

# CURRICULUM VITAE

Marco Cristoforetti

## PERSONAL INFORMATION

First name / Surname: Marco Cristoforetti

Date of Birth:

Nationality:

Work address: Fondazione Bruno Kessler, via Sommarive 18 – Povo, I-38123 Trento, Italy

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Google Scholar: <https://scholar.google.it/citations?user=FcIaNuAAAAAJ&hl=it>

Occupational field: data scientist

## RESEARCH INTERESTS

In the field of Data Science my expertise as computational and theoretical physicist are exploited for designing models used for the analysis of complex data as for batch and streaming data processing.

In this direction I am particularly interest in machine learning methods for time series analysis and forecasting. These algorithms can be applied to several global challenges of the coming years: **condition monitoring** and **predictive maintenance** in Digital Industry, **production and quality estimation** in Digital Agriculture and **predicting the effects of extreme events** in climate science.

In physics the use of deep learning algorithms has exploded in recent years. My education and research activity as a physicist and my experience as data scientist are an effective combination developing **data science solutions for High Energy & Quantum Physics**.

## PROFESSIONAL EXPERIENCE

*Gen. 2021 - :* **Researcher**, Head of the Data Science for Industry and Physics unit (DSIP), Digital Industry Center, FBK , Trento, Italy

*Dec. 2014 – Dec. 2020 :* **Researcher**, Predictive Models for Biomedicine and Environment (MPBA), ICT Center (FBK), Trento, Italy

*April 2010 – Nov. 2014 :* **Postdoctoral** Research Associate, European Centre for Theoretical Studies in Nuclear Physics and related areas (ECT\*), Trento, Italy

*Oct. 2007 – Mar. 2010 :* **Postdoctoral** Research Associate, Technical University of Munich (TUM), Munich, Germany.

## EDUCATION

- 5<sup>th</sup> Nov. 2007: Ph.D. degree in Physics, Trento University, Italy  
Thesis title: “*Chiral dynamics in light hadrons with instantons*”.  
Supervisor: Prof M. Traini.
- 29 Aug. – 7 Sep. 2007: Admitted to the “International School of subnuclear Physics”, Directors.  
G. ‘t Hooft and A. Zichichi, Erice (Italy) 29 August – 7 September  
2007.
- Feb. 2007 – Apr. 2007: spent at the SUNY, Stony Brook working with Prof. E. Shuryak.
- Feb. 2004: Master degree in Physics, Milano University, Italy  
Thesis title: “*Semiclassical QCD contributions to non-leptonic weak decays of light baryons*”. Supervisor: Prof. R. Ferrari.

## RECENT AND ONGOING PROJECTS

### Data Science for Digital Industry

- 2020 – 2023: “**RUBY: Robust and reliable general management tool for performance and dUraBility improvement of fuel cell stationarY units**” H2020, FCH JU call for proposal 2019, Research & Innovation.
- 2019 – 2021: “**AI for predictive maintenance**” – SAME DEUTZ-FAHR ITALIA S.p.A.
- 2019 – 2021: “**Modello predittivo per stima del segno di area**” – Dolomiti Energia Trading
- 2017: “**Online banking anti-fraud monitoring**” – Security Reply. EIT Digital Finance Action Line. **Awarded EIT Digital “Impact Success Story”**
- 2014- 2015: “**Enel Settlement gas**” for ENEL Energia

### Data Science for Physics

- 2019 – : Member and active Author of the ATLAS Collaboration @CERN. Working on application of **Machine Learning to the flavor tagging** problem.
- 2019 – : **Deep Learning based Tracking system** for the HEPD system in the CSES-Limadou experiment.
- 2020 – : **Deep Learning for proton computed tomography**. In collaboration with the Center for Sensor and Devices, FBK (I) and University of Liverpool (UK).
- 2019 – 2021: **ARTificial Intelligence for Quantum Systems (ARTIQS)**. Project funded in the context of the Quantum at Trento (Q&TN) initiative.
- 2019: **OpenHack: “ML for High Energy Physics experiments”** organized in FBK in collaboration with members of the LHCb@CERN experiment and Microsoft Azure (US).

### Data Science for Agriculture

- 2020 – 2022: “**MAPPIAMO: Modelli e Algoritmi per la Previsione su una Piattaforma Integrata per una Agricoltura MODerna**” – Cantina Valpolicella Negrar sca, Cantina Sociale La Guardiense sca and Consorzio Cooperative Riunite d’Abruzzo sca. Funded by Ministero Sviluppo Economico.
- 2020: “**Deep Learning based worldwide crop-specific growth forecast by weather and satellite data**”, Microsoft Azure AI4Earth grant
- 2019 – 2020: “**Artificial intelligence at the service of the census and management of grazing areas**” – Dipartimento Territorio, Agricolture e Foreste, Provincia

- Autonoma di Trento.
- 2019 – : **“CatchMe: platform for detection and counting of harmful insects”** – CAVIT s.c.
- 2017 – 2020: **“Fruitipy. Deep Learning for monitoring grape in pre-harvesting season”** – CAVIT s.c.
- 2016 – 2018: **“Enophit. Predicting models for monitoring and preventing phytopathologies”** – MPA Solutions. Trentino L.P. 6/1999

#### **Data Science for weather forecast and climate change**

- 2020 – 2022: **“MIARAD: Modelli di Intelligenza Artificiale per Nowcasting Radar con applicazioni alle capacità di allerta real-time”** with Arpa Emilia Romagna and CINECA.
- 2019 – 2021: **“AI based nowcasting radar model for early warning”** – MeteoTrentino.
- 2018 – 2021: **“Frost Risk Prediction”** funded through Partenariato Europeo per l’Innovazione “Produttività e sostenibilità dell’agricoltura” (PEI\_AGRI).
- 2018: **“Modelling crop-specific impact of heat waves by deep learning”**, Microsoft Azure AI4Earth grant

#### **Data Science for Digital Society**

- 2018 – 2019: **“ACCEPT: Knowledge-based Counter-narratives Campaign to Increase Social Acceptance of LGBTI People and Rights and Reduce Homophobic and Transphobic Hate in Italy”**, H2020 Rights, Equality and Citizenship Programme 2016.
- 2016: **“Vaccine Confidence Monitoring Platform”** – ISS Veneto, Liguria, Toscana, Emilia Romagna, Lazio, Marche, Puglia, Sardegna, Sicilia. Funded by Programma CCM 2014.

#### **SUPERVISION ACTIVITIES**

- 2021: **Tutor of M.Sc. student** (Massimiliano Datres). Internship
- 2020 – 2023: **Co-advisor PhD student** (Daniela Mascione)  
With prof. Roberto Iuppa, Dept. of Physics, University of Trento (I).  
Topic: *“Data science for particle physics”*
- 2020: **Co-advisor B.Sc student** (Alberto Anzellotti)  
With prof. Leonardo Ricci, Dept. of Physics, University of Trento (I).
- 2020: **Tutor of B.Sc. student** (Alberto Anzellotti). Internship.
- 2018 – 2022: **Co-advisor PhD student** (Thomas Ackernley)  
With dr. Kurt Rinnert, Dept. of Physics, University of Liverpool (UK).  
Topic: *“Deep Learning for proton computed tomography”*
- 2018 – 2021: **Co-advisor PhD student** (Andrea Di Luca)  
With prof. Roberto Iuppa, Dept. of Physics, University of Trento (I).  
Topic: *“Deep Learning for High Energy Physics”*
- 2018: **Co-advisor M.Sc. student** (Sagar Malhotra)  
With prof. Roberto Iuppa, Dept. of Physics, University of Trento (I).
- 2017: **Co-advisor M.Sc. student** (Giulia Gangi)

- With prof. Claudio Agostinelli, Dept. of Mathematics, University of Trento (I)
- 2017: **Tutor of M.Sc. student** (Giulia Gangi). Internship
- 2016: **Co-advisor B.Sc. student** (Luca Coviello)  
With prof. Alberto Montresor, DISI, University of Trento (I)
- 2016: **Co-advisor B.Sc. student** (Andrea Nardelli)  
With prof. Mauro Brunato, DISI, University of Trento (I)

## TEACHING ACTIVITIES

- 2018 - 2019: **Tutor**, WebValley, FBK international data science Summer Course for high school (18y) talented students.
- 2016 - 2017: **Tutor and coordinator**, WebValley, FBK international data science Summer Course for high school (18y) talented students “*Deep Learning solutions for Digital Agriculture*”.
- WS 2009: **Lecture assistant**, *Quantum mechanics II*, Physics Department, Technical University of Munich, Germany.
- SS 2008: **Teaching assistant**, *Theoretical Physics for Bachelors I (mechanics and thermodynamics)*, Physics Department, Technical University of Munich, Germany.
- 2005-2006 **Examination assistant**, *Introduction to Quantum Physics*, Physics Department, University of Trento, Italy.
- 2005-2006 **Examination assistant**, *General physics VI*, Physics Department, University of Trento, Italy

## REFEREE FOR INTERNATIONAL JOURNALS

Physical Review D.  
Physics Letters B.  
ISPRS Journal of Photogrammetry and Remote Sensing.

## MOST RELEVANT PUBLICATIONS of the last ten years

1. **Proton path reconstruction for pCT using Neural Networks”**  
T Ackernley, G Casse, M Cristoforetti  
[arXiv:2010.00427]
2. **“How do Twitter users react to TV broadcasts dedicated to vaccines in Italy?”**  
F. Gesualdo et al., European Journal of Public Health, (2020).
3. **“GBCNet: In-Field Grape Berries Counting for Yield Estimation by Dilated CNNs”**  
L. Coviello, M. Cristoforetti, G. Jurman, C. Furlanello Applied Sciences 10 (14), 4870 (2020)
4. **“Influence of augmented humans in online interactions during voting events”**,  
M. Stella, M. Cristoforetti, M. De Domenico, PloS one 14 (5), e0214210 (2019)
5. **“Evaluating reproducibility of AI algorithms in digital pathology with DAPPER”**,  
A. Bizzego, N. Bussola, M. Chierici, V. Maggio, M. Francescato, L. Cima, M. Cristoforetti, G. Jurman, C. Furlanello, PLoS Comp. Bio. e1006269 (2019)

6. **“Deep Learning Approach to Track Reconstruction in the upgraded VELO”**,  
K. Rinnert, M. Cristoforetti, EPJ Web of Conferences 214, 06038, (2019)
7. **“Early Detection and Information Extraction for Weather-induced Floods using Social Media Streams”**, C. Rossi, M. Cristoforetti et al., International Journal of Disaster Risk Reduction, 30, 145 (2018).
8. **“Lefschetz thimble Monte Carlo for many body theories: application to the repulsive Hubbard model away from half filling”**  
A. Mukherjee, M. Cristoforetti, Phys. Rev. B 90, 035134, 2014
9. **“Monte Carlo simulations on the Lefschetz thimble: taming the sign problem”**  
M. Cristoforetti, F. Di Renzo, A. Mukherjee, L. Scorzato,  
Phys. Rev. D88 (R): 051501, 2013
10. **“Quark flavour effects on gluon and ghost propagators”**  
A. Ayala, A. Bashir, D. Binosi, M. Cristoforetti and J. Rodriguez-Quintero  
Phys. Rev. D86: 074512, 2012
11. **“New approach to the sign problem in quantum field theories: High density QCD on a Lefschetz thimble”** M. Cristoforetti, F. Di Renzo, L. Scorzato,  
Phys. Rev. D86: 074512, 2012
12. **“Are there hadronic bound states above the QCD transition temperature?”**  
C. Ratti, R. Bellwied, M. Cristoforetti, M. Barbaro, Phys. Rev. D85: 014004, 2012
13. **“Instanton fermionic zero mode at finite temperature and chemical potential”**  
M. Cristoforetti, Phys. Rev. D84:114016, 2011

*I authorise the processing of my personal information under D.Lgs. 196/03.  
Autorizzo il trattamento dei miei dati personali, ai sensi del D.lgs. 196 del 30 giugno 2003 e ss. mm.*