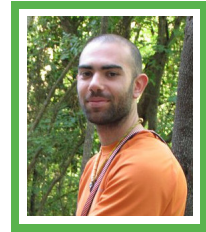# Alessandro Manfredini

Curriculum Vitae

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Personal Details

Birth   *November 11th 1985*, Rome, Italy.

Nationality   *Italian.*

Education

2018–Present   **Postdoctoral Fellow in Astroparticle Physics**.
University Of Zurich, Zurich, Switzerland.

2014–2018   **Postdoctoral Fellow in Astroparticle Physics**.
Weizmann Institute of Science, Rehovot, Israel.

2011–2014   **Ph.D. Student in Experimental Particle Physics.**
Max-Planck Institute For Physics, Munich, Germany.

2008–2010   **Master of Science in Nuclear and Sub-nuclear Physics.**
University of Roma Tre, Rome, Italy. Grade: 110/110 magna cum laude.

Coordination and Awards

2016–2018   I was the XENON1T experiment's statistical inference coordinator.

2019 –   DARWIN experiment's "electrodes and high voltage" sub-group coordinator.

2017   Awarded *"senior postdoctoral fellow"* at Weizmann Institute of Science.

Skills Highlights

My main expertise are in data intensive statistical analyses and the Internet of Things. Proficient in C++, JavaScript and Python. Good knowledge of back-end and front-end web programming as well as micro-service orchestration with Kubernetes. Good knowledge of SQL and NoSQL databases and data streaming platform like Kafka.

Research During Second Postdoc

2018–Present I joined the group of Prof. Laura Baudis as co-leader of an ERC funded R&D project for the future DARWIN dark matter detector (more info here). I am responsible for the design of a fully automated experiment monitoring and control system based on industrial Programmable Logic Controllers (PLC) and state of the art of big-data tools. I designed innovative IoT gateways (OPC-Proxy and IoTpy) that allows to connect the data-taking sensors with the micro-services infrastructure of our back-end. We use Kubernetes to orchestrate a series of services that includes Prometheus, Grafana, NodeJs and Apache Kafka. Finally, I designed the graphical user interface of our system, allowing to control the experiment remotely from a browser.

Research During First Postdoc

2014–2018 I joined the XENON dark matter project in the group of Prof. Ran Budnik. The XENON collaboration consist of more than 100 physicist from all over the world.

Statistics: For two years I was co-leading the statistical inference team of the XENON1T experiment, where I performed hypothesis testing with computation of the confidence intervals and developed the statistical model of the experiment.

Data Analysis: I contributed with two independent Analyses. One performing dark matter search in the framework of Effective Field Theory. The other investigating inelastic dark matter scattering on ^{129}Xe isotope.

Slow Control: I was part of the XENON1T slow control developers team. My main contribution was to design the safety and motion control systems for a set of motors and belts used to move calibration sources in the experiment. I also developed the high voltage module controller, and the safety system of the experiment's water recirculation facility.

Research During Ph.D.

I joined the ATLAS experiment at CERN in 2011 under the supervision of Dr. Sandra Kortner. The ATLAS collaboration consist of thousands of physicist all over the world.

Thesis Title: "Search for Neutral MSSM Higgs Bosons in $A/h/H \to \tau^+\tau^- \to e\mu + 4\nu$ Decays with the ATLAS Detector."

Data Analysis I was part of the ATLAS Beyond Standard Model Higgs sub-group. I contributed to the neutral MSSM Higgs boson search of which I was one of the main analyzer. My contribution was focused on the estimation of the backgrounds and their systematics, the implementation of the probability model for hypothesis testing, and on studies aimed to improve the signal sensitivity at low mass employing flavor tagging techniques.

Software Skills

Programming Languages	Proficient in C++, Python, JavaScript, TypeScript, HTML, CSS. Good knowledge of C#.
Data Analysis and Statistics	Good knowledge of SciPy, NumPy and Pandas libraries. Good knowledge of the ROOT framework, ROOSTAT and RooFit.
Deep Learning	Basic knowledge of Keras and TensorFlow.
Web Tools	SQL (PostgreSQL) and NoSQL (MongoDB) databases. Server-side programming with NodeJS, Twisted. Good knowledge of asynchronous programming and multi-threading programming. Websocket and SSE. Knowledge of lit-element front-end framework (for custom-elements) and Redux.
Communication Protocols	RS232, TCP-IP sockets, OPC, MQTT.
Monitoring	Operative knowledge of Prometheus, AlertManager, InfluxDB and Grafana.
Cloud	Experience with Google Cloud Platform, Kubernetes, Docker.
Big Data	Operative knowledge of Apache Kafka.
Automation	PLC ladder diagram and structured text programming.

My Git Repositories

Xephyr	- A statistical framework (C++).
ImperaJS	- An app-state managment framework (Javascript).
Brick-Element	- A web-component generator (Javascript).
OPC-Proxy	- A modular OPC gateway (C#).
JaS-HMI	- A Javascript Human-Machine-Interface framework.
IOTpy	- A Python framework to expose devices trough REST API.

Language Skills

Mother tongue	Italian
English	Fluent - (CEFR C1)
Spanish	Good understanding - (CEFR B1)
German	Basics - (CEFR A2)