

# Riccardo Pincioli, Ph.D.

» Postdoctoral Fellow

📁 Department of Computer Science, Gran Sasso Science Institute, L'Aquila, Italy

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## Academic Positions

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- Oct. 2020 – Ongoing    📌 **Postdoctoral Fellow.** Gran Sasso Science Institute, Italy.  
*Topic:* Performance evaluation of cyber-physical systems (e.g., smart hospitals), uncertainty propagation, agent-based models to investigate virus propagation.  
*Supervisor:* Dr. Trubiani C.
- Sep. 2019 – Sep. 2020    📌 **Postdoctoral Fellow.** Dept. of Computer Science, William and Mary, VA, USA.  
*Topic:* Performance prediction for resource allocation in the cloud, effective serving of deep neural network applications, reliability analysis of storage devices.  
*Supervisor:* Dr. Smirni E.
- Feb. 2019 – Sep. 2019    📌 **Research Associate.** Dept. of Computer Science, William and Mary, VA, USA.  
*Topic:* Performance prediction for resource allocation in the cloud, effective serving of deep neural network applications, reliability analysis of storage devices.  
*Supervisor:* Dr. Smirni E.
- Nov. 2017 – Jan. 2019    📌 **Research Associate.** DEIB, Politecnico di Milano, Italy.  
*Topic:* Performance and capacity analysis of university private cloud to support the research projects.  
*Supervisor:* Dr. Di Nitto E.

## Education

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- Nov. 2014 – Feb. 2018    📌 **Ph.D.** in Information Technology at Politecnico di Milano, Italy.  
*Dissertation:* Energy efficiency in large data-centers using performance evaluation techniques  
*Advisors:* Dr. Gribaudo M. and Dr. Serazzi G.
- Oct. 2012 – Oct. 2014    📌 **M.Sc.** in Computer Engineering at Politecnico di Milano, Italy.  
*Thesis:* Energy consumption minimization in systems with multi-class workloads  
*Advisors:* Dr. Gribaudo M. and Dr. Serazzi G.  
*Final Score:* 110/110 cum laude
- Oct. 2009 – Jul. 2012    📌 **B.Sc.** in Computer Engineering at Politecnico di Milano, Italy.

## Visiting Experiences

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- Feb. 2018 – Jun. 2018    📌 **Visiting Scholar.** Dept. of Computer Science, William and Mary, VA, USA.  
*Supervisor:* Dr. Smirni E.
- Jan. 2016 – Apr. 2016    📌 **Visiting Scholar.** ECE Dept., Duke University, NC, USA.  
*Supervisor:* Dr. Trivedi K.

## Research Activities

Performance and Dependability Analysis	■ Performance and dependability analysis of large-scale and complex systems using data analysis, stochastic formalisms (queuing networks, Petri nets, and Markov chains), simulation (discrete-event and agent-based), machine learning, and experimental evaluation.
Cloud Computing	■ Profiling and modeling of virtual resources and microservice design patterns for performance prediction and optimization. These models consider bursty workloads and allow meeting objectives defined on the latency distribution.
Cyber-physical Systems	■ Analysis of architectural patterns and coordination mechanisms to optimize the performance of systems whose space is dynamic and agents exhibit malicious behaviors.
Uncertainty Propagation	■ Analysis of stochastic models to investigate how the uncertainty on input parameters propagates through a model and affects output measures.

**Keywords:** Performance; Dependability; Uncertainty Propagation; Energy Consumption; Cloud Computing; Cyber-physical Systems; Complex Systems; Stochastic Models; Queuing Networks; Petri Nets; Markov Chains; Simulation; Machine Learning; Data Analysis

## Organization

- 2023
- **Publicity Chair.** ACM SIGMETRICS 2023
  - **Co-chair.** Workshop on Artificial Intelligence for Performance Modeling, Prediction, and Control (AIPerf 2023)
  - **Co-chair.** International Workshop on Context-aware, Autonomous and Smart Architecture (CASA 2023)

## Scientific Committees

- 2023
- **Program Committee.** European Conference on Software Architecture (ECSA 2023)
  - **Program Committee.** Technical track on Software Architecture: Theory, Technology, and Applications (SAT-TA) at SAC 2023
  - **Program Committee (Emerging Research Track).** ACM/SPEC International Conference on Performance Engineering (ICPE 2023)
  - **Program Committee (Poster Track).** IEEE International Conference on Software Architecture (ICSA 2023)
  - **Program Committee.** Workshop on Hot Topics in Cloud Computing Performance (HotCloud-Perf 2023)
- 2022
- **Program Committee (Industrial Track).** European Conference on Software Architecture (ECSA 2022)
  - **Program Committee (Work-in-Progress and Vision Track).** ACM/SPEC International Conference on Performance Engineering (ICPE 2022)
  - **Program Committee (Artifact Evaluation Track).** ACM/SPEC International Conference on Performance Engineering (ICPE 2022)

## Scientific Committees (continued)

- Program Committee.** IEEE International Conference on JointCloud Computing (JCC 2022)
- Program Committee (Artifact Evaluation Track).** International Conference on Quantitative Evaluation of SysTems (QEST 2022)
- Program Committee.** Workshop on Hot Topics in Cloud Computing Performance (HotCloud-Perf 2022)
- Program Committee.** International Workshop on Energy-Efficient Data Centres (E2DC 2022)
- Program Committee.** Workshop on Cloud, IoT and Fog Systems (CIFS 2022)
- Program Committee.** Workshop on Software Engineering for Resilient Systems (SERENE 2022)
- Program Committee.** IEEE International Symposium on the Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS 2021)
- Program Committee.** IEEE International Conference on JointCloud Computing (JCC 2021)
- Program Committee (Cloud Computing and Data Centers Track).** IEEE International Conference on Distributed Computing Systems (ICDCS 2021)
- Program Committee (Artifact Evaluation Track).** ACM/SPEC International Conference on Performance Engineering (ICPE 2021)
- Program Committee (Artifact Evaluation Track).** International Conference on Quantitative Evaluation of SysTems (QEST 2021)
- Program Committee.** International Workshop on Energy-Efficient Data Centres (E2DC 2021)
- Program Committee.** International Conference on Quantitative Evaluation of SysTems (QEST 2020)
- Program Committee.** IEEE International Symposium on the Modeling, Analysis, and Simulation of Computer and Telecommunication Systems (MASCOTS 2020)

## Teaching Activities

- Simulation Theory and Applications** (for Ph.D. students), held by Dr. Pinciroli R. at Gran Sasso Science Institute  
*Role:* Teacher
- Formal Methods at Work** (for Ph.D. students), held by Dr. Trubiani C. and Dr. Pinciroli R. at Gran Sasso Science Institute  
*Role:* Teacher
- Impianti e Servizi Informatici** (for B.Sc. students), held by Dr. Mirandola R. at Politecnico di Milano (online)  
*Role:* Teaching assistant
- Computer Systems Performance Evaluation** (for M.Sc. students), held by Dr. Gribaudo M. at Politecnico di Milano  
*Role:* Teaching assistant
- Computer Systems Performance Evaluation** (for M.Sc. students), held by Dr. Serazzi G. at Politecnico di Milano  
*Role:* Teaching assistant

## Teaching Activities (continued)

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2014/2015 – 2016/2017

- **Performance Evaluation of Computer Systems** (for M.Sc. students), held by Dr. Gribaudo M. at Politecnico di Milano (Como)  
*Role:* Teaching assistant

## Publications

### Journal Articles

- J1 **Pincirolì, R.**, & Trubiani, C. (2023). “Performance Analysis of Fault-Tolerant Multi-Agent Coordination Mechanisms” [Early Access]. *IEEE Transactions on Industrial Informatics*, pp. 1–12.
- J2 **Pincirolì, R.**, Yang, L., Alter, J., & Smirni, E. (2023). “Lifespan and Failures of SSDs and HDDs: Similarities, Differences, and Prediction Models”. *IEEE Transactions on Dependable and Secure Computing*, 20(1), pp. 256–272.
- J3 Schmedding, A., **Pincirolì, R.**, Yang, L., & Smirni, E. (2023). “Epidemic Spread Modeling for COVID-19 Using Cross-fertilization of Mobility Data” [Early Access]. *IEEE Transactions on Big Data*, pp. 1–16.
- J4 Trubiani, C., **Pincirolì, R.**, Biaggi, A., & Fontana, F. A. (2023). “Automated Detection of Software Performance Antipatterns in Java-Based Applications” [Early Access]. *IEEE Transactions on Software Engineering*, pp. 1–19.
- J5 Antonelli, F., Cortellessa, V., Gribaudo, M., **Pincirolì, R.**, Trivedi, K., & Trubiani, C. (2020). “Analytical modeling of performance indices under epistemic uncertainty applied to cloud computing systems”. *Future Generation Computer Systems*, 102, pp. 746–761.
- J6 **Pincirolì, R.**, Ali, A., Yan, F., & Smirni, E. (2020). “CEDULE+: Resource Management for Burstable Cloud Instances Using Predictive Analytics”. *IEEE Transactions on Network and Service Management*, pp. 1–13.
- J7 Gribaudo, M., **Pincirolì, R.**, & Trivedi, K. (2018). “Epistemic uncertainty propagation in power models”. *Electronic Notes in Theoretical Computer Science*, 337, pp. 67–86.
- J8 **Pincirolì, R.**, & Distefano, S. (2017). “Characterization and evaluation of mobile crowdsensing performance and energy indicators”. *ACM SIGMETRICS Performance Evaluation Review*, 44(4), pp. 80–90.

### Conference Proceedings

- C1 **Pincirolì, R.**, Aleti, A., & Trubiani, C. (2023). “Performance Modeling and Analysis of Design Patterns for Microservice Systems”, In *Proceedings of the International Conference on Software Architecture (ICSA)*, IEEE.
- C2 Ali, A., **Pincirolì, R.**, Yan, F., & Smirni, E. (2022). “Optimizing Inference Serving on Serverless Platforms”, In *Proceedings of the Very Large Data Base Endowment (VLDB)*, VLDB Endowment.
- C3 Murgia, M., **Pincirolì, R.**, Trubiani, C., & Tuosto, E. (2022). “On Model-Based Performance Analysis of Collective Adaptive Systems”, In *Proceedings of the International Symposium on Leveraging Applications of Formal Methods, Verification and Validation (ISoLA)*, Springer.
- C4 **Pincirolì, R.**, Yang, L., Alter, J., & Smirni, E. (2022). “Machine Learning Models for SSD and HDD Reliability Prediction”, In *Proceedings of the Annual Reliability and Maintainability Symposium (RAMS)*, IEEE.
- C5 Schmedding, A., Yang, L., **Pincirolì, R.**, & Smirni, E. (2022). “GeoSpread: an Epidemic Spread Modeling Tool for COVID-19 Using Mobility Data”, In *Proceedings of the International Conference on Information Technology for Social Good (GoodIT)*, ACM.
- C6 **Pincirolì, R.**, Smith, C. U., & Trubiani, C. (2021). “QN-based Modeling and Analysis of Software Performance Antipatterns for Cyber-Physical Systems”, In *Proceedings of the International Conference on Performance Engineering (ICPE)*. ACM/SPEC.

- C7** **Pincirolì, R.,** & Trubiani, C. (2021). “Model-based Performance Analysis for Architecting Cyber-Physical Dynamic Spaces”, In *Proceedings of the International Conference on Software Architecture (ICSA)*. IEEE.
- C8** Ali, A., **Pincirolì, R.,** Yan, F., & Smirni, E. (2020). “Batch: machine learning inference serving on serverless platforms with adaptive batching”, In *Proceedings of the International Conference for High Performance Computing, Networking, Storage and Analysis (SC)*. IEEE.
- C9** Yang, L., Schmedding, A., **Pincirolì, R.,** & Smirni, E. (2020). “Simulating COVID-19 containment measures using the South Korean patient data: poster abstract”, In *Proceedings of the 18th Conference on Embedded Networked Sensor Systems (SenSys)*. ACM.
- C10** Ali, A., **Pincirolì, R.,** Yan, F., & Smirni, E. (2019). “It’s not a Sprint, it’s a Marathon: Stretching Multi-resource Burstable Performance in Public Clouds”, In *Proceedings of the 20th International Middleware Conference Industrial Track (Middleware)*, ACM.
- C11** Ali, A., **Pincirolì, R.,** Yan, F., & Smirni, E. (2018). “CEDULE: A Scheduling Framework for Burstable Performance in Cloud Computing”, In *Proceedings of the International Conference on Autonomic Computing (ICAC)*. IEEE.
- C12** **Pincirolì, R.,** Bobbio, A., Bolchini, C., Cerotti, D., Gribaudo, M., Miele, A., & Trivedi, K. (2017). “Epistemic uncertainty propagation in a weibull environment for a two-core system-on-chip”, In *Proceedings of the 2nd International Conference on System Reliability and Safety (ICSRS)*. IEEE.
- C13** **Pincirolì, R.,** Gribaudo, M., Roveri, M., & Serazzi, G. (2017). “Capacity Planning of Fog Computing Infrastructures for Smart Monitoring”, In *Workshop on New Frontiers in Quantitative Methods in Informatics (InfQ)*. Springer.
- C14** **Pincirolì, R.,** Gribaudo, M., & Serazzi, G. (2017). “Modeling Multiclass Task-Based Applications on Heterogeneous Distributed Environments”, In *Proceedings of the International Conference on Analytical and Stochastic Modeling Techniques and Applications (ASMTA)*. Springer.
- C15** Cerotti, D., Gribaudo, M., **Pincirolì, R.,** & Serazzi, G. (2016). “Optimal population mix in pool depletion systems with two-class workload”, In *Proceedings of the 10th International Conference on Performance Evaluation Methodologies and Tools (ValueTools)*. EAI.
- C16** Cerotti, D., Gribaudo, M., **Pincirolì, R.,** & Serazzi, G. (2016). “Stochastic Analysis of Energy Consumption in Pool Depletion Systems”, In *Proceedings of the 18th International GI/ITG Conference on Measurement, Modelling, and Evaluation of Computing Systems and Dependability and Fault Tolerance (MMB&DFT)*. Springer.
- C17** **Pincirolì, R.,** & Distefano, S. (2016). “Extending Queuing Networks to Assess Mobile CrowdSensing Application Performance”, In *Proceedings of the 10th International Conference on Performance Evaluation Methodologies and Tools (ValueTools)*. EAI.
- C18** **Pincirolì, R.,** Trivedi, K. S., & Bobbio, A. (2016). “Parametric Sensitivity and Uncertainty Propagation in Dependability Models”, In *Proceedings of the 10th International Conference on Performance Evaluation Methodologies and Tools (ValueTools)*. EAI.
- C19** Cerotti, D., Gribaudo, M., Piazzolla, P., **Pincirolì, R.,** & Serazzi, G. (2015). “Modeling Power Consumption in Multicore CPUs with Multithreading and Frequency Scaling”, In *Proceeding of the 30th International Symposium on Computer and Information Sciences (ISCIS)*, Springer.
- C20** Cerotti, D., Gribaudo, M., Piazzolla, P., **Pincirolì, R.,** & Serazzi, G. (2014). “Multi-Class Queuing Networks Models for Energy Optimization”, In *Proceedings of the 8th International Conference on Performance Evaluation Methodologies and Tools (ValueTools)*. EAI.

## Books and Chapters

- B1** Cerotti, D., Gribaudo, M., **Pincioli, R.**, & Serazzi, G. (2019). “Modeling Techniques for Pool Depletion Systems”. *Systems Modeling: Methodologies and Tools*, pp. 79–94.

## Contributed Talks

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| 2023 | ■ | International Conference on Software (Research Track)  |
| 2022 | ■ | International Symposium on Leveraging Applications of Formal Methods, Verification and Validation (Research Track) |
|      | ■ | Annual Reliability and Maintainability Symposium (Research Track)  |
| 2021 | ■ | International Conference on Performance Engineering (Research Track)   |
|      | ■ | International Conference on Software Architecture (Research Track)   |
| 2020 | ■ | Conference on Embedded Networked Sensor Systems (Poster Track)   |
| 2017 | ■ | International Conference on System Reliability and Safety (Research Track)   |
|      | ■ | Workshop on the Practical Application of Stochastic Modelling  |
| 2016 | ■ | International Conference on Performance Evaluation Methodologies and Tools (Research Track)                        |
| 2015 | ■ | International Symposium on Computer and Information Sciences (Research Track)                                      |

L'Aquila – April 3, 2023