

PERSONAL INFORMATION

Davide Marcato

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Gender Male | Nationality Italian

WORK EXPERIENCE

15 May 2023 – present

INFN Technologist

INFN Laboratori Nazionali di Legnaro – Legnaro (PD), Italy

Working for the PNRR TeRabbit project in the Datacloud software development team. Building an Identity and Access Management (IAM) system for the Italian and international research communities, including INFN Cloud and CERN WLCG. Managing the transition from VOMS proxy certificates to IAM tokens and the OIDC protocol. Further activities include the operations of Cloudveneto Openstack-based cloud infrastructure and the development of high level python tools to offload computationally intensive physics workloads to Kubernetes clusters in the cloud.

25 March 2021 – 14 May 2023

INFN Research Fellow

INFN Laboratori Nazionali di Legnaro – Legnaro (PD), Italy

Machine Learning for Particle Accelerators Control Systems. Technological research with focus on deep learning, anomaly detection and time series forecast. Applications in the fields of industrial control systems, beam transport optimization, predictive maintenance, root cause analysis and prognostics, in the context of the SPES project.

3 March 2016 – 24 March 2021

INFN Technician

INFN Laboratori Nazionali di Legnaro – Legnaro (PD), Italy

Design and implementation of control systems for particle accelerators (Alpi, Adige, SPES). Main working areas:

- Drivers to control hardware with EPICS
- Graphical User Interfaces
- Software libraries and procedures for high-level slow control.
- Data analysis with Machine Learning
- Alarm Handlers
- Heterogeneous systems integration
- Networking and system administration (Linux)
- Contributing to public open source software, in particular for EPICS.
- Development of innovative user interfaces based on web technologies.
- Study of centralized authentication and authorization systems.

1 July 2019 – 30 August 2019

CERN Openlab Summer Student

CERN – Geneva, Switzerland

Explorations in heterogeneous computing. Tweaking performance of CMSSW for both CPU and GPU using CUDA and heterogeneous computing libraries to enable faster execution of CMS pixel tracking. Porting of a clustering algorithm for HGCal to CUDA. Attended multiple seminars on physics and IT themes, from theoretical physics to machine learning.

3 March 2014 – 2 March 2016

INFN Scholarship

INFN Laboratori Nazionali di Legnaro – Legnaro (PD), Italy

Software development for the automatic testing of an RF power amplifier using the EPICS and CSS frameworks; maintenance and upgrades on the beam line of ALPI linear accelerator to install the new magnets control system; various software development to interface with hardware tools and expose their functionalities to the end user.

February 2011 – February 2014 **Pizza Chef**

Bazzolo & C. S.n.c di Bazzolo P.&C. – Legnaro (PD), Italy
Weekend job while studying at high school.

July 2012 **Internship**

ULSS 16, Hospital "Immacolata Concezione" – Piove di Sacco (PD), Italy
Summer internship.

ROLES AND RESPONSIBILITIES

Management roles

- IT Manager at IPAC 2023, Venice.
- Presentation Manager at IPAC 2022, Bangkok.
- Thesis supervisor for several students of the University of Padova, with projects on Machine Learning, control systems and computing infrastructure.
- Tutor for LNL 2021 and 2022 internships, with an introductory project on Machine Learning for high school students.

Science Communication and Outreach

- Guide at the INFN-LNL for visits of schools and the general public.
- Development of an interactive exhibit for the “Sperimentando” fair in Padova showing a small levitating train controlled by a PLC.
- Participation in the European Researchers’ Night 2019, at the University of Padova.
- Lectures at the Don Bosco Institute (Padova) on particle accelerators for high school students.
- Seminar “L’INFN per l’evoluzione informatica del Paese” as part of a series of seminars for the citizenship of the municipality of Legnaro organized by INFN-LNL.

EDUCATION

2020 – 2023 **Ph.D. in Information Engineering**

Università degli Studi di Padova, via 8 Febbraio 2, 35122 Padova (IT), Italy

[Research Project](#) Intelligent Control Systems and Machine Learning Approaches for Particle Accelerators

2017 – 2020 **Master’s degree - Software Engineering**

Università degli Studi di Padova, via 8 Febbraio 2, 35122 Padova (IT), Italy

[Qualification obtained](#) Master’s degree in Software Engineering - 110 Cum Laude

2013–2017 **Bachelor’s degree - Information Engineering**

Università degli Studi di Padova, via 8 Febbraio 2, 35122 Padova (IT), Italy

[Qualification obtained](#) Bachelor’s degree in Information Engineering - 96/110

2008–2013 **High School - Scientific School**

I.I.S. A. Einstein, via G. Parini 10, 35028 Piove di Sacco (PD), Italy

[Qualification obtained](#) Scientific Diploma - 95/100

COURSES AND CERTIFICATIONS

- November 2022 **SOSC 2022**
International School on Open Science Cloud, INFN – Perugia, Italy
- November 2022 **OIDC federation protocol analysis**
GARR Consortium – Online course
- May 2022 **AI@INFN Workshop**
INFN – Bologna, Italy
- April 2022 **AWS Discovery Day**
An official introduction to AWS, Fast Lane – Online course
- March 2022 **Google Cloud OnBoard**
GCP Fundamentals: Core Infrastructure, Fast Lane – Online course
- June 2021 **ML-INFN Hackaton**
Online event
- 30 April 2020 **Red Hat DO080**
Deploying containerized applications technical overview.
- July 2019 **Patatrack Hackaton**
Heterogeneous computing for CMS experiment. CERN – Geneva, Switzerland
- 23-28 October 2017 **ESC 17**
Ninth INFN International School on Architectures, tools and Methodologies for developing efficient large scale scientific computing applications
– Efficient exploitation of the C++ language
– Introduction to OpenCL and CUDA
– OpenMP, MPI programming
- February 2017 **Schneider PLC programming**
Schneider Electric S.p.A.
– Managing and Programming of a PLC with Unity Pro
– Application development for supervisory systems with Vijeo Citec
- 12-14 January 2015 **Linux Embedded Drivers**
Evidence s.r.l
- 25 July 2012 **First Certificate in English - Council of Europe Level B2**
University of Cambridge – ESOL Examinations

PERSONAL SKILLS

Mother tongue Italian

Other languages	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C2	B2	B2	B2
French	A1	A1	-	-	-

Levels: A1 and A2: Basic user – B1 and B2: Independent user – C1 and C2: Proficient user
[Common European Framework of Reference for Languages](#)

- Technical skills**
- Software development in Python, C, C++, Java, CUDA.
 - Machine learning for control systems applications.
 - Reinforcement learning.
 - Control system for industrial facilities and physics experiments, in particular with EPICS.
 - PLCs programming and management.
 - Expert in Linux and Bash.
 - Network and system administration.
 - Cloud computing, Docker, Kubernetes, OpenStack.
 - Web technologies (React, Bootstrap, Node.js, REST, Spring Boot)
 - Database design and management.

SCIENTIFIC PUBLICATIONS

- ICALEPCS 2023** W. Duckitt, J.K. Abraham, D. Marcato, and G. Savarese, "React Automation Studio: Modern Scientific Control with the Web", in Proc. 19th Int. Conf. Accel. Large Exp. Phys. Control Syst. (ICALEPCS'23), Cape Town, South Africa, Oct. 2023. doi:10.18429/JACoW-ICALEPCS2023-FR2BCO01
- IFAC 2023** D. Marcato, D. Bortolato, V. Martinelli, G. Savarese, G. A. Susto, Time-Series Deep Learning Anomaly Detection for Particle Accelerators, IFAC-PapersOnLine, Volume 56, Issue 2, 2023, Pages 1566-1571, ISSN 2405-8963, doi:10.1016/j.ifacol.2023.10.1855
- IPAC 2023** D. Marcato et al., "Demonstration of Beam Emittance Optimization using Reinforcement Learning", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 2881-2884. doi:10.18429/JACoW-IPAC2023-WEPA100
- IPAC 2023** D. Marcato et al., "Upgrade of the ALPI low and medium beta RF control system", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 4205-4208. doi:10.18429/JACoW-IPAC2023-THPA104
- IPAC 2023** G. Savarese et al., "First installation of the upgraded vacuum control system for ALPI accelerator", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 858-861. doi:10.18429/JACoW-IPAC2023-MOPL130
- IPAC 2023** L. Bellan et al., "New techniques for the LNL superconductive linac ALPI beam dynamics simulations and commissioning", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 1307-1310. doi:10.18429/JACoW-IPAC2023-TUODA3
- IPAC 2023** E. Fagotti et al., "Upgrade of the heavy ion accelerator complex at INFN-LNL", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 2198-2201. doi:10.18429/JACoW-IPAC2023-TUPM004
- IPAC 2023** A. Ruzzon et al., "Status of the commissioning of Beam Cooler for SPES project", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 2245-2248. doi:10.18429/JACoW-IPAC2023-TUPM028
- IPAC 2023** L. de Ruvo et al., "Functional Architecture of SPES Safety System", in Proc. IPAC'23, Venice, Italy, May 2023, pp. 4733-4735. doi:10.18429/JACoW-IPAC2023-THPL114
- IPAC 2022** G. Savarese, L. Antoniazzi, D. Bortolato, A. Conte, F. Gelain, D. Marcato, C. R. Roncolato; "Vacuum Control System Upgrade for ALPI Accelerator", in Proc. IPAC'22, Bangkok, Thailand, Jun. 2022, pp. 744-746. DOI: 10.18429/JACoW-IPAC2022-MOPOMS045

- IPAC 2022** V. Martinelli, et al., "BOLINA, a Suite for High Level Beam Optimization: First Experimental Results on the Adige Injection Beamline of SPES", in Proc. IPAC'22, Bangkok, Thailand, Jun. 2022, pp. 933-936. DOI: 10.18429/JACoW-IPAC2022-TUPOST035
- ICALEPCS 2021** D. Marcato, G. Arena, M. Bellato, D. Bortolato, F. Gelain, G. Lilli, V. Martinelli, E. Munaron, M. Roetta, G. Savarese, "Pysmlib: A Python Finite State Machine Library for EPICS", Proceedings of the 18th International Conference on Accelerator and Large Experimental Physics Control Systems (ICALEPCS 2021), DOI: 10.18429/JACoW-ICALEPCS2021-TUBL05
- ICALEPCS 2021** G. Savarese, G. Arena, D. Bortolato, F. Gelain, D. Marcato, V. Martinelli, E. Munaron, M. Roetta, "Design and Development of the new Diagnostic Control System for the SPES Project at INFN-LNL", Proceedings of the 18th International Conference on Accelerator and Large Experimental Physics Control Systems (ICALEPCS 2021) DOI: 10.18429/JACoW-ICALEPCS2021-TUPV016
- CCTA 2021** D. Marcato, G. Arena, D. Bortolato, F. Gelain, V. Martinelli, E. Munaron, M. Roetta, G. Savarese, G. A. Susto, "Machine Learning-based Anomaly Detection for Particle Accelerators", 2021 IEEE Conference on Control Technology and Applications (CCTA), 2021, pp. 240-246, DOI: 10.1109/CCTA48906.2021.9658806.
Winner of the Best Student Paper Award
- ICIS 2021** A. Galatà, A. Monetti, et al., "First beams from the 1+ source of the ADIGE injector for the SPES Project", Journal of Physics: Conference Series, Volume 2244, 19th International Conference on Ion Sources – ICIS2021 20/09/2021 - 24/09/2021 Online, DOI: 10.1088/1742-6596/2244/1/012069
- Springer Series in Reliability Engineering 2021** Barbariol T., Dalla Chiara F., Marcato D., Susto G.A., "A Review of Tree-Based Approaches for Anomaly Detection" Tran K.P. (eds) Control Charts and Machine Learning for Anomaly Detection in Manufacturing. Springer Series in Advanced Manufacturing. Springer, Cham. DOI: 10.1007/978-3-030-83819-5_7
- Journal of Physics 2020** M. Comunian et al., "Status of the SPES Exotic Beam Facility" Journal of Physics: Conference Series, vol.1401, pp.012002, January 2020. DOI: 10.1088/1742-6596/1401/1/012002
- CERN Openlab 2019** D. Marcato, "Explorations in heterogeneous computing", 2019 CERN Openlab Summer Student Reports
- Journal of Physics 2019** A. Galatà et al., "Towards the first beams from the ADIGE injector for the SPES Project" Journal of Physics: Conference Series, vol.1350, pp.012090, November 2019. DOI: 10.1088/1742-6596/1350/1/012090
- Journal of Physics 2019** G. Bisoffi et al., "Hardware Commissioning of the Refurbished ALPI Linac at INFN-LNL to Serve as SPES Exotic Beam Accelerator" Journal of Physics: Conference Series, vol.1350, pp.012091, November 2019. DOI: 10.1088/1742-6596/1350/1/012091
- IPAC 2018** G. Bisoffi et al., "Progress in the realization and commissioning of the exotic beam facility SPES at INFN-LNL" Journal of Physics: Conference Series, vol.1067, pp.052017, September 2018. DOI: 10.1088/1742-6596/1067/5/052017
- International Workshop on ECR Ion Sources 2018** A. Galatà et al., "Progresses in the installation of the SPES-Charge Breeder beam line" Journal of Instrumentation, vol.13, no.12, pp.C12009-C12009, December 2018. DOI: 10.1088/1748-0221/13/12/c12009
- IEEE Transactions on Nuclear Science 2018** D. Pedretti, M. Bellato, D. Bortolato, C. Fanin, F. Gelain, R. Isocrate, D. Marcato, E. Munaron, S. Pavinato, "The new Beam Diagnostic Data Readout and Signal Processing System at LNL" IEEE Transactions on Nuclear Science, vol.65, no.4, pp.972-979, April 2018. DOI: 10.1109/TNS.2018.2808220

- ICALEPCS 2017** D. Bortolato, S. Pavinato, M. Bellato, F. Gelain, R. Isocrate, D. Marcato, E. Munaron, D. Pedretti, "Upgrade of the LLRF Control System at LNL", in Proc. 16th Int. Conf. on Accelerator and Large Experimental Control Systems (ICALEPCS'17), Barcelona, Spain, Oct. 2017, paper TUPHA117, pp. 678-681, ISBN: 978-3-95450-193-9, DOI: 10.18429/JACoW-ICALEPCS2017-TUPHA117
- LINAC 2016** S. Pavinato, M. Betti, D. Bortolato, F. Gelain, D. Marcato, D. Pedretti, M. Bellato, R. Isocrate, M. Bertocco, "Development of a Digital LLRF Control System at LNL", in Proc. 28th Linear Accelerator Conf. (LINAC'16), East Lansing, MI, USA, Sep. 2016, paper THPLR048, pp. 966-968, ISBN: 978-3-95450-169-4. DOI: 10.18429/JACoW-LINAC2016-THPLR048
- RT 2016** D. Bortolato, S. Pavinato, D. Pedretti, M. Betti, F. Gelain, D. Marcato, M. Bellato, R. Isocrate, M. Bertocco, "New LLRF control system at LNL," 2016 IEEE-NPSS Real Time Conference (RT), Padua, 2016, pp. 1-8, DOI: 10.1109/RTC.2016.7543105
- RT 2016** D. Pedretti, S. Pavinato, M. Betti, D. Bortolato, F. Gelain, D. Marcato, M. Bellato, R. Isocrate, M. Bertocco, "An I/O controller for real time distributed tasks in particle accelerators," 2016 IEEE-NPSS Real Time Conference (RT), Padua, 2016, pp. 1-7, DOI: 10.1109/RTC.2016.7543108
- ICALEPCS 2015** D. Pedretti, D. Bortolato, F. Gelain, M. Giacchini, D. Marcato, M. Montis, S. Pavinato, J. A. Vasquez, M. Bellato, R. Isocrate, "Custom Hardware Platform Based on Intel Edison Module", in Proc. 15th Int. Conf. on Accelerator and Large Experimental Physics Control Systems (ICALEPCS'15), Melbourne, Australia, October 2015, paper WEM307, pp. 673-676, ISBN: 978-3-95450-148-9, DOI: 10.18429/JACoW-ICALEPCS2015-WEM307