Gabriele Russo Russo

Curriculum Vitae

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Research Interests and Scientific Results

I am currently a Research Fellow (*RTDa*) at the University of Rome Tor Vergata, where I received my PhD degree in 2021. Previously, I was a PostDoc researcher at Roma Tre University (Jan–Apr 2023) and at the University of Rome Tor Vergata (2021–2023). My research interests are in the area of distributed computing systems, with particular emphasis on run-time performance management for distributed applications.

I co-authored 5 papers published in international journals, 14 papers published in international conference and workshop proceedings, and 2 peer-reviewed book chapters. As at February 2024, Google Scholar reports 317 citations of my papers, with a h-index equal to 9; Scopus reports 216 citations, with a h-index equal to 7.

Since November 2021, I am a member of the Review Board of *IEEE Transactions on Parallel and Distributed Systems*.

Education and Positions

Education

2017–21 **PhD student** in Computer Science, University of Rome Tor Vergata. Final examination grade: *Excellent*.
Advisors: Prof. Valeria Cardellini and Prof. Francesco Lo Presti.
Thesis: "Model-based Auto-Scaling of Distributed Data Stream Processing Applications".

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

2017 **Post-graduate scolarship**, University of Rome Tor Vergata, July–September 2017.
Topic: "Distributed elastic control of data stream processing applications in Storm".
Supervisor: Prof. Valeria Cardellini.

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.

Positions

2023– **Research Fellow** ("RTDa"), Dept. of Civil Engineering and Computer Science Engineering, University of Rome Tor Vergata, April 2023–present.

2023 **Research Assistant** ("Borsista"), Roma Tre University, January–April 2023.
Project: "Per una Giustizia Giusta: Innovazione ed Efficienza negli Uffici Giudiziari-Giustizia Agile".
Coordinator: Dr. Stefano Iannucci.

2022–23 **Research Assistant** ("Assegnista di Ricerca"), University of Rome Tor Vergata.
Project: "Earth In The Cloud, POR FESR Lazio 2014-2020".
Coordinator: Prof. Francesco Quaglia.

2021–22 **Research Assistant** ("Assegnista di Ricerca"), University of Rome Tor Vergata.
Project: "Self-adaptive Deployment of Data Stream Processing Applications in Edge and Serverless Environments".
Coordinator: Prof. Valeria Cardellini.

Honors and Awards

2023 **Best Paper Award** in the Special Session on Compute Continuum at PDP '23, with the paper [C5].

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.

Participation in Research Projects

2023– Spoke 1 **"Future HPC & Big Data"** of *ICSC National Research Centre for High Performance Computing, Big Data and Quantum Computing*, funded by MUR Missione 4 Componente 2 Investimento 1.4: Potenziamento strutture di ricerca e creazione di "campioni nazionali" di R&S (M4C2-19) - Next Generation EU (NGEU).

2022 **Earth In The Cloud**, POR FESR Lazio 2014-2020 (Azione 1.2.1)
Role: research scientist, contributing to the definition and evaluation of scheduling algorithms for workflow execution in public Cloud platforms.
Local Project Leader: Prof. Francesco Quaglia.

Research Groups

- Member of the *DAMON* research group at the University of Rome Tor Vergata. April 2017–present.
- Collaboration with the *Quality of Service Research* (QORE) lab, led by Dr. Giuliano Casale, at the Imperial College London, UK. August 2019–December 2020.

Professional service

Conference and Workshop Organization

Workshop Chair

- *International Workshop on Quality of Service-aware Serverless Computing (QServ 2023)*, co-located with IEEE/ACM UCC 2023

- *International Workshop on Artificial Intelligence for Autonomous computing Systems (AI4AS 2023)*, co-located with IEEE ACSOS 2023

TPC Member

- *30th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2024)*
- *1st International Workshop on the Orchestration of the Serverless Edge-Cloud Continuum (COHERENT 2024)*
- *2nd Workshop on Artificial Intelligence for Performance Modeling, Prediction, and Control (AIPerf 2024)*
- *International Workshop on Sustainable Service-Oriented Computing: Addressing Environmental, Social, and Economic Dimensions (SSCOPE 2023)*
- *International Workshop on Scalable Compute Continuum (WSCC 2023)*
- TPC Chair, *4th International Workshop on Self-Protecting Systems (SPS 2022)*
- *16th ACM International Conference on Distributed and Event-based Systems (DEBS 2022)*
- Shadow TPC Member, *16th ACM EuroSys (EuroSys 2021)*

Publicity & Social Media Chair

- *30th IEEE Real-Time and Embedded Technology and Applications Symposium (RTAS 2024).*
- *14th ACM/SPEC International Conference on Performance Engineering (ICPE 2023).*

Invited Talks

- "Using Reinforcement Learning to Control Auto-Scaling of Distributed Applications", invited talk at the *1st Workshop on Artificial Intelligence for Performance Modeling, Prediction, and Control*, co-located with ACM/SPEC ICPE '23, Coimbra, Portugal, April 15, 2023.
- "Meet-the-author: Serverledge: Decentralized Function-as-a-Service for the Edge-Cloud Continuum", invited talk at the *2nd Workshop on Serverless computing for pervasive cloud-edge-device systems and services*, co-located with IEEE Percom '23, Atlanta, USA, March 13, 2023.

Reviewer for Journals and Conferences

I reviewed manuscripts submitted to the following international journals:

- IEEE Transactions on Parallel and Distributed Systems (2021–2024)
- Future Generation Computer Systems, Elsevier (2019, 2023–2024)
- Journal of Systems and Software, Elsevier (2023)
- Parallel Computing, Elsevier (2022–2023)
- Cluster Computing, Springer (2019–2023)
- ACM Computing Surveys (2022)
- IEEE Transactions on Network and Service Management (2022)
- IEEE Transactions on Mobile Computing (2022)
- IEEE Transactions on Cloud Computing (2022)
- Journal of Parallel and Distributed Computing, Elsevier (2022)
- IEEE Internet of Things Journal (2021,2022)
- Journal of Grid Computing, Springer (2020–2022)
- Information Systems, Elsevier (2021)
- Science of Computer Programming, Elsevier (2020)

- Expert Systems with Applications, Elsevier (2018)

Since November 2021, I am a member of the ***Review Board*** **of IEEE Transactions on Parallel and Distributed Systems**.

I also served as a reviewer for the following international conferences:

- ACM Distributed and Event-based Systems (2019,2022)
- ACM/SPEC International Conference on Performance Engineering (2021)
- IEEE/ACM International Conference on Utility and Cloud Computing (2020,2021)
- IEEE Vehicular Technology Conference (2018)

Teaching

I have been involved in the following teaching activities (at the University of Rome Tor Vergata, if not explicitly stated):

Doctoral Courses

- *Model-free and Model-based Auto-Scaling Techniques for Distributed Applications* (10 hours), Roma Tre University, June 2023.

Graduate and Master Degree Courses

- *Machine Learning* (9 ECTS; 6 ECTS taught by me), for the MSc in *Computer Engineering* (2023/24).
- *Hands-on Cloud Computing Services*, supplementary course (10 hours) for the MSc in *Computer Engineering* (from 2019/20 to 2022/23).
- *Hands-on Big Data & Hadoop* (12 hours), 2nd Level Master degree in *Customer Experience & Social Media Analytics (CESMA) (from 2018/19 to 2022/23).*
- *Hands-on Big Data* (16 hours), 1st Level Master degree in *Data Science (2021/22,2022/23).*

Undergraduate Courses

- *Fundamentals of Programming and Data Analytics* (3 ECTS), BSc course at the Department of Engineering, Roma Tre University. (2022/23).
- *MIPS Assembler Programming*, supplementary course (10 hours) for the BSc in *Computer Engineering* (2021/22).
- TA for the *Computer Architecture* course, BSc in *Computer Engineering* (from 2016/17 to 2020/21).

Thesis Supervision

Since 2023, I have supervised 2 *Laurea Magistrale* (MSc) theses and, since 2018, I have been assistant supervisor of 18 theses at the University of Rome Tor Vergata.

Publications

International Journals

J1 G. Russo Russo, V. Cardellini, and F. Lo Presti. Hierarchical auto-scaling policies for data stream processing on heterogeneous resources. *ACM Transactions on Autonomous and Adaptive Systems*, 2023. Just Accepted. doi:10.1145/3597435

J2 V. Cardellini, F. Lo Presti, M. Nardelli, and G. Russo Russo. Run-time adaptation of data stream processing systems: The state of the art. *ACM Computing Surveys*, 54(11s), 2022. doi:10.1145/3514496

J3 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

J4 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

J5 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 A. Semjonov, G. Russo Russo, H. Bornholdt, and J. Edinger. Wasimoff: Distributed computation offloading using webassembly in the browser. In *Proceedings of 2024 IEEE International Conference on Pervasive Computing and Communications Workshops and other Affiliated Events, PerCom 2024 Workshops, Biarritz, France, March 11-15, 2024*. IEEE, 2024

C2 M. Nardelli, G. Russo Russo, and V. Cardellini. Compute continuum: What lies ahead? In *Proceedings of the 1st International Workshop on Scalable Compute Continuum (in conjunction with Euro-Par 2023)*, 2023

C3 F. Filippini, R. Cavadini, D. Ardagna, R. Lancellotti, G. Russo Russo, V. Cardellini, and F. Lo Presti. Figaro: reinforcement learning management across the computing continuum. In *Proceedings of the 3rd International Workshop on Distributed Machine Learning for the Intelligent Computing Continuum (DML-ICC 2023), (in conjunction with IEEE/ACM UCC 2023)*, 2023

C4 G. Russo Russo, T. Mannucci, V. Cardellini, and F. Lo Presti. Artifact: Serverledge: Decentralized function-as-a-service for the edge-cloud continuum. In *Proceedings of IEEE International Conference on Pervasive Computing and Communications Workshops and other Affiliated Events, PerCom Workshops 2023, Atlanta, GA, USA, March 13-17, 2023*, pages 1–2. IEEE, 2023. doi:10.1109/PerComWorkshops56833.2023.10150345

C5 G. Russo Russo, V. Cardellini, and F. Lo Presti. Serverless functions in the cloud-edge continuum: Challenges and opportunities. In *Proceedings of the 31st Euromicro International Conference on Parallel, Distributed and Network-based Processing, PDP 2023, Naples, Italy, March 1-3, 2023*. IEEE, 2023 (to appear)

C6 C. Calavaro, G. Russo Russo, and V. Cardellini. Real-time analysis of market data leveraging apache flink. In *Proceedings of the 16th ACM International Conference on Distributed and Event-based Systems, DEBS 2022, Copenhagen, Denmark, June 27 - 30, 2022*, pages 162–165, 2022. doi:10.1145/3524860.3539650

C7 G. Russo Russo, A. Milani, S. Iannucci, and V. Cardellini. Towards qos-aware function composition scheduling in apache openwhisk. In *Proceedings of 2022 IEEE International Conference on Pervasive Computing and Communications Workshops and other Affiliated Events, PerCom 2022 Workshops, Pisa, Italy, March 21-25, 2022*, pages 693–698. IEEE, 2022. doi:10.1109/PerComWorkshops53856.2022.9767299

C8 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

C9 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

C10 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

C11 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

C12 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, 2019. doi:10.1145/3328905.3329506

C13 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

C14 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

C15 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

C16 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

PhD Thesis

G. Russo Russo. *Model-based Auto-Scaling of Distributed Data Stream Processing Applications*. PhD thesis, University of Rome Tor Vergata, 2021

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.

Rome, February 14, 2024