Jonathan Mace

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INTERESTS

Distributed Systems
Multi-Tenant Cloud Systems
End-to-End Request Tracing
Networks & Operating Systems
Resource Scheduling & Performance Guarantees
Data-Driven Performance Analysis

EDUCATION

Brown University, Providence, Rhode Island, USA — 2011 – present
Ph.D. Computer Science, *Expected Completion May 2018*
M.Sc. Computer Science, May 2014
- Advisor: Prof. Rodrigo Fonseca
- GPA: 4.0

Oxford University, Hertford College, Oxford, UK — 2005 – 2009
MMathComp Mathematics and Computer Science, June 2009
- 1st Class (Honors)
- Hertford College Scholarship
- Practical Distinction

HONORS AND AWARDS

2017 SIGCOMM Student Scholar, "*50 Years of the ACM Turing Award Celebration*"

2016 USENIX ATC "Best of the Rest" Invited Speaker
Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems

2016 Facebook PhD Fellowship in Distributed Systems
Pervasive Monitoring, Diagnostics, and Analytics of Distributed Systems through Dynamic Causal Tracing.
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)
Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems

2015 Student Scholar, 3rd Heidelberg Laureate Forum

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

2011 Brown University Graduate School Fellowship

2006 Hertford College Scholarship

INDUSTRY EXPERIENCE

Research Contractor, Facebook — 2017 – present
- Machine learning for predicting execution performance using end-to-end request traces

Research Intern, Facebook — Summer 2016
- Large-scale clustering and statistical analysis of end-to-end request traces

Research Contractor, Microsoft Research — 2013 – 2016
- Resource management and fair scheduling in Microsoft Azure Storage and Hadoop

Research Intern, Microsoft Research — Summer 2015
- Application-level fair request scheduling in Microsoft Azure Storage

Research Intern, Microsoft Research Summer 2013
- Tracing, modeling, and performance simulation of request execution in Microsoft Azure Storage

Research Intern, Willow Garage Summer 2012
- Developed web interfaces (http://robotwebtools.org) for the Robot Operating System

Software Engineer, IBM UK 2009 – 2011
- Emerging Technology Services: natural language systems research
- Websphere Service Registry and Repository: UI development

Extreme Blue Intern, IBM UK Summer 2008
- Developed "InfoSlicer" application for One Laptop Per Child project

TEACHING

CS138: Distributed Systems
Brown University
- Co-designed a rebooted course after several years' hiatus (2015)
- Designed and developed course assignments in Go (2015)
- Teaching Assistant (2015) and Guest Lecturer (2015, 2016)
- Received "Great TA" award, nominated by students (2015)

CS168: Networking
Brown University
- Developed reference implementation of TCP/IP course assignment (2013)

Student Project Co-Advising
Brown University
- Kartik Singhal, M.Sc. 2017
  End-to-end Tracing for Serverless Applications
- Joshua Liebow-Feeser, M.Sc. 2016
  Causal Tracing for Go
- George Hongkai Sun, M.Sc. 2016
  General Baggage Model for End-to-End Tracing and Its Application on Critical Path Analysis
- Ryan Roelke, M.Sc. 2015
  Dynamic Causal Monitoring for Distributed Systems
- Jonathan Leavitt, M.Sc. 2014
  End-to-End Tracing Models: Analysis and Unification
- Evan Wallace, B.Sc. 2012
  RIDE: A web-based IDE for ROS

Education Outreach
Willow Garage
- Hosted a "Program a Robot" exhibit at The Tech Museum of Innovation, San Jose (2012)

IBM UK
- Taught a weekly "Introduction to Java" class to new graduate hires (2010)
- Taught weekly IT lessons at John Keble Primary School, Hursley (2010), and Weeke Primary School, Winchester (2011)
- Hosted a physics simulation exhibit for National Science and Engineering week (2010)
- Developed "InfoSlicer" application for One Laptop Per Child project (2008)

COMMUNITY

Reviewer for:
- *ACM Transactions on Networking*
- *IEEE Transactions on Parallel and Distributed Systems*

Member of the OpenTracing Industrial Advisory Board

PUBLICATIONS

Conferences

Universal Context Propagation for Distributed System Instrumentation
J. Mace and R. Fonseca
to appear in 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

Workshops

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

Journals

Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems
J. Mace, R. Roelke, R. Fonseca
to appear in ACM Transactions on Computer Systems (TOCS)

Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems
J. Mace, R. Roelke, R. Fonseca
to appear in Communications of the ACM (CACM)

Miscellaneous

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*

Revisiting End-to-End Trace Comparison with Graph Kernels
J. Mace and R. Fonseca
Master's Project, Brown University, May 2013

PUBLICATIONS CONT.

Posters

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
Presented at:
- *26th ACM Symposium on Operating Systems Principles (SOSP), October 2017*
- *4th New England Networking and Systems Day (NENS), December 2017*

Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems
J. Mace, R. Roelke, R. Fonseca
Presented at:
- *2nd New England Networking and Systems Day (NENS), October 2015*
- *25th ACM Symposium on Operating Systems Principles (SOSP), October 2015*
- *3rd Heidelberg Laureate Forum (HLF), August 2015*
- *12th USENIX Symposium on Networked Systems Design and Implementation (NSDI), May 2015*

Towards General-Purpose Resource Management in Shared Cloud Services
J. Mace, P. Bodik, R. Fonseca, and M. Musuvathi
Presented at:
- *Microsoft TechFest, March 2014*

Talks

Baggage Context: A Narrow Waist for Distributed Systems Instrumentation
Presented at:
- *4th New England Networking and Systems Day (NENS), December 2017*

Towards a Tracing Plane for Distributed Systems
Presented at:
- *OpenTracing Distributed Tracing Workshop, June 2017*
- *Los Alamos National Laboratory, Information Science and Technology Institute, May 2017*
- *OpenTracing Distributed Tracing Workshop, February 2017*

2DFQ: Two-Dimensional Fair Queuing for Multi-Tenant Cloud Services
Presented at:
- *ACM SIGCOMM Conference, August 2016*
- *Facebook New York, August 2016*

Pivot Tracing: Dynamic Causal Monitoring for Distributed Systems
Presented at:
- *2016 USENIX Annual Technical Conference (ATC), June 2016*
- *MIT Database Group Seminar, November 2015*
- *Facebook New York, November 2015*
- *25th ACM Symposium on Operating Systems Principles (SOSP), October 2015*

Retro: Targeted Resource Management in Multi-Tenant Distributed Systems
Presented at:
- *12th USENIX Symposium on Networked Systems Design and Implementation (NSDI), May 2015*
- *Tracelytics, Providence RI, December 2014*
- *1st New England Networking and Systems Day (NENS), October 2014*

Towards General-Purpose Resource Management in Shared Cloud Services
Presented at:
- *10th Workshop on Hot Topics in System Dependability (HotDep), October 2014*

PUBLICATIONS CONT.

Patents

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

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

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

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

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

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

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

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

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

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

OPEN-SOURCE CONTRIBUTIONS

OpenTracing Industrial Advisory Board
http://opentracing.io
Initiative to develop standards for cross-platform end-to-end tracing, with an emphasis on open-source systems and tracing frameworks

Tracing Plane
http://github.com/TracingPlane
An interface definition language, compiler, protocol, and data format for general-purpose cross-platform baggage contexts

Brown Tracing Framework
http://brownsys.github.io/tracing-framework
Research artifacts from the Retro and Pivot Tracing projects

Hadoop and Spark
http://github.com/brownsys/spark
http://github.com/brownsys/hadoop
Forks of Hadoop and Spark with end-to-end instrumentation, compatible with Brown Tracing Framework

Spark TPC-DS
http://github.com/brownsys/tpcds
Implementation of the TPC-DS Big Data benchmark (http://www.tpc.org/tpcds) for Apache Spark

Robot Web Tools
http://robotwebtools.org
Open-source modules and tools for browsers to interface with the Robot Operating System

Infoslicer
http://wiki.sugarlabs.org/go/Activities/Info_Slicer
Application for the One Laptop Per Child for editing and distributing Wikipedia content