

Academic Curriculum Vitae*

Stefano Pio Zingaro

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I am assistant professor of computer science at the dept. of computer science of the university of Bologna. I carry out research and teaching activities in the field of artificial intelligence and machine learning, focusing on the development of predictive models to prevent early school leaving. In 2011, I graduated in computer science at the university of Trento and, in 2014, in bioinformatics at the university of Bologna. In 2020, I defended my PhD thesis in computer science at the university of Bologna on the use of service-oriented programming paradigms for modern large-scale distributed systems. I am author of several international scientific publications in the fields of artificial intelligence and software engineering, and on these topics I participate in numerous national and European projects and organise international schools, seminars and conferences.

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Education

- 2020 **PhD in Computer Science and Engineering** (XXXII cycle). University of Bologna and EIT Digital Industrial Doctoral School of Trento, Italy. The thesis work [3]—supervised by Maurizio Gabbrielli and Ivan Lanese—investigates theoretical and practical aspects of developing a programming language to improve interoperability among applications in cloud, fog and IoT scenarios. Dissertation title: *Interoperability challenges in internet of thing systems: a linguistic approach based on microservices computing*.
- 2014 **Master degree in Bioinformatics** (cum laude). University of Bologna, Italy. The thesis work—supervised by Piero Fariselli and Gualberto Asencio Cortés—evaluates a machine learning based predictor for RNA secondary structure and benchmarks its performance against state-of-the-art techniques. Dissertation title: *Ranking of RNA secondary structure predictors using SCFGs*.
- 2011 **Bachelor degree in Computer Science**. University of Trento, Italy. The thesis work—supervised by Luca Abeni—reviews different techniques to implement operative system checkpoint and evaluates the integration in the Linux kernel of the most relevant ones. Dissertation title: *Checkpoint mechanisms in Linux*.

Research interests

My main research interest is in the field of artificial intelligence, more specifically in the use of machine learning algorithms in educational scenarios.

So far, I worked in the fields of software engineering and artificial intelligence. On the one hand, I have developed techniques for the effective integration of software in modern large-scale systems [16, 4, 15, 1, 3, 12, 14], and on the other hand, I have developed predictive tools that are effective in terms of performance and explainability [11, 10, 6, 9, 5, 2]. Finally, I have chosen to apply the results of my investigation in the field of (human) learning, in which I have a particular interest both from a didactic point of view (particularly in the discipline of Computer Science) [13, 8, 7] and from a pedagogical point of view.

Concretely, I am currently participating in a project funded by the University of Bologna with the aim of developing predictive models for the prevention of school dropout in academia. The results obtained so far are promising both in terms of predictive performance and the ability to interpret predictions. Nevertheless, research for the development of an effective tool and its integration into decision-making processes is ongoing and there is room for improvement.

Publication metrics

Journal articles: **2**

In conference proceedings: **12**

Book chapters & others: **2**

Scopus citation count: **61** by **58** documents with *h*-index **3**

Journal articles

- [1] Saverio Giallorenzo et al. “Ephemeral data handling in microservices with Tquery”. In: *PEERJ COMPUTER SCIENCE* 8 (2022), pp. 1–40. DOI: 10.7717/peerj-cs.1037. URL: <https://peerj.com/articles/cs-1037/>.
- [2] Stefano Pio Zingaro et al. “Predictive models for effective policy making against university dropout”. In: *Form@re* 20.3 (2020), pp. 165–175. ISSN: 1825-7321. DOI: 10.13128/form-9767.

Book chapters & others

- [3] Stefano Pio Zingaro. “Interoperability Challenges in Internet of Things Systems: a Service-Oriented Computing Approach”. PhD thesis. alma, Apr. 2020. URL: <http://amsdottorato.unibo.it/9088/>.
- [4] Maurizio Gabbrielli et al. *Linguistic Abstractions for Interoperability of IoT Platforms*. Ed. by Tim A. Majchrzak et al. Vol. 347. Cham: Springer, 2019, pp. 83–114. ISBN: 978-3-030-28430-5. DOI: 10.1007/978-3-030-28430-5_5.

In conference proceedings

- [5] Lorenzo Bacchiani et al. “Proactive-Reactive Global Scaling, with Analytics”. In: *Service-Oriented Computing*. Ed. by Javier Troya et al. Cham: Springer Nature Switzerland, 2022, pp. 237–254. ISBN: 978-3-031-20984-0.
- [6] Andrea Zanellati, Stefano Pio Zingaro, and Maurizio Gabbrielli. “Student Low Achievement Prediction”. In: *Artificial Intelligence in Education*. Ed. by Maria Mercedes Rodrigo et al. Cham: Springer International Publishing, 2022, pp. 737–742. ISBN: 978-3-031-11644-5.
- [7] Michael Lodi et al. “The online course was great: I would attend it face-to-face: The good, the bad, and the ugly of IT in emergency remote teaching of CS1”. In: *GoodIT 2021 - Proceedings of the 2021 Conference on Information Technology for Social Good*. New York, NY: Association for Computing Machinery, Inc, 2021, pp. 242–247. ISBN: 9781450384780. DOI: 10.1145/3462203.3475902. URL: <https://dl.acm.org/doi/10.1145/3462203.3475902>.
- [8] Marco Sbaraglia et al. “The Good, The Bad, and The Ugly of a Synchronous Online CS1”. In: *ITiCSE '21: Proceedings of the 26th ACM Conference on Innovation and Technology in Computer Science Education V. 2*. New York, NY: Association for Computing Machinery, 2021, pp. 660–660. ISBN: 9781450383974. DOI: 10.1145/3456565.3460075.

- [9] Andrea Zanellati et al. “Informing predictive models against Students Dropout”. In: *Atti Convegno Nazionale DIDAMATiCA 2021*. Milano: AICA - Associazione Italiana per l’Informatica ed il Calcolo Automatico, 2021, pp. 18–25. ISBN: 978-88-98091-62-1. URL: <https://www.aicanet.it/didamatica2021>.
- [10] Stefano Pio Zingaro, Giuseppe Lisanti, and Maurizio Gabbrielli. “Multimodal Side-Tuning for Document Classification”. In: *Proceedings of the 25th International Conference on Pattern Recognition (ICPR)*. 2021, pp. 5206–5213. DOI: 10.1109/ICPR48806.2021.9413208.
- [11] Francesca Del Bonifro et al. “Student dropout prediction”. In: *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*. Vol. 12163. Springer, 2020, pp. 129–140. ISBN: 978-3-030-52237-7. DOI: 10.1007/978-3-030-52237-7_11.
- [12] Saverio Giallorenzo et al. “The Servers of Serverless Computing: A Formal Re-visitation of Functions as a Service”. In: *Recent Developments in the Design and Implementation of Programming Languages*. Vol. 86. Dagstuhl: Schloss Dagstuhl–Leibniz-Zentrum für Informatik, 2020, pp. 1–21. ISBN: 978-3-95977-171-9. DOI: 10.4230/OASICS.Gabbrielli.5.
- [13] Michael Lodi et al. “(Non) parliamo di pensiero computazionale”. In: *Didattica della Matematica, disciplina scientifica per una scuola efficace*. Bologna: Pitagora Editrice, 2020, pp. 77–78.
- [14] Maurizio Gabbrielli et al. “No more, no less: A formal model for serverless computing”. In: *Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics)*. Vol. 11533. Springer Verlag, 2019, pp. 148–157. DOI: 10.1007/978-3-030-22397-7_9. URL: <https://www.springer.com/series/558>.
- [15] Saverio Giallorenzo et al. “Ephemeral data handling in microservices”. In: *Proceedings - 2019 IEEE International Conference on Services Computing, SCC 2019 - Part of the 2019 IEEE World Congress on Services*. Institute of Electrical and Electronics Engineers Inc., 2019, pp. 234–236. ISBN: 978-1-7281-2720-0. DOI: 10.1109/SCC.2019.00048. URL: <http://ieeexplore.ieee.org/xpl/mostRecentIssue.jsp?punumber=8798918>.
- [16] Maurizio Gabbrielli et al. “A Language-based Approach for Interoperability of IoT Platforms”. In: *Proceedings of the 51st Hawaii International Conference on System Sciences*. 2018, pp. 5697–5706.

Organization of events & committees

- 2023 **Technical program committee** for the 24rd International Conference on Artificial Intelligence in Education (AIED23), Tokio, Japan.
- 2023 **Organizing committee** for the 28th Bertinoro International Spring School (BISS) 2023, Bertinoro, Italy.

- 2023 **Organizing committee** for the Advanced Schools in Artificial Intelligence in Emilia-Romagna (ASAI-ER) 2023 School on Artificial Intelligence, Bertinoro, Italy.
- 2022 **Organizing committee** for the 27th Bertinoro International Spring School (BISS) 2022, Bertinoro, Italy.
- 2022 **Technical program committee** for the 23rd International Conference on Artificial Intelligence in Education (AIED22), Durham, United Kingdom.
- 2022 **Technical program committee** for the 23rd International Conference on Agile Software Development (XP2022), Copenhagen, Denmark.
- 2021 **Technical program committee** for the 22nd International Conference on Agile Software Development (XP2021), Online.
- 2020 **Publicity chair** and **Organizing committee** for the Bologna Federated Conference on Programming Languages (BOPL2020), Online.
- 2020 **Technical program committee** for the 22nd International Symposium on Principles and Practice of Declarative Programming (PPDP2020), Online.
- 2020 **Technical program committee** for the 30th International Symposium on Logic-Based Program Synthesis and Transformation (LOPSTR2020), Online.
- 2020 **Technical program committee** for the 28th International Workshop on Functional and Logic Programming (WFLP2020), Online.
- 2020 **Technical program committee** for the 3rd International Conference on Microservices, Online.
- 2020 **Technical program committee** for the 21st International Conference on Agile Software Development (XP2020), Online.
- 2019 **Technical program committee** for the 2nd International Conference on Microservices, Dortmund, Germany.
- 2018 **Technical program committee** for the 2nd International Workshop on Microservices: Agile and DevOps Experience (MADE18), Porto, Portugal.
- 2017 **Technical program committee** for the 1st International Conference on Microservices, Odense, Denmark.

Reviews

Conference

- Springer Artificial Intelligence in Education (AIED)
- Springer Fundamentals of Software Engineering (FSEN)

- Springer Extreme Programming (XP) and Agile Processes in Software Engineering
- Springer Service Oriented Computing (ICSOC)
- Proceedings of the Joint Conference on Artificial Intelligence (IJCAI)
- Microservices

Journal

- Transactions on Management Information Systems (TMIS)
- Springer AI & SOCIETY
- Multidisciplinary Digital Publishing Institute (MDPI) Applied Sciences
- Elsevier Food Control

Professional & research experience

- 2022 **Postdoctoral research fellow.** Department of Computer Science and Engineering, University of Bologna. Position funded by Area Formazione e Dottorato (AFORM), University of Bologna. Focus: development and evaluation of *AI-based solution to prevent dropout in University* and design interventions for student educational guidance.
- 2021 **Postdoctoral research fellow.** Department of Computer Science and Engineering, University of Bologna. Position funded by H2020 AI4EU—European AI On Demand Platform and Ecosystem (Grant Agreement n. 825619). Focus: development and evaluation of tools for the orchestration and workflow pipeline of machine learning resources to be integrated in the AI4EU platform.
- 2020 **Postdoctoral research fellow.** Centro Interdipartimentale di Ricerca Industriale ICT, University of Bologna. Position funded by POR FESR 2014–20, CoACh (CUP: D41F18000060009). Focus: development of a IoT orchestration system for tracking and managing food cold-chain in industrial setting.
- 2018 **Adjunct faculty.** Department of Mathematics and Computer Science, South Denmark University, Odense. Focus: theory and practice of developing a programming language for cloud, fog and IoT scenarios.
- 2016 **System manager and consultant.** Ericsson S.p.A for Vodafone Italy S.p.A., Bologna. Focus: information systems, ERP, data processing and acquisition.
- 2015 **Full-stack developer.** Natisoft S.r.l., Bologna. Focus: software engineering, data analysis, website design and development.

Fellowships & awards

- 2020 EIT Digital Industrial Doctorate Business Development Experience (BDExp) Fellowship for the development of a business-oriented project in collaboration with the Engineering S.p.A. company. Bologna, Italy.
- 2018 Marco Polo University Programme Fellowship as a visiting researcher at the Department of Mathematics and Computer Science (IMADA) of the University of Southern Denmark (SDU), Odense, Denmark.
- 2013 LLP ERASMUS Fellowship as an exchange student for the development of the Master degree thesis at the Pablo de Olavide University (UPO), Seville, Spain.
- 2012 ER.GO Diritto allo studio Universitario: granting of merit-based benefits available for “capable and worthy students regardless of their financial condition” (art. 34 of the Constitution): scholarship, exemption from the provincial student welfare tax, total exemption from University tuition fees. Bologna, Italy.
- 2008 Opera Universitaria di Trento: granting of merit-based benefits available for “capable and worthy students regardless of their financial condition” (art. 34 of the Constitution): scholarship, accommodation, exemption from the provincial student welfare tax, total exemption from University tuition fees. Trento, Italy.

Technical skills

I have a strong experience (more than 10 years) in the *development and evaluation of machine learning algorithms and predictive models for the analysis of large datasets*. I mainly use `Python` (≥ 3.8) for implementing software solutions based on machine learning algorithms. In particular, I am familiar with the most common development frameworks for machine learning (`MATLAB`, INRIA `scikit-learn`, `pandas`, `matplotlib`) and deep learning (e.g. Linux Foundation `PyTorch`, Apache `MXNet`, Google `Tensorflow` and `Keras`). In Bioinformatics related projects, I exploited `R` for data mining (e.g., on Rfam database) and `C++` for the development of optimised algorithms for the analysis of genetic data (e.g., `Infernal`).

During my PhD, I gained expertise in both the *theoretical* [12, 14] and *pragmatic* [5, 15, 16, 1] aspects of programming languages—e.g., for the management of modern large-scale distributed systems, service-oriented architectures and microservices. In particular, I refined my coding skills in the object-oriented language `Java` and in event-oriented programming using the `Netty` framework. Furthermore, I acquired skills in defining formal models for a programming language (using λ and π calculi), creating applications for the orchestration of distributed systems (e.g., `Jolie`, `FIWARE`, `NodeJS`) and developing protocols for cloud, fog computing and IoT (e.g., `Web of Things`, `CoAP`, `MQTT`) [4, 16].

Finally, I have been cultivating my skills in *web application development*, both back-end and front-end, since finishing my Bachelor’s degree. This interest was consolidated during the years of employment and consultancy in private sector companies in the

IT field (Natisoft S.r.l, Ericsson S.p.A. and Vodafone S.p.A.) with technologies such as PHP, SQL and Perl. Then, during my years at the academy, I created numerous web applications for the presentation and management of numerous projects, schools, seminars and conferences, using the **Jekyll** framework and the **Markdown** language to create high-performance static web pages. I worked as a systems engineer and, to date, I regularly maintain servers and virtual machines for the Department of Computer Science and Engineering of the University of Bologna (managing Debian, CentOS, Slurm cluster, and Jupyter Notebook servers).

Languages

Italian (mother tongue)

C1 **English** (certified by the University of Cambridge)

B2 **Spanish** (self-assessed)

A1 **French** (self-assessed)

Didactics

Teaching

2022 **Decision Support Systems**. Master in Artificial Intelligence and Innovation Management, Bologna Business School. 10 teaching hours.

2022 **Summer school Artificial Intelligence**. Expeditions project by Fondazione MAST, Bologna, Italy. 20 teaching hours.

2021 **Decision Support Systems**. Master in Artificial Intelligence and Innovation Management, Bologna Business School. 10 teaching hours.

2021 **Future Technologies in Action**. Executive Master in Digital Technology and Innovation Management, Bologna Business School. 2 teaching hours.

2021 **Summer school Artificial Intelligence**. Expeditions project by Fondazione MAST, Bologna, Italy. 20 teaching hours.

2020 **Machine Learning**. Master in Artificial Intelligence and Innovation Management, Bologna Business School. 30 teaching hours.

2020 **Summer school Artificial Intelligence**. Expeditions project by Fondazione MAST, Bologna, Italy. 20 teaching hours.

2019 **Machine Learning**. Master in Artificial Intelligence and Innovation Management, Bologna Business School. 30 teaching hours.

- 2019 **Operating Systems** (9 CFU). First cycle degree programme (L) in Information Science for Management, University of Bologna. 30 teaching hours, SSD: INF/01.
- 2019 **Summer school Artificial Intelligence**. Expeditions project by Fondazione MAST, Bologna, Italy. 15 teaching hours.
- 2018 **Summer school Artificial Intelligence**. Expeditions project by Fondazione MAST, Bologna, Italy. 10 teaching hours.

Tutorships

- 2022 **Artificial Intelligence** (6 CFU). Teacher: Maurizio Gabbrielli. Second cycle degree programme in Computer Science, University of Bologna. Tutoring hours: 40. SSD: INF/01.
- 2021 **Artificial Intelligence** (6 CFU). Teacher: Maurizio Gabbrielli. Second cycle degree programme in Computer Science, University of Bologna. Tutoring hours: 40. SSD: INF/01.
- 2019 **Introduction to Algorithms and Programming** (6 CFU). Teachers: Simone Martini and Maurizio Gabbrielli. Second cycle degree programme in Artificial Intelligence, University of Bologna. Tutoring hours: 20. SSD: INF/01.
- 2019 **Computer Science** (8 CFU). Teacher: Simone Martini. First cycle degree programme in Mathematics and second cycle degree programme in Philosophical Sciences, University of Bologna. Tutoring hours: 40. SSD: INF/01.
- 2018 **Operating Systems** (6 CFU). Teacher: Davide Sangiorgi. First cycle degree programme in Information Science for Management, University of Bologna. Tutoring hours: 40. SSD: INF/01.
- 2018 **Computer Science** (8 CFU). Teachers: Maurizio Gabbrielli and Giuseppe Lisanti. First cycle degree programme in Mathematics and second cycle degree programme in Philosophical Sciences, University of Bologna. Tutoring hours: 40. SSD: INF/01.
- 2017 **Operating Systems** (6 CFU). Teacher: Davide Sangiorgi. First cycle degree programme in Information Science for Management, University of Bologna. Tutoring hours: 40. SSD: INF/01.
- 2016 **Foundations of Informatics** (9 CFU). Teacher: Marco Patella. First cycle degree programme in Engineering Management, University of Bologna. Tutoring hours: 40. SSD: ING-INF/05.

Co-supervised theses

- 2023 **Evangelista, Gabriele**.

- 2023 **Zanotti, Michelle.**
- 2023 **Pascarella, Antonietta.**
- 2023 **Boccuti, Alessandra.**
- 2023 **Celozzi, Michele.**
- 2022 **Chini, Giacomo.** *Implementazione di una architettura di bilanciamento del carico per microservizi tramite tecniche di Machine Learning.* University of Bologna, Bachelor Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2021 **Procino, Edoardo.** *Global scaling predittivo di un'architettura a microservizi con tecniche di deep learning: gestione del flusso di email.* University of Bologna, Bachelor Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2021 **Boldrini, Simone.** *Strumenti di orchestrazione e analisi di workflow nel machine learning.* University of Bologna, Bachelor Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2021 **Tomasone, Marco Benito.** *Pipeline per il Machine Learning: Analisi dei workflow e framework per l'orchestrazione: i casi Recommendation System e Face2Face Translation.* University of Bologna, Bachelor Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2021 **Freda, Alessandro.** *Didattica della programmazione: analisi quantitativa di comportamenti ed errori dei novizi in un corso introduttivo.* University of Bologna, Master Degree in Computer Science. Supervisor: Michael Lodi.
- 2021 **Vainigli, Lorenzo.** *Registrazioni vocali per la diagnosi di COVID-19 con Deep Convolutional Neural Networks.* University of Bologna, Master Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2020 **Mele, Matteo.** *Convolutional Neural Networks for the Classification of Olive Oil Geographical Origin.* University of Bologna, Bachelor Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2020 **Soncini, Filippo.** *Classificazione di documenti tramite reti neurali.* University of Bologna, Master Degree in Computer Science. Supervisor: Maurizio Gabbrielli.
- 2019 **Pitaro, Raffaele.** *McGiver: Module Classifier using fine tuning Machine Learning techniques.* University of Bologna, Master Degree in Computer Science. Supervisor: Maurizio Gabbrielli.