Gabriele Russo Russo

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Research Interests and Scientific Results

I am currently a Research Associate at the University of Rome Tor Vergata. My research interests are in the area of distributed computing systems, with particular emphasis on performance modeling and optimization of distributed applications. As a PhD student I investigated mechanisms and policies for run-time deployment adaptation of distributed data stream processing applications.

Since 2017, I have co-authored 3 papers published in international journals, 9 papers published in international conference and workshop proceedings, and 2 peer-reviewed book chapters. As at October 2021, Google Scholar reports 136 citations of my papers, with a h-index equal to 6; Scopus reports 110 citations, with a h-index equal to 6.

Education and Positions

2021–(22) **Research Associate**, University of Rome Tor Vergata.
1st level research grant ("Assegno di ricerca di prima fascia"). Supervisor: Prof. Valeria Cardellini.

2017–21 **PhD student** in Computer Science, University of Rome Tor Vergata.
Winner of a grant financed by the Italian *Ministry for Education, University, and Scientific Research*. *Thesis*: "Model-based Auto-Scaling of Distributed Data Stream Processing Applications". *Advisors*: Prof. Valeria Cardellini, and Prof. Francesco Lo Presti.

2019 **Visiting PhD student**, Imperial College London (UK).
Hosted by Dr. Giuliano Casale, August–September 2019.

2017 **Post-graduate scolarship**, University of Rome Tor Vergata.
Research project: "Distributed elastic control of data stream processing applications in Storm" (supervised by Prof. Valeria Cardellini), July–September 2017.

2014–17 **Laurea Magistrale** (MSc equivalent) in Computer Engineering.
University of Rome Tor Vergata, 110/110 *cum laude*.
Thesis: "Optimal Deployment and Run-Time Reconfiguration for Data Stream Processing".
Advisors: Prof. Valeria Cardellini and Prof. Francesco Lo Presti.

2011–14 **Laurea** (BSc equivalent) in Computer Engineerinig.
University of Rome Tor Vergata, 110/110 *cum laude*.
Thesis: "Analysis and Implementation of Energy-Aware Routing Algorithms for Ad-Hoc Wireless Networks". *Advisor*: Prof. Francesco Lo Presti.

Honors and Awards

2019 Selected for participation to the 7th **Heidelberg Laureate Forum** as a young researcher.

2011 **Alfiere del Lavoro**.
Awarded by Italian President Giorgio Napolitano and *Federazione Nazionale Cavalieri del Lavoro*. I was included in the list of the 25 Italian students completing high school with the highest grades.

Student Travel Grants

2019 Travel grant sponsored by SAP for attending the *13th ACM Conference on Distributed and Event-Based Systems* (*DEBS 2019*) in Darmstadt (Germany).

2018 Travel grant sponsored by ACM Council of European Chapter Leaders for attending the Symposium *Being human with algorithms* in Heidelberg (Germany).

2017 Travel grant for attending the Summer School on *Latency Control for Internet of Services* organized by COST Action 1304 *Autonomous Control for a Reliable Internet of Services* (ACROSS), in Karlstad (Sweden).

Professional service

I reviewed manuscripts submitted to the following international journals:

- IEEE Transactions on Parallel and Distributed Systems (2021)
- Cluster Computing, Springer (2019,2021)
- Information Systems, Elsevier (2021)
- Journal of Grid Computing, Springer (2020,2021)
- Science of Computer Programming, Elsevier (2020)
- Future Generation Computer Systems, Elsevier (2019)
- Expert Systems with Applications, Elsevier (2018)

I reviewed manuscripts submitted to the following international conferences:

- ACM/SPEC International Conference on Performance Engineering (2021)
- IEEE/ACM International Conference on Utility and Cloud Computing (2020,2021)
- ACM Distributed and Event-based Systems (2019)
- IEEE Vehicular Technology Conference (2018)

Teaching

I have been involved in the following teaching activities at the University of Rome Tor Vergata:

Graduate and Master degree courses

- *Hands-on Cloud Computing Services*, supplementary course (10 hours) for the MSc in *Computer Science* (from 2019/20 to 2021/22).
- *Hands-on Big Data & Hadoop* (12 hours), 2nd Level Master degree in *Customer Experience & Social Media Analytics* (*CESMA*) (*2019, 2020, 2021*).

Undergraduate courses

- *MIPS Assembler Programming*, supplementary course (10 hours) for the BSc in *Computer Science* (2021/22).
- TA for the *Computer Architecture* course, BSc in *Computer Science* (from 2016/17 to 2020/21).

Thesis supervision

I have co-supervised the following *Laurea Magistrale* (MSc) theses:

T9 A. Milani, *Priority-based Scheduling of Serverless Functions in Apache OpenWhisk* (Italian), April 2021. Supervisor: Valeria Cardellini.

T8 A. Sanzo, *Elastic Data Stream Processing on Heterogeneous Infrastructures with Apache Flink* (Italian), April 2021. Supervisor: Valeria Cardellini.

T7 A. Schiazza, *Mechanisms and Policies for Elastic Functions in Apache Pulsar* (Italian), April 2020. Supervisor: Valeria Cardellini.

T6 S. Mancini, *Elastic Data Stream Processing on Heterogeneous Resources using Deep Reinforcement Learning* (Italian), February 2020. Supervisor: Valeria Cardellini.

T5 E. Serrao, *Elasticity Control Policies for Data Stream Processing in the Fog: A Reinforcement Learning Approach* (Italian), April 2019. Supervisor: Francesco Lo Presti.

T4 A. Ponte, *A Scalable Architecture for Real-Time Data Analytics based on Akka* (Italian), April 2019. Supervisor: Valeria Cardellini.

T3 M. Calzetta, *Mechanisms and Reinforcement Learning-based Policies for Elastic Data Stream Processing in Apache Flink* (Italian), February 2019. Supervisor: Valeria Cardellini.

T2 F. Di Giacomo, *Operator Migration Policies for Data Stream Processing in a Fog Environment* (Italian), February 2019. Supervisor: Francesco Lo Presti.

T1 G. Vertulli, *A Deep Reinforcement Learning-based Approach for Data Stream Processing Application Placement* (Italian), October 2018. Supervisor: Valeria Cardellini.

Publications

International Journals

J1 G. Russo Russo, M. Nardelli, V. Cardellini, and F. Lo Presti. Multi-level elasticity for wide-area data streaming systems: A reinforcement learning approach. *Algorithms*, 11(9):134, 2018. doi:10.3390/a11090134

J2 V. Cardellini, F. Lo Presti, M. Nardelli, and G. Russo Russo. Decentralized self-adaptation for elastic data stream processing. *Future Generation Computer Systems*, 87:171–185, 2018. doi:10.1016/j.future.2018.05.025

J3 V. Cardellini, F. Lo Presti, M. Nardelli, and G. Russo Russo. Optimal operator deployment and replication for elastic distributed data stream processing. *Concurrency and Computation: Practice & Experience*, 30(9), 2018. doi:10.1002/cpe.4334

International Conferences and Workshops

C1 G. Russo Russo, V. Cardellini, G. Casale, and F. Lo Presti. Mead: Model-based vertical auto-scaling for data stream processing. In *Proceedings of 21th IEEE/ACM International Symposium on Cluster, Cloud and Internet Computing, CCGRID '21, Virtual Event, May 10-13, 2021*, pages 314–323, 2021. doi:10.1109/CCGrid51090.2021.00041

C2 G. Russo Russo, A. Schiazza, and V. Cardellini. Elastic pulsar functions for distributed stream processing. In *ICPE '21: ACM/SPEC International Conference on Performance Engineering, Virtual Event, France, April 19-21, 2021*, pages 9–16. ACM, 2021. doi:10.1145/3447545.3451901

C3 G. Russo Russo. Model-based auto-scaling of distributed data stream processing applications. In *Proceedings of the 21st International Middleware Conference Doctoral Symposium, Middleware 2020, Virtual Event / Delft, The Netherlands, December 07-11, 2020*, pages 5–8. ACM, 2020. doi:10.1145/3429351.3431741

C4 G. Russo Russo. Self-adaptive data stream processing in geo-distributed computing environments. In *Proceedings of the 13th ACM International Conference on Distributed and Event-based Systems, DEBS 2019, Darmstadt, Germany, June 24-28, 2019*, pages 276–279. ACM, 2019. doi:10.1145/3328905.3332304

C5 G. Russo Russo, V. Cardellini, and F. Lo Presti. Reinforcement learning based policies for elastic stream processing on heterogeneous resources. In *Proceedings of the 13th ACM International Conference on Distributed and Event-based Systems, DEBS 2019, Darmstadt, Germany, June 24-28, 2019*, pages 31–42. ACM, 2019. doi:10.1145/3328905.3329506

C6 M. Nardelli, G. Russo Russo, V. Cardellini, and F. Lo Presti. A multi-level elasticity framework for distributed data stream processing. In *Euro-Par 2018: Parallel Processing Workshops - Euro-Par 2018 International Workshops, Turin, Italy, August 27-28, 2018, Revised Selected Papers*, volume 11339 of *Lecture Notes in Computer Science*, pages 53–64. Springer, 2018. doi:10.1007/978-3-030-10549-5_5

C7 G. Russo Russo. Towards decentralized auto-scaling policies for data stream processing applications. In *Proceedings of the 10th Central European Workshop on Services and their Composition, Dresden, Germany, February 8-9, 2018*, volume 2072 of *CEUR Workshop Proceedings*, pages 47–54. CEUR-WS.org, 2018. URL: http://ceur-ws.org/Vol-2072/paper8.pdf

C8 V. Cardellini, F. Lo Presti, M. Nardelli, and G. Russo Russo. Towards hierarchical autonomous control for elastic data stream processing in the fog. In *Euro-Par 2017: Parallel Processing Workshops - Euro-Par 2017 International Workshops, Santiago de Compostela, Spain, August 28-29, 2017, Revised Selected Papers*, volume 10659 of *Lecture Notes in Computer Science*, pages 106–117. Springer, 2017. doi:10.1007/978-3-319-75178-8_9

C9 V. Cardellini, F. Lo Presti, M. Nardelli, and G. Russo Russo. Auto-scaling in data stream processing applications: A model-based reinforcement learning approach. In *New Frontiers in Quantitative Methods in Informatics - 7th Workshop, InfQ 2017, Venice, Italy, December 4, 2017, Revised Selected Papers*, volume 825 of *Communications in Computer and Information Science*, pages 97–110. Springer, 2017. doi:10.1007/978-3-319-91632-3_8

Book Chapters

B1 A. Alnafessah, G. Russo Russo, V. Cardellini, G. Casale, and F. Lo Presti. Ai-driven performance management in data-intensive applications. In N. Zincir-Heywood, Y. Diao., and M. Mellia, editors, *Communications Network and Service Management in the Era of Artificial Intelligence and Machine Learning*. Wiley, 2021. doi:10.1002/9781119675525.ch9

B2 G. Russo Russo, V. Cardellini, F. Lo Presti, and M. Nardelli. Towards a security-aware deployment of data streaming applications in fog computing. In Wei Chang and Jie Wu, editors, *Fog/Edge Computing For Security, Privacy, and Applications*, pages 355–385. Springer International Publishing, Cham, 2021. doi:10.1007/978-3-030-57328-7_14

Conference Tutorials

2021 F. Lo Presti, G. Russo Russo, V. Cardellini, "Reinforcement learning for run-time performance management in the Cloud/Edge", *39th International Symposium on Computer Performance, Modeling, Measurements and Evaluation 2021* (*Performance 2021*), Milan, Italy, 8-12 November, 2021.

Talks

2021 I presented [C1] online at CCGRID '21.
2021 I presented [C2] online at the AutoDaSP workshop.
2020 I presented [C3] online at ACM Middleware '20.
2019 I presented [C4] and [C5] at ACM DEBS '19, Darmstadt, Germany.

2019 "Self-Adaptive Data Stream Processing in Geo-Distributed Computing Environments" at the *9th Workshop of the Italian group on Quantitative Methods in Informatics* (InfQ '19), Caserta, Italy.
2018 I presented [C6] at AutoDaSP '18, Turin, Italy.
2018 I presented [C7] at ZEUS '18, Dresden, Germany.
2017 I presented [C9] at InfQ '17, Venice, Italy.

Rome, November 11, 2021