent App. 13/462,740, 2012*

Adaptive Touch-Sensitive Displays and Methods **A. Armstrong, J. Mace, and R. Pilot.** *US Patent App. 12/982,700, 2010*

**TEACHING**

### Classes Taught

*Distributed Systems*, University of Saarland, 2021

*Advanced Topics in Cloud and Datacenter Systems*, University of Saarland, 2020

### Theses Supervised

**Powering Accurate Aggregate Analysis with Representative Distributed Tracing**
Reyhaneh Karimipour
*M.Sc. Thesis, University of Saarland, February 2023*

**Using Reinforcement Learning for Low-Latency High-Throughput Request Scheduling**
Safya Alzayat
*M.Sc. Thesis, University of Saarland, November 2022*

**Efficient DNN Serving: Evaluating the Feasibility of FPGAs for Multi-Tenant Model Serving**
Franco Caspe
*M.Sc. Thesis, Pazmany Peter Catholic University (Erasmus Program), June 2021*

**Pathfinder: Exploiting Inter-Thread Communication for Request Flow Instrumentation**
Nicolas Schäfer
*M.Sc. Thesis, University of Saarland, January 2021*