

# Arpan Gujarati

Ph.D. Candidate

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## Research Interests

Real-time systems, distributed systems, fault tolerance, reliability analysis, and scheduling

## Education

- 2014–2019 **Ph.D. in Computer Science (dissertation phase)**  
Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken/Kaiserslautern, Germany  
and Technical University of Kaiserslautern (TU-KL), Kaiserslautern, Germany  
Advisor: Björn B. Brandenburg (head of the Real-Time Systems Group at MPI-SWS)  
Thesis: *Towards “Ultra-Reliable” CPS: Reliability Analysis of Distributed Real-Time Systems*
- 2012–2014 **Ph.D. in Computer Science (preparatory phase and graduate coursework)**  
Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken/Kaiserslautern, Germany  
and Saarland University (UdS), Saarbrücken, Germany
- 2007–2011 **B.E. (Hons.) in Computer Science**  
Birla Institute of Technology and Science (BITS), Pilani, India

## Work Experience

- 2020 **Postdoctoral Researcher**  
Max Planck Institute for Software Systems (MPI-SWS), Saarbrücken/Kaiserslautern, Germany  
Advisor: Jonathan Mace  
Focus areas: Building systems for machine learning in the cloud
- 2020 **Visiting Researcher (February and March)**  
University of British Columbia (UBC), Vancouver, Canada  
Hosts: Karthik Pattabiraman, Sathish Gopalakrishnan  
Focus areas: Building reliable machine learning frameworks for resilient intelligence at the edge
- 2015 **Research Intern (three months)**  
Microsoft Research, Redmond, WA, USA  
Mentors: Kathryn S. McKinley, Sameh Elnikety, Yuxiong He  
Focus areas: Distributed autoscaling of machine learning inference services
- 2011–2012 **Software Development Engineer**  
Cloud Networking Group, Citrix R&D, Bengaluru, India  
Manager: Sanjay Gupta  
Focus areas: Management Service VM for the Xen Server
- 2011 **Software Development Intern**  
Visual and Parallel Computing Group, Intel, Bengaluru, India  
Team: Display Features and Miniport  
Focus areas: Prototype code optimizations for kernel-mode graphics drivers

## Honors and Awards

- 2018 **Best Presentation Award**, 30<sup>th</sup> Euromicro Conference on Real-Time Systems
- 2018 **Best Student Paper Award**, 18<sup>th</sup> ACM/IFIP/USENIX International Middleware Conference
- 2014 **Young Researcher**, 2<sup>nd</sup> Heidelberg Laureate Forum
- 2013 **Outstanding Paper Award**, 25<sup>th</sup> Euromicro Conference on Real-Time Systems

## Invited Talks

- 2019 **Towards “Ultra-Reliable” CPS: Reliability Analysis of Distributed Real-Time Systems**  
ETH Zurich (remote talk). Host: Lothar Thiele  
George Washington University. Host: Gabriel Parmer  
University of Pennsylvania. Host: Linh Thi Xuan Phan

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## Publications

### Conference Publications

- RTAS'20 **Real-Time Replica Consistency over Ethernet with Reliability Bounds**  
Arpan Gujarati, Sergey Bozhko, and Björn B. Brandenburg  
26<sup>th</sup> IEEE Real-Time and Embedded Technology and Applications Symposium, Sydney, Australia
- ECRTS'19 **From Iteration to System Failure: Characterizing the FITness of Periodic Weakly-Hard Systems**  
Arpan Gujarati, Mitra Nasri, Rupak Majumdar, and Björn B. Brandenburg  
31<sup>th</sup> Euromicro Conference on Real-Time Systems, Stuttgart, Germany
- ECRTS'18 **Quantifying the Resiliency of Fail-Operational Real-Time Networked Control Systems**  
Arpan Gujarati, Mitra Nasri, and Björn B. Brandenburg  
30<sup>th</sup> Euromicro Conference on Real-Time Systems, Barcelona, Spain
- EuroSys'18 **Tableau: A High-Throughput and Predictable VM Scheduler for High-Density Workloads**  
Manohar Vanga, Arpan Gujarati, and Björn B. Brandenburg  
13<sup>th</sup> European Conference on Computer Systems, Porto, Portugal
- Middleware'17 **Swayam: Distributed Autoscaling to Meet SLAs of Machine Learning Inference Services with Resource Efficiency**  
Arpan Gujarati, Sameh Elnikety, Yuxiong He, Kathryn S. McKinley, and Björn B. Brandenburg  
18<sup>th</sup> ACM/IFIP/USENIX International Middleware Conference, Las Vegas, USA
- RTSS'15 **When is CAN the Weakest Link? A Bound on Failures-In-Time in CAN-Based Real-Time Systems**  
Arpan Gujarati and Björn B. Brandenburg  
36<sup>th</sup> IEEE Real-Time Systems Symposium, San Antonio, USA
- RTSS'14 **Linux's Processor Affinity API, Refined: Shifting Real-Time Tasks towards Higher Schedulability**  
Felipe Cerqueira, Arpan Gujarati, and Björn B. Brandenburg  
35<sup>th</sup> IEEE Real-Time Systems Symposium, Rome, Italy
- ECRTS'13 **Schedulability Analysis of the Linux Push and Pull Scheduler with Arbitrary Processor Affinities**  
Arpan Gujarati, Felipe Cerqueira, and Björn B. Brandenburg  
25<sup>th</sup> Euromicro Conference on Real-Time Systems, Paris, France

### Journal Publications

- RTS'18 **Correspondence Article: A Correction of the Reduction-Based Schedulability Analysis for APA Scheduling**  
Arpan Gujarati, Felipe Cerqueira, Björn B. Brandenburg, and Geoffrey Nelissen  
Real-Time Systems, August 2018
- RTS'15 **Multiprocessor Real-Time Scheduling with Arbitrary Processor Affinities: From Practice to Theory**  
Arpan Gujarati, Felipe Cerqueira, and Björn B. Brandenburg  
Real-Time Systems, Volume 51, Issue 4, pp. 440–483. Springer Verlag, 2015

### Workshop and Work-in-Progress Publications

- EMSOFT'19 **Work-in-Progress: Ahal: Building Highly Reliable Networked Control Systems**  
Malte Appel, Arpan Gujarati, and Björn B. Brandenburg,  
15<sup>th</sup> ACM International Conference on Embedded Software, New York City, USA
- CERTS'18 **Using Schedule-Abstraction Graphs for the Analysis of CAN Message Response Times**  
Mitra Nasri, Arpan Gujarati, and Björn B. Brandenburg  
3<sup>rd</sup> Workshop on Security and Dependability of Critical Embedded Real-Time Systems, Luxembourg
- CERTS'17 **Lower-Bounding the MTTF for Systems with (m, k) Constraints and IID Iteration Failure Probabilities**  
Arpan Gujarati, Mitra Nasri, and Björn B. Brandenburg  
2<sup>nd</sup> Workshop on Security and Dependability of Critical Embedded Real-Time Systems, Paris, France
- CERTS'17 **A Byzantine Fault-Tolerant Key-Value Store for Safety-Critical Distributed Real-Time Systems**  
Malte Appel, Arpan Gujarati, and Björn B. Brandenburg,  
2<sup>nd</sup> Workshop on Security and Dependability of Critical Embedded Real-Time Systems, Paris, France

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## Professional Activities

### Technical Program Committee

- RTEST WiP Real-Time and Embedded Systems and Technologies, Work-in-Progress (2018)  
RTAS BP Real-Time and Embedded Technology and Applications Symposium, Brief Presentations (2019, 2020)  
ECRTS AE Euromicro Conference on Real-Time Systems, Artifact Evaluation (2019)

### Journal Reviewer

- TECS ACM Transactions on Embedded Computing Systems (2019)  
TDSC IEEE Transactions on Dependable and Secure Computing (2019)

### External Reviewer

- EuroSys European Conference on Computer Systems (2013, 2016, 2019)  
RTSS IEEE Real-Time Systems Symposium (2013, 2016, 2018)  
RTAS IEEE Real-Time and Embedded Technology and Applications Symposium (2013, 2014, 2016)  
ECRTS Euromicro Conference on Real-Time Systems (2013–2015, 2019)  
RTNS International Conference on Real-Time Networks and Systems (2014–2016)  
Systor ACM International Systems and Storage Conference (2015, 2016)  
Middleware ACM/IFIP International Middleware Conference (2018)

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## Teaching Experience

- 2017 **Teaching Assistant, Operating Systems**, MPI-SWS and Saarland University  
2016 **Teaching Assistant, Distributed Systems**, MPI-SWS and Saarland University  
2014 **Teaching Assistant, Foundations of Cyber-Physical Systems**, MPI-SWS and TU-KL  
2010 **Teaching Assistant, Data Structures and Algorithms**, BITS Pilani

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## Advising

- 2017-2018 **Malte Appel (UdS)**  
Undergraduate thesis: *A BFT Key-Value Store for Safety-Critical Distributed Real-Time Systems*  
2016 **Rohith R (BITS Pilani)**  
Summer internship: *An Empirical Evaluation of the Temporal Behavior of Linux's CFS Scheduler*  
2015 **Akshay Aggarwal (IIT Kanpur)**  
Summer internship: *An Analysis of CAN in the Presence of Host and Network Faults*

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## References

**Björn B. Brandenburg (bbb@mpi-sws.org)**

Tenured Faculty at MPI-SWS

**Rupak Majumdar (rupak@mpi-sws.org)**

Scientific Director at MPI-SWS

**Kathryn S. McKinley (ksmckinley@google.com)**

Senior Staff Research Scientist at Google

**Linh Thi Xuan Phan (linhphan@cis.upenn.edu)**

Associate Professor at University of Pennsylvania