

Francesco Vinci

Data & Process Scientist

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francesco-vinci | franvinci | Francesco Vinci



Biography

Francesco Vinci is an **AI and process science researcher** at the University of Padua, where he works on data-driven and explainable process simulation models for operational decision-making. His research bridges process mining, machine learning, and explainable AI to enable transparent *what-if* and prescriptive analytics in real-world settings.

He has applied his methods in **healthcare and industrial domains**, focusing on workflow optimization, resource allocation, and performance improvement. Francesco has collaborated with leading international research groups at RWTH Aachen University and Fraunhofer FIT, and he actively develops open-source tools to translate research outcomes into practice.


Experience

- **University of Padua** [🌐] October 2025 - Current
Research Fellow Padova (PD), Italy
 - I am currently a Postdoctoral Research Fellow ("Assegnista di Ricerca") at the University of Padua. My research focuses on the discovery and enhancement of process simulation models using explainable machine learning techniques with applications to the optimization of healthcare processes, particularly in emergency medicine.
- **University of Padua** [🌐] October 2022 - September 2025
Ph.D. Researcher Padova (PD), Italy
 - During my Ph.D., I conducted research in process mining, process simulation, and data-driven modeling, with a strong focus on the discovery, repair, and improvement of simulation models using event data. My work leveraged data science and artificial intelligence techniques for online model adaptation and process optimization, and was applied to real-world domains such as business and healthcare processes.
- **Danieli Automation** [🌐] March 2022 - August 2022
R&D Data Science Intern Buttrio (UD), Italy
 - I was an intern at the Danieli Research Center, where I developed a framework combining supervised and unsupervised machine and deep learning methods for video anomaly detection to identify sticking events in the continuous casting process of steel manufacturing.




Visiting

- **RWTH Aachen University** [🌐] March 2025 - September 2025
Visiting Researcher Aachen, Germany
 - During my Ph.D., I visited the Process and Data Science (PADS) Research Group in Aachen, where I conducted research on the discovery of white-box process simulation models. During this period, I also developed *ProSiT*, a tool for configurable process simulation.
 - Supervised by Prof. Wil van der Aalst.
- **Fraunhofer FIT** [🌐] September 2024 - March 2025
Visiting Researcher Aachen, Germany
 - During my Ph.D., I visited the Fraunhofer Process Mining Group in Aachen, where I conducted research on the discovery of white-box process simulation models and their adaptation in online settings.
 - Supervised by Prof. Wil van der Aalst and Dr. Gyunam Park.

Teaching

- **University of Padua**  April 2023 - Current
Teaching Assistant Padova (PD), Italy
 - I am a Teaching Assistant for the Database course in the Bachelor's degree in Computer Science, where I support students during laboratory sessions on PostgreSQL and pgAdmin, and contribute to the preparation of class and project materials.

Education

- **University of Padua**  October 2022 - September 2025
Ph.D. in Brain, Mind & Computer Science Padova (PD), Italy
 - Curricula: Computer Science for Societal Challenges and Innovation
 - Project: *Data-driven Optimization of Processes in Public Administrations: When Human Perception meets Objectivity*
 - Supervisor: Prof. Massimiliano de Leoni
 - Cosupervisor: Dr. Silvia Gabrielli
 - Thesis: *Towards Reliable and Explainable Process Simulation Models: Discovery, Refinement, and Applications*
- **University of Padua**  October 2020 - September 2022
M.Sc. in Data Science Padova (PD), Italy
 - Thesis: *Semi-supervised Deep Learning methods for Video Anomaly Detection applied to sticking identification during steelmaking continuous casting process*
 - Supervisor: Prof. Michele Rossi
 - Co-Supervisor: Andrea Zamolo
- **University of Padua**  October 2016 - February 2020
B.Sc. in Mathematics Padova (PD), Italy
 - Thesis: *Enlargement of filtrations in discrete time and applications to finance*
 - Supervisor: Prof. Claudio Fontana

Publications

C=CONFERENCE, J=JOURNAL, *=UNDER REVIEW

- [J.3*] Alessandro Padella, **Francesco Vinci**, Massimiliano de Leoni (2026). **An Experimental Comparison of Alternative Methods for Event-Log Augmentation**. In *arXiv*.
- [J.2] **Francesco Vinci**, Davide Aloini, Elisabetta Benevento, Alessandro Stefanini, Francesca Zen, Massimiliano de Leoni (2026). **Improving Organizational Processes in Healthcare through Simulation-Driven Resource Allocation: Methodology and Real-World Case Study**. In *Artificial Intelligence in Medicine*. Vol. 176. pp. 103391. Elsevier. DOI: 10.1016/j.artmed.2026.103391. Ranking (JCR): Q1.
- [C.7] **Francesco Vinci**, Gyunam Park, Wil van der Aalst, Massimiliano de Leoni (2025). **ProSiT: A Tool for Interactive and Transparent Process Simulations**. In *International Conference on Service Oriented Computing, Demonstrations and Resources*. December 1-4, 2025, Shenzhen, China. **Accepted**.
- [C.6] **Francesco Vinci**, Gyunam Park, Wil van der Aalst, Massimiliano de Leoni (2025). **Reliable and Configurable Process Simulations via Probabilistic White-Box Models**. In *International Conference on Service Oriented Computing*, pp. 337-352. Springer Nature Singapore. December 1-4, 2025, Shenzhen, China. DOI: 10.1007/978-981-95-5015-9_24. Ranking (CORE): A.
- [C.5] Ngoc-Diem Le, Alessandro Padella, **Francesco Vinci**, Massimiliano de Leoni (2025). **Leveraging Counterfactuals for Prescriptive Process Analytics**. In *Business Process Management: Responsible BPM Forum, Process Technology Forum, Educators Forum. BPM 2025*. Springer Nature Switzerland. DOI: 10.1007/978-3-032-02936-2_15.
- [C.4] **Francesco Vinci**, Gyunam Park, Wil van der Aalst, Massimiliano de Leoni (2025). **Online Discovery of Simulation Models for Evolving Business Processes**. In *International Conference on Business Process Management*, pp. 451-468. Springer Nature Switzerland. August 31- September 5, 2025, Seville, Spain. DOI: 10.1007/978-3-032-02867-9_27. Ranking (CORE): A.
- [J.1] **Francesco Vinci**, Massimiliano de Leoni (2025). **Balancing Fitness and Precision in Process Model Repair: Framework Formalization, Assessment, and Benefits for Simulation**. In *Process Science*, Vol. 2, n. 3, Best Process Science Conference Papers 2024 Collection. Springer Nature. DOI: 10.1007/s44311-025-00007-7.

- [C.3] **Francesco Vinci**, Massimiliano de Leoni (2024). **Repairing Process Models Through Simulation and Explainable AI**. In *International Conference on Business Process Management*, pp. 129-145. Springer Nature Switzerland. September 1-6, 2024, Krakow, Poland. DOI: 10.1007/978-3-031-70396-6_8. Ranking (CORE): A.
- [C.2] Alessandro Padella, Felix Mannhardt, **Francesco Vinci**, Massimiliano de Leoni, Irene Vanderfeesten (2024). **Experience-Based Resource Allocation for Remaining Time Optimization**. In *International Conference on Business Process Management*, pp. 345-362. Springer Nature Switzerland. September 1-6, 2024, Krakow, Poland. DOI: 10.1007/978-3-031-70396-6_20. Ranking (CORE): A.
- [C.1] Massimiliano de Leoni, **Francesco Vinci**, Sander Leemans, Felix Mannhardt (2023). **Investigating the Influence of Data-Aware Process States on Activity Probabilities in Simulation Models: Does Accuracy Improve?**. In *International Conference on Business Process Management*, pp. 129-145. Springer Nature Switzerland. September 11-15, 2023, Utrecht, The Netherlands. DOI: 10.1007/978-3-031-41620-0_8. Ranking (CORE): A.

Tools and Software

• ProSiT

Process Simulation Tool

2025



- Open-source web application for **data-driven business process simulation**, built with Python, Flask, and Docker. ProSiT ingests XES event logs and automatically discovers simulation parameters (control flow, resource assignments, timing distributions, trace attributes) using **explainable ML models** including probabilistic decision trees and statistical distributions.
- Supports interactive *what-if* scenario configuration, discrete-event simulation, and accuracy evaluation against real event data. Delivers visual analytics including process maps, cycle time distributions, and resource utilization heatmaps.

Conferences

- **23rd International Conference on Service-Oriented Computing (ICSOC 2025)** 1-4 December 2025
Harbin Institute of Technology, Shenzhen, China
◦ Attendee and Speaker
◦ Presented the paper "*Reliable and Configurable Process Simulations via Probabilistic White-Box Models*" at the main conference.
◦ Presented the paper "*ProSiT: A Tool for Interactive and Transparent Process Simulations*" at the demonstration and resources session.
- **23rd International Conference on Business Process Management (BPM 2025)** August 31 – September 5 2025
Universidad de Sevilla, Seville, Spain
◦ Attendee and Speaker
◦ Presented the paper "*Online Discovery of Simulation Models for Evolving Business Processes*" at the main conference.
- **7th International Workshop on Process-Oriented Data Science for Healthcare (PODS4H)** 14 October 2024
Technical University of Denmark, Lyngby, Denmark
◦ Attendee and Speaker
◦ Presented "*Healthcare Process Optimization via Simulations: An Emergency Department Case Study*" during the poster session.
- **6th International Conference on Process Mining (ICPM 2024)** 14 October 2024
Technical University of Denmark, Lyngby, Denmark
◦ Attendee
- **22nd International Conference on Business Process Management (BPM 2024)** 1-6 September 2024
AGH University, Krakow, Poland
◦ Attendee and Speaker
◦ Presented the paper "*Repairing Process Models Through Simulation and Explainable AI*" at the main conference.
- **12th European Big Data Management & Analytics Summer School (eBISS 2024)** 1-5 July 2024
University of Padua, Padova, Italy
◦ Organizer
- **21st International Conference on Business Process Management (BPM 2023)** 11-15 September 2023
Utrecht University, Utrecht, The Netherlands
◦ Attendee and Speaker
◦ Presented the paper "*Investigating the Influence of Data-Aware Process States on Activity Probabilities in Simulation Models: Does Accuracy Improve?*" at the main conference.

- **11th European Big Data Management & Analytics Summer School (eBISS 2023)** 3-7 July 2023
Universitat Politècnica de Catalunya, Barcelona, Spain 
 ◦ Attendee
- **Youth in Action for SDGs** 6 May 2022
Fondazione Italiana Accenture, Milan, Italy 
 ◦ Attendee
- **Web Summit 2021** 1-4 Novemeber 2021
Lisbon, Portugal 
 ◦ Attendee

Hackathons

- **World Data League** July 2021
World Data League 
 ◦ Finalist
- **Youth in Action** April 2021
Fondazione Italiana Accenture 
 ◦ *Premio Promotori* Winner

Skills

- **Programming Languages:** Python (Advanced), SQL, R, Julia, JavaScript, C, C++
- **ML & AI Frameworks:** PyTorch, TensorFlow, Keras, scikit-learn, XGBoost, CatBoost, LightGBM, SciPy, River (online ML), LangChain, SHAP (explainability)
- **Data Engineering & Analysis:** Pandas, NumPy, event log processing (XES/OCEL), time series analysis, anomaly detection, data augmentation, statistical modeling
- **Process & Simulation:** Discrete-event simulation, process mining (Pm4Py, ProM, Apromore), Petri nets, BPMN, what-if analysis, prescriptive analytics
- **MLOps & Infrastructure:** Docker, Git, GitHub Actions, Flask, REST APIs, SQLite, PostgreSQL, pgAdmin, MongoDB
- **Agentic AI & LLMs:** LangChain, prompt engineering, Claude Code, Cursor, agentic workflow design
- **Visualization & Reporting:** Matplotlib, Seaborn, Plotly, R Studio

Additional Information

Languages: Italian (C2), English (C1), German (A1), Spanish (A1)
Driving Licence: B (EEA)