Curriculum vitae

PERSONAL INFORMATION

Marco Zini

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Gender Male | Date of birth 1 July 1990 | Nationality Italian

WORK EXPERIENCE

September 2023 – Present — Adjunt Professor at the University of Florence

MSc: Mechanical Engineering for Sustainability (MES)

Course: Smart Energy Systems, Storage and Technologies (1 CFU)

Topics: Sustainable Development Goals, Smart Cities, Renewable Energy Communities

December 2022 – Present — Member of "Gruppo Energia UniFi" (UniFi Energy Group)

Department of Industrial Engineering (DIEF), Università degli Studi di Firenze
Via di Santa Marta 3, Florence, Italy

Active participation in the activities of a group set up by the University of Florence to analyse structures, systems and energy consumption of university buildings and propose energy efficiency solutions.

Key activities: Gathering and organizing data related to energy consumption, data analysis, and validation through on-site inspections, development of energy monitoring methods using advanced statistical and machine learning techniques, and techno-economic evaluation of potential modifications to existing systems..

December 2022 – Present — Research fellowship

Department of Industrial Engineering (DIEF), Università degli Studi di Firenze
Via di Santa Marta 3, Florence, Italy

Energy demand analysis and monitoring methods applied to the University of Florence buildings and other industrial buildings

Collaboration with **Sammontana S.p.A.**: : Energy simulations of buildings and industrial systems aimed at optimizing current facilities and assessing the technical and economic feasibility of new renewable energy generation systems

January 2020 – November 2022 — Collaboration with Azienda Ospedaliero-Universitaria Careggi

Department of Industrial Engineering (DIEF), Università degli Studi di Firenze
Via di Santa Marta 3, Florence, Italy

Collaboration with "Azienda Ospedaliero-Universitaria Careggi", Optimization of a trigeneration system from a techno-economic and environmental point of view.
Analysis of the energy consumption of a natural gas city gate station

September 2019 - November 2019 — Preliminar activities to Ph.D. studies

Casa di Cura Villa Donatello S.p.A., Florence, Italy

Building energy demand analysis

September 2017 - March 2018 — Undergraduate Internship

Department of Industrial Engineering (DIEF), Università degli Studi di Firenze
Via di Santa Marta 3, Florence, Italy

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Numerical analysis of the aerodynamic behavior of a vertical axis wind turbine in turbulent flow
Employed as: intern/trainee - undergraduate internship
Number of hours: 300

September 2008 - October 2008

Apprenticeship

Bonini Simone Impianti, Florence, Italy

Assembling and disassembling of wireways and electrical wiring for houses, offices and small businesses

June 2008 - July 2008

Apprenticeship

ASC - Automazione e sicurezza, Florence, Italy

Fixing and maintenance of alarm systems, security systems and gates

EDUCATION AND TRAINING

2019 – 2022

Ph.D. Degree - Industrial Engineering

Department of Industrial Engineering (DIEF), Università degli Studi di Firenze
Via di Santa Marta 3, Florence, Italy

Curriculum: Energy and innovative industrial and environmental technologies

Ph.D. Thesis: *Developing of machine learning-based energy monitoring methodologies for the building energy demand of healthcare facilities: an Italian case study*

Collaboration with "Casa di Cura Villa Donatello S.p.A".

The Ph.D. research regards the development of energy monitoring methods through machine learning (especially artificial neural networks) and building energy modelling. A continuous *HVAC* system optimization has been carried out exploiting the building energy management system (*BEMS*).
Tutors:
- Prof. Carlo Carcasci

2015 – 2019

Master Degree in Energy Engineering

Università degli Studi di Firenze, Florence, Italy

Degree grade: **108/110**.
Thesis title: "*Numerical analysis of the aerodynamic behaviour of a vertical axis wind turbine in turbulent flow*".

2009 – 2015

Bachelor Degree in Mechanical Engineering

Università degli Studi di Firenze, Florence, Italy

Thesis title: "*Acquisition and processing of an audio signal*".

2004 - 2009

School leaving certificate (Electrotechnic technician)

I.T.I. Leonardo da Vinci, Florence, Italy

PERSONAL SKILLS

Mother tongue: Italian

Other languages

	UNDERSTANDING		SPEAKING		WRITING
	Listening	Reading	Spoken interaction	Spoken production	
English	C1	C1	C1	C1	C1

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

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Communication skills

- Predisposition to teamwork developed during studies, PhD activities, as well as while working in the technical office of Villa Donatello S.p.A.
- Communication skills developed through presenting at international conferences and coordinating seminars and lessons for energy engineering courses

Technical skills

- Proficiency in optimizing building energy demand. Experience in Building Energy Management Systems (BEMS) use and hands-on experience in optimizing *HVAC* systems acquired through employment at the healthcare facility "*Casa di Cura Villa Donatello S.p.A.*".
- Experience in building energy modelling (EnergyPlus) obtained by implementing the digital twin of a healthcare facility
- Data analysis, data science and programming skills acquired during PhD and through personal and personal interest-guided studies.
- Machine Learning skills obtained through the development ML-based building energy monitoring methods and through personal interest-guided studies.
  - Programming language: Python 3
  - Third party packages: Scikit-learn, Tensorflow (Keras), PyTorch

Digital competences

SELF-ASSESSMENT				
Information Processing	Communication	Content creation	Safety	Problem solving
Proficient user	Basic user	Independent user	Independent user	Proficient user

Digital competences - Self-assessment grid

Computer skills

- **OS**
  - Windows
  - Linux CentOS 7
  - Linux Ubuntu 19

- **Programming languages**
  - Python 3 (Proficient)
  - C (Basic)
  - Matlab, Octave (Indipendent)
  - SQL (Basic)
  - Java (Basic)
  - Fortran (Basic)
  - LaTex (Indipendent)

- **Software**
  - Microsoft Office Suite (Proficient)
  - OriginLab (Proficient)
  - Microsoft Visio (Indipendent)
  - GNU Gimp (Indipendent)
  - ANSYS Fluent (Indipendent)
  - EnergyPlus (Proficient)
  - PostgreSQL (Basic)
  - National Instrument Labview (Basic)
  - MATLAB Simulink
  - DaVinci Resolve (Basic)
  - Reaper (Digital Audio Workstation)

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Courses and Certifications

– **CINECA**
  - Introduction to Python Programming
  - Introduction to Deep Learning with Tensorflow
  - Introduction to Julia programming language
  - Introduction to Fortran for Scientific Computing

– **Fòrema**
  - *Energy Specialist*, la nuova figura professionale che ottimizza il consumo energetico nelle aziende

– **Cluster Energia**
  - *Masterclass Energy Manager*: 24 hours
  - *Masterclass Renewable Energy Communities*: 8 hours
  - *Masterclass New renewable energy plants*: 8 hours

Conferences

– **International Conferences**
  - 16th Conference on Sustainable Development of Energy, Water and Environment System, Dubrovnik (Croatia), October 10-15, 2021
  - ASME Turbo Expo 2022 - Turbomachinery Technical Conference & Exposition
  - 17th Conference on Sustainable Development of Energy, Water and Environment System, Paphos (Cyprus), November 6-10, 2022
  - 18th Conference on Sustainable Development of Energy, Water and Environment System, Dubrovnik (Croatia), September 24-29, 2023

– **National Conferences**
  - ATI 2020 | 75° Congresso Nazionale ATI, Roma (Italy), 15-16 September, 2020

Driving licence A2, B

PUBLICATIONS

[1] Francesco Balduzzi, **Marco Zini**, Andreu Carbó Molina, Gianni Bartoli, Tim De Troyer, Mark C. Runacres, Giovanni Ferrara, and Alessandro Bianchini. “Understanding the Aerodynamic Behavior and Energy Conversion Capability of Small Darrieus Vertical Axis Wind Turbines in Turbulent Flows”. In: *Energies* 13.11 (2020). URL: https://www.mdpi.com/1996-1073/13/11/2936.

[2] Francesco Balduzzi, **Marco Zini**, Giovanni Ferrara, and Alessandro Bianchini. “Development of a Computational Fluid Dynamics Methodology to Reproduce the Effects of Macroturbulence on Wind Turbines and Its Application to the Particular Case of a VAWT”. In: *Journal of Engineering for Gas Turbines and Power* 141.11 (Oct. 2019). 111010. eprint: https://asmedigitalcollection.asme.org/gasturbinespower/article-pdf/141/11/111010/6426059/gtp_141_11_111010.pdf. URL: https://doi.org/10.1115/1.4044231.

[3] Alessandro Bianchini, Carlo Carcasci, Giampaolo Manfrida, and **Marco Zini**. “Reconstruction and Analysis of the Energy Demand of a Healthcare Facility in Italy”. In: *E3S Web Conf.* 197 (2020), p. 02009. URL: https://doi.org/10.1051/e3sconf/202019702009.

[4] **Marco Zini** and Carlo Carcasci. “Developing of an Offline Monitoring Method for the Energy Demand of a Healthcare Facility in Italy”. In: *16th SDEWES Conference* (2021). Dubrovnik, Croatia.

[5] **Marco Zini** and Carlo Carcasci. “Developing of an Offline Monitoring Method for the Energy Demand of a Healthcare Facility in Italy”. In: *Journal of Sustainable Development of Energy, Water and Environment Systems* 10 (4 2022). URL: http://www.sdewes.org/jsdewes/pid10.0421.

[6] **Marco Zini** and Carlo Carcasci. “Modelling and optimization of a hospital gas turbine-based cogeneration system”. In: *ASME TurboEXPO* (2022). Rotterdam, Netherlands.

[7] **Marco Zini** and Carlo Carcasci. “Dynamic Building Energy Modelling of Healthcare Facilities: An Italian Case Study”. In: *17th SDEWES Conference* (2022). Paphos, Cyprus.

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[8] **Marco Zini**, Roberto Sodini, and Carlo Carcasci. “Modeling and Optimization of a Hospital Gas Turbine-Based Cogeneration System”. In: *Journal of Engineering for Gas Turbines and Power* 144.11 (Sept. 2022). 111009. eprint: https://asmedigitalcollection.asme.org/gasturbinespower/article-pdf/144/11/111009/6918594/gtp_144_11_111009.pdf. URL: https://doi.org/10.1115/1.4055418.

[9] **Marco Zini**, Giampaolo Manfrida, Alessandro Bianchini, and Carlo Carcasci. “Richiesta energetica di ospedali e strutture sanitarie: un caso studio italiano”. In: *La Termotecnica* (2022). URL: https://www.verticale.net/requisiti-energetici-di-strutture-sanitarie-e-ospedali-27500?nl=1&codice=5416724673979629857 8.

[10] **Marco Zini** and Carlo Carcasci. “Machine learning-based monitoring method for the electricity consumption of a healthcare facility in Italy”. In: *Energy* 262 (2023), p. 125576. URL: https://www.sciencedirect.com/science/article/pii/S0360544222024628.

[11] **Marco Zini** and Carlo Carcasci. “Analysis and monitoring of HVAC systems energy demand in an italian healthcare facility”. In: *18th SDEWES Conference* (2023). Dubrovnik, Croatia.

[12] **Marco Zini**, Lapo Cheli, and Carlo Carcasci. *Machine Learning-Based Energy Monitoring of Buildings: Development of a Systematic Method Applied to an Italian Case Study*. en. SSRN Scholarly Paper. June 2023. (Visited on 11/30/2023).

[13] **Marco Zini** and Carlo Carcasci. “Machine learning-based energy monitoring method applied to the HVAC systems electricity demand of an Italian healthcare facility”. In: *Smart Energy* (Mar. 2024), p. 100137. (Visited on 03/21/2024).

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