

# Matteo Nardelli

March 20, 2018

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## Research Interests

My research interests are in the field of distributed computer systems, with a focus on the execution of data stream applications in a geographically distributed environment. Currently, I am investigating the QoS-aware deployment problem for self-adaptive and distributed data stream processing systems.

Since 2015, I have co-authored more than 20 papers in peer-reviewed international journals, book chapters, and conference proceedings. Two of these publications have received paper awards.

According to Google Scholar, in March 2018 there are more than 110 citations of all the articles that I co-authored, with a h-index equal to 5. According to Scopus, in March 2018, the total number of citations is 57 (with 18 indexed articles) and my h-index is 4.

## Positions and Education

### Current Position

**Research Associate** (November 2017-present) at the University of Rome Tor Vergata, Italy.

### Past Position

**Ph.D Student** (November 2014-October 2017) in Computer Science, Control and GeoInformation (XXX Cycle) at the University of Rome Tor Vergata, Italy. Winner of a grant financed by the Italian Ministry for Education, University, and Scientific Research (MIUR) in 2014. Financial grant period: from November 2014 to October 2017. Advisor: Valeria Cardellini.

**Visiting Researcher** (September 2016-February 2017) at TU Wien (Technische Universität Wien), Austria, in the Distributed Systems Group led by Schahram Dustdar and in the unit led by Stefan Schulte.

## Education

**2012-2014** Laurea Magistrale (Master's degree) cum laude in Computer Engineering at the University of Rome Tor Vergata, Italy. Thesis title: "A network-aware approach for data stream processing" (Italian).

**2008-2012** Laurea Triennale (Bachelor's degree) cum laude in Computer Engineering at the University of Rome Tor Vergata, Italy. Thesis title: "Analysis and simulation of throughput-optimal access protocol for wireless networks" (Italian).

## Participation to International Events

**September 2017** Heidelberg Laureate Forum 2017. Heidelberg, Germany.

**June 2017** ACM 50th Celebration of the Turing Award. San Francisco, California, USA.

## Summer schools

**2017** The Onassis Foundation Science Lecture Series: The 2017 Lectures in Computer Science "Big Data and Applications", Heraklion, Crete. July 2017. Distinguished Lecturers: M. Stonebraker (*ACM Turing Award 2014*), D. Bertsimas, M. Brodie.

**2017** Summer School on "Optimization, Big Data and Applications", Veroli, Italy. July 2017.

**2016** International Summer School on "Autonomous Control for Reliable Future Networks and Services", organized by the COST Action IC1304 ACROSS. Opatija, Croatia. May 2016. The Summer School was co-located with the MIPRO 2016 conference, where I presented "QoS-aware Deployment of Data Streaming Applications over Distributed Infrastructures" [IC4].

**2015** International Summer School on "NFV meets Big Data", organized by the COST Action IC1304 ACROSS. Würzburg, Germany. April 2015. During the poster session, I presented "A Storm-based Distributed Scheduler for QoS-aware Placement of Data Stream Applications".

## Research Activities

### Awards

**2016** Honorable mention paper award for [IC5] at the 10th ACM International Conference on Distributed and Event-Based Systems (DEBS 2016).

**2015** Best poster award for [IC1] at the 9th ACM International Conference on Distributed Event-Based Systems (DEBS 2015).

### Student Grants

**2017** Heidelberg Laureate Forum: Travel Grant for attending the 5th **Heidelberg Laureate Forum**, in Heidelberg, Germany. September 2017.

**2017** The Onassis Foundation: Grant for attending the 2017 Science Lectures in Computer Science on "Big Data and Applications", Heraklion, Crete. July 2017.

**2017 SIGSOFT:** Student Travel Grant for attending the ACM 50th Celebration of the **Turing Award**, in San Francisco, CA, USA. June 2017.

**2016** Student Travel Grant for attending the 2016 HPCS conference, in Innsbruck, Austria. July 2016.

**2016 SIGSOFT-CAPS:** Student Travel Grant for attending the 2016 DEBS conference, in Irvine, CA, USA. June 2016.

### Conference Presentations

**Auto-DaSP 2017** (August 2017) International Workshop on Autonomic Solutions for Parallel and Distributed Data Stream Processing (Auto-DaSP 2017), where I presented the paper [IC14].

**ACPROSS 2017** (April 2017) 1st International Workshop on Autonomous Control for Performance and Reliability Trade-offs in Internet of Services (ACPROSS 2017), where I presented the paper [IC11].

**ZEUS 2017** (February 2017) 9th ZEUS Workshop on Services and their Composition (ZEUS 2017), where I presented the paper [IC10].

**InfQ 2016** (October 2016) Workshop of the Italian group on Quantitative Methods in Informatics, where I presented [IC9]. During the PhD Defense Corner, I presented my research activity.

**HPCS 2016** (July 2016) International Conference on High Performance Computing & Simulation (HPCS 2016), where I presented the paper [IC8].

**DEBS 2016** (June 2016) 10th ACM International Conference on Distributed and Event-Based Systems (DEBS 2016), where I presented the papers [IC5], receiving the **Honorable Mention Paper Award**, and [IC7].

**MIPRO 2016** (May 2016) 39th International Convention on Information and Communication Technology, Electronics and Microelectronics. During the PhD symposium, I presented the paper [IC4].

**ZEUS 2016** (January 2016) 8th Central-European Workshop on Services and their Composition (ZEUS 2016), where I presented the paper [IC3].

**MOCS 2015** (July 2015) 5th International Workshop on Management of Cloud and Smart City Systems (MOCS 2015) in conjunction with IEEE ISCC 2015, where I presented the paper [IC2].

**DEBS 2015** (July 2015) 9th ACM International Conference on Distributed Event-Based Systems (DEBS 2015), where I presented [IC1], receiving the **Best Poster Award**.

### Conference Committees Member

- *1st International Workshop on Autonomic Management of Large-scale Container-based Systems* (AMLCS 2017).
- *International Workshop on Autonomic Solutions for Parallel and Distributed Data Stream Processing* (Auto-DaSP 2017), co-located with Euro-Par 2017.

- *International Workshop on Autonomic Systems for Big Data Analytics* (ASBDA 2017), co-located with IEEE ICCAC 2017 and IEEE SASO 2017.

## Conference Organization

- Publicity chair, *International Workshop on Autonomic Systems for Big Data Analytics* (ASBDA 2017), co-located with IEEE ICCAC 2017 and IEEE SASO 2017.
- Publicity chair, *1st Workshop on Automatic Management of Large Scale Container-based Systems* (AMLCS 2017), co-located with IEEE ICCAC 2017 and IEEE SASO 2017.
- Publicity chair, *6th Workshop of the Italian group on Quantitative Methods in Informatics* (InfQ 2016)

## Reviewer for Journal and Conferences

Since 2015 I have reviewed 20 articles submitted to international journals and conferences:

- IEEE Transactions on Software Engineering (2017, 2016).
- Springer Frontiers of Information Technology & Electronic Engineering (2017).
- Elsevier Knowledge-based Systems (2017, 2016).
- WIREs Data Mining and Knowledge Discovery (2017, 2016).
- IEEE International Symposium on Modeling, Analysis and Simulation of Computer and Telecommunications Systems (MASCOTS 2017, MASCOTS 2016).
- IEEE Computer (2016).
- ACM Transactions on Autonomous and Adaptive Systems (2016). On behalf of Valeria Cardellini.
- IEEE Transactions on Vehicular Technology (2016). On behalf of Valeria Cardellini.
- IEEE 23rd Int'l Symposium on Modeling, Analysis and Simulation of Computer and Telecommunications Systems (MASCOTS 2015). On behalf of Valeria Cardellini.

## Membership and Responsibility for Professional Associations

- Secretary of the University of Rome Tor Vergata ACM Student Chapter (2016-present)
- Member, ACM (2015-present)
- Member, IEEE and IEEE Computer Society (2015-present)

## Teaching Activities

### Graduate Teaching at University of Rome Tor Vergata

Data Stream Processing Systems and Applications (2016/17), 2 ECTS.

## 1st and 2nd Level Master degree Teaching at University of Rome Tor Vergata

- Hands-on Laboratory of Big Data (2016/17, 2015/16), 1st Level Master degree in Data Science.
- Hands-on Hadoop (2016-17), 2nd Level Master degree in Customer Experience & Social Media Analytics (CESMA).

## Teaching Assistant

- Distributed Systems and Cloud Computing (2015/16, 2014/15), taught by Valeria Cardellini;
- Foundations of Informatics (2014/15), taught by Vincenzo Grassi.

## Lectures

- Docker Containers. In Distributed Systems and Cloud Computing (2017/18).
- Distributed Data Stream Processing. In Distributed Systems and Cloud Computing (2015/16).
- Distributed System Architectures: software and system architectures, structured and unstructured overlay networks. In Distributed Systems and Cloud Computing (2015/16).
- Distributed Data Stream Processing. In Distributed Systems and Cloud Computing (2014/15).

## Thesis Co-Advisor

I have been co-advisor of Laurea (L) and Laurea Magistrale (LM) theses.

- L1.** C. Zucchiatti, “A Cloud Application for Stream Processing Energy Consumption Data” (italian). April 2015.
- L2.** G. Marciani, “Optimal Placement of Data Stream Processing Applications” (italian). October 2015.
- LM1.** G. Rotundo, “Real-time Analysis and Prediction of Energy Consumptions in a Data Stream Processing System” (italian). October 2015.
- LM2.** D. Luzzi, “Elastic Migration for Data Stream Processing Systems” (italian). February 2016.
- LM3.** M. Mastrogirolamo, “GMesos: a Manager for Resource Orchestration in Distributed Cloud Systems” (italian). February 2016.
- LM4.** A. Patacca, “Resource Allocation in Geographically Distributed Cloud Systems” (italian). February 2016.
- LM5.** G. Scolastri, “Network-aware Placement of Data Stream Processing Applications in a Distributed Cloud System” (italian). February 2016.
- LM6.** G. Catricalà, “A System for Real-time Analysis of Geospatial Data in a Metropolitan Setting” (italian). April 2016.
- LM7.** A. Marsicovetere, “Optimal Service Selection for SOA Applications using a Network-aware Approach” (italian). April 2016.

- LM8.** P. Casulli, “T10: Elasticity of DSP Applications Leveraging on a Reinforcement Learning Approach” (italian). October 2016.
- LM9.** A. Ferlazzo, “Multi-level Scheduling of Geographically Distributed Data Streaming Applications in Apache Aurora and Heron” (italian). February 2017.
- LM10.** G. Rossi, “Optimal Placement of Data Streaming Applications over Heterogeneous Infrastructures with Apache Flink” (italian). February 2017.
- LM11.** P. Verlotta, “A SDN Controller to Support the Optimal Placement of Data Streaming Applications in Apache Storm” (italian). April 2017.
- LM12.** G. Russo Russo, “Optimal Deployment and Run-time Reconfiguration for Data Stream Processing”. April 2017.
- LM13.** L. Fulgieri, “Design and Development of a Hierarchical Decentralized Autonomous DSP System” (italian). October 2017.

## Publications

### International Journals

- IJ1.** V. Cardellini, V. Grassi, F. Lo Presti, M. Nardelli, “Optimal Operator Replication and Placement for Distributed Stream Processing Systems”, *ACM SIGMETRICS Performance Evaluation Review*, Vol. 44, No. 4, pp. 11–22, May 2017. doi: 10.1145/3092819.3092823.
- IJ2.** M. Nardelli, S. Nastic, S. Dustdar, M. Villari, R. Ranjan, “Osmotic Flow: Osmotic Computing + IoT Workflow”, *IEEE Cloud Computing*, vol. 4, no. 2, pp. 68–75, 2017. doi: 10.1109/MCC.2017.22.
- IJ3.** V. Cardellini, F. Lo Presti, M. Nardelli, G. Russo Russo, “Optimal Operator Deployment and Replication for Elastic Distributed Data Stream Processing”, *Concurrency and Computation: Practice and Experience*, 25 pages. Accepted for publication in 2017. doi: 10.1002/cpe.4334.
- IJ4.** O. Skarlat, M. Nardelli, S. Schulte, M. Borkowski, P. Leitner, “Optimized IoT Service Placement in the Fog”, *Service Oriented Computing and Applications*, vol. 11, no. 4, pp. 427–443, 2017. doi: 10.1007/s11761-017-0219-8.
- IJ5.** M. Borkowski, W. Fdhila, M. Nardelli, S. Rinderle-Ma, S. Schulte, “Event-based Failure Prediction in Distributed Business Processes”, *Information Systems*, 2017. doi: 10.1016/j.is.2017.12.005.

### Referred Chapters in International Books

- BC1.** V. Cardellini, T. G. Grbac, A. Kassler, A. Marotta, P. Kathiravelu, F. Lo Presti, M. Nardelli, L. Veiga, “Integrating SDN and NFV with QoS-aware Service Composition”, *Autonomous Control for a Reliable Internet of Services: Methods, Models, Approaches, Techniques, Algorithms and Tools*, Lecture Notes in Computer Science, Springer. Accepted for publication in 2017.

- BC2.** V. Cardellini, T. G. Grbac, M. Nardelli, N. Tanković, H. L. Truong, “QoS-based Elasticity for Service Chains in Distributed Edge Cloud Environments”, *Autonomous Control for a Reliable Internet of Services: Methods, Models, Approaches, Techniques, Algorithms and Tools*, Lecture Notes in Computer Science, Springer. Accepted for publication in 2017.

### International Conferences and Workshops

- IC1.** V. Cardellini, V. Grassi, F. Lo Presti, M. Nardelli, “Distributed QoS-aware scheduling in Storm”, In *Proceedings of the 9th ACM International Conference on Distributed Event-Based Systems (DEBS 2015)*, pp. 344–347, Oslo, Norway, July 2015. doi: 10.1145/2675743.2776766. **Best Poster Award**
- IC2.** V. Cardellini, V. Grassi, F. Lo Presti, M. Nardelli, “On QoS-aware scheduling of data stream applications over fog computing infrastructures”, *5th International Workshop on Management of Cloud and Smart City Systems 2015 (MOCS 2015)*, in conjunction with ISCC 2015. Published in *Proceedings of the 2015 IEEE Symposium on Computers and Communication (ISCC 2015)*, pp. 271–276, Larnaca, Cyprus, July 2015. doi: 10.1109/ISCC.2015.7405527.
- IC3.** M. Nardelli, “A Framework for Data Stream Applications in a Distributed Cloud”, In *Proceedings of the 8th ZEUS Workshop 2016 (ZEUS 2016)*, pp. 56–63, Vienna, Austria, January 2016. CEUR-WS.org/Vol-1562, urn:nbn:de:0074-1562-4, online: <http://ceur-ws.org/Vol-1562/paper9.pdf>.
- IC4.** M. Nardelli, “QoS-aware Deployment of Data Streaming Applications over Distributed Infrastructures”, In *Proceedings of the 39th IEEE International Convention on Information and Communication Technology, Electronics and Microelectronics (MIPRO 2016)*, pp. 736–741, Opatija, Croatia, May 2016. doi: 10.1109/MIPRO.2016.7522238.
- IC5.** V. Cardellini, V. Grassi, F. Lo Presti, M. Nardelli, “Optimal Operator Placement for Distributed Stream Processing Applications”, In *Proceedings of the 10th ACM International Conference on Distributed and Event-Based Systems (DEBS 2016)*, pp. 69–80, Irvine, CA, USA, June 2016. doi: 10.1145/2933267.2933312. **Honorable Mention Paper Award**
- IC6.** G. Marciani, M. Piu, M. Porretta, M. Nardelli, V. Cardellini, “Grand Challenge: Real-time Analysis of Social Networks Leveraging the Flink Framework”, In *Proceedings of the 10th ACM International Conference on Distributed and Event-Based Systems (DEBS 2016)*, pp. 386–389, Irvine, CA, USA, June 2016. doi: 10.1145/2933267.2933517.
- IC7.** M. Nardelli, “Doctoral Symposium: Placement of Distributed Stream Processing over Heterogeneous Infrastructures”, In *Proceedings of the 10th ACM International Conference on Distributed and Event-Based Systems (DEBS 2016)*, pp. 422–425, Irvine, CA, USA, June 2016. doi: 10.1145/2933267.2933432.
- IC8.** V. Cardellini, M. Nardelli, D. Luzi, “Elastic Stateful Stream Processing in Storm”, In *Proceedings of the 2016 International Conference on High Performance Computing & Simulation (HPCS 2016)*, pp. 583–590, Innsbruck, Austria, July 2016. doi: 10.1109/HPCSim.2016.7568388.
- IC9.** V. Cardellini, V. Grassi, F. Lo Presti, M. Nardelli, “Joint Operator Replication and Placement Optimization for Distributed Streaming Applications”, In *Proceedings of InfQ 2016 -*

*New Frontiers in Quantitative Methods in Informatics (in conjunction with ValueTools 2016)*, pp. 263–270, Taormina, Italy, October 2016.<sup>1</sup> doi: 10.4108/eai.25-10-2016.2266628.

- IC10.** M. Nardelli, “Elastic Allocation of Docker Containers in Cloud Environments”, In *Proceedings of the 9th ZEUS Workshop 2017 (ZEUS 2017)*, pp. 59–66, Lugano, Switzerland, February 2017. CEUR-WS.org/Vol-1826, urn:nbn:de:0074-1826-4, online: <http://ceur-ws.org/Vol-1826/paper10.pdf>.
- IC11.** M. Nardelli, C. Hochreiner, S. Schulte, “Elastic Provisioning of Virtual Machines for Container Deployment”, *1st International Workshop on Autonomous Control for Performance and Reliability Trade-offs in Internet of Services (ACPROSS 2017)*, in conjunction with ACM/SPEC ICPE 2017. Published in *Proceedings of the 8th ACM/SPEC on International Conference on Performance Engineering Companion (ICPE '17 Companion)*, pp. 5–10, L’Aquila, Italy, April 2017. doi: 10.1145/3053600.3053602.
- IC12.** O. Skarlat, M. Nardelli, S. Schulte, S. Dustdar, “Towards QoS-aware Fog Service Placement”, In *Proceedings of the 2017 IEEE 1st International Conference on Fog and Edge Computing (ICFEC 2017)*, pp. 89–96, Madrid, Spain, May 2017. doi: 10.1109/ICFEC.2017.12.
- IC13.** G. Marciani, M. Porretta, M. Nardelli, G. F. Italiano, “A Data Streaming Approach to Link Mining in Criminal Networks”, In *Proceedings of the 5th International Conference on Future Internet of Things and Cloud Workshops (FiCloudW 2017)*, pp. 138–143, Prague, Czech Republic, August 2017. doi: 10.1109/FiCloudW.2017.88.
- IC14.** V. Cardellini, F. Lo Presti, M. Nardelli, G. Russo Russo, “Towards Hierarchical Autonomous Control for Elastic Data Stream Processing in the Fog”, *International Workshop on Autonomous Solutions for Parallel and Distributed Data Stream Processing (Auto-DaSP 2017)*, in conjunction with Euro-Par 2017. Published in *Euro-Par 2017: Parallel Processing Workshops*, Lecture Notes in Computer Science Vol. 10659, pp. 106–117, 2018. doi: 10.1007/978-3-319-75178-8\_9.

## Technical Reports

- TR1.** V. Cardellini, V. Grassi, F. Lo Presti, and M. Nardelli, “Distributed QoS-aware scheduling in Storm”. *Technical Report DICII RR-15.7, University of Rome Tor Vergata*, 2015. <http://www.ce.uniroma2.it/publications/RR-15.7.pdf>.

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<sup>1</sup>Selected and published as extended journal version in ACM SIGMETRICS Performance Evaluation Review, 2017. Reference: [IJ1].