Luca Bottero

Personal Information

Date of Birth *February 20th, 1999*
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Education

Oct 2022 – Present **Master in Theorethical Physics** – *University of Turin, Italy*

July 2021 **Summer School Student** – Università della Svizzera Italiana (in collaboration with Swiss National Supercomputing Centre), *Viganello, Switzerland*

- CSCS-USI Summer School 2021: Effective High-Performance Computing & Data Analytics with GPUs
- In-depth study of HPC architectures and instruments, including: GPU programming with CUDA and OpenACC, kokkos and JupyterLab for HPC
- Theory and application of Python HPC libraries: Numpy, SciPy, Dask, Numba
- Theory and Application of Python ML & DS libraries: RAPIDS and TensorFlow
- Successfully passed the exam (*6 ECTS*)

Oct 2018 – Nov 2022 **Bachelor in Physics** – *University of Turin, Italy.*

- **Graduation date:** 17th of November, 2022
- Thesis title: "Investigating the 3-body decay of the (anti-)hypertriton in pp collisions with ALICE using machine learning techniques"

2013 – 2018 **Liceo Scientifico** – *Liceo G. Giolitti - G. B. Gandino* – "Opzione Scienze Applicate" (Applied Sciences curricula)

- Participation in many extra-curricular activities in several different scientific fields
- Development of a *C++* library for creation of arbitrary Multi-Layer Feed-Forward Neural Network for the end of study thesis

Work Experience

Jun 2023 – Present **Ai & ML consultant**, – *Turin, Italy & web-based*

- **Partita IVA no. 04063950044** - ATECO codes: 62.02 (IT consulting) & 62.01 (Software production)
- **Past works**:
  - creation of a chat-based, Generative, Retrieval-Augmented Question-Answering API: by interaction with a chat, the user receives a natural language response based on actual facts retrieved from the company's documentation together with a reference to the documents used to generate the answer.
  - data analysis and statistical modeling of a massive time-series purchasing dataset. Development of a predictive algorithm for the forecast of sales. Investigation of the usage of GenAI technologies in retail operations.
  - full stack design, development and deployment of an AI-centered web app, called mIA, with a strong focus on its generative aspects (RAG text, video and audio).

Dec 2022 – Dec 2023 **The Clever Company srl. Co-Founder and Chief AI Officer**, – *Turin, Italy*

- Startup building the **clevi.co** service: online supermarkets shopping platform with a focus on saving by comparing products prices between different vendors.
- Advanced product matching and similarity evaluation capabilities. Generative AI integration for automatic creation of optimized carts from *natural language interaction* between AI and human customer
- Building of ML comparison models between commodities, NLP, data collection, elaboration and modeling, advanced data analysis, ML model development and deployment to production, Transformers pre-training and fine-tuning

Oct 2021 – Present **Freelancer** – Upwork (*Web-based*)

- Freelancer building **Machine Learning** models and advanced **Data Analysis** for a wide range of use-cases

Jan – Feb 2022 **Informatics teacher at high school**, – *Liceo G. Giolitti - G. B. Gandino, Bra, Italy*

- Teaching of Informatics at the "triennio" of "Liceo opzione Scienze applicate" (Appliced sciences curricula): equivalent to year 11, 12 and 13 of UK's school system (KS4-KS5)

Aug – Oct 2018 **Training Internship** – Tesi SpA, *Roreto di Cherasco (CN), Italy*

- Production of web interfaces for end-user supply chain management

2016 – Present **Private Teacher**

- Extensive experience as a private teacher of scientific subjects (Mathematics, Physics, Natural Sciences, IT) for high-school and undergraduate students
- Developed strong teaching skills focused on making "growth paths" tailored on the peculiar capabilities of each student

Extracurricular Activities

May – Dec 2020 **Team Member** – *ProjectX2020 Competition*

- Selected to get access as the only European University
- Member of the selected 6 participants of the *University of Turin's* Team
- Development of a Physics Informed Neural Network for Wildfire propagation (see "Publications" below)
- Collaboration with MIT' JuliaLAB for development, testing and usage of the Julia Language library *NeuralPDE.jl*

Dec 2020 – July 2022 **Co-Founder & Council Member** – *Machine Learning Journal Club, Turin, Italy*

Aug 2022 – Present **Co-Founder & Vice-President** – *Machine Learning Journal Club, Turin, Italy*

- Founding Member of the **1st Italian** collaborative research project (*no-profit organization*) managed by students, in cooperation with the *University of Turin.*
- Teaching **Python** for Scientific Computing and Practical Machine Learning, including group teaching of standard as well advanced ML techniques (theory and application)
- Participation in several online competitions (mainly on the kaggle platform)
- Study of advanced ML topics, including (but not limited to): PINNs, TDA, DeepRL, Continual Learning, NLP
- Application of ML and Data Analysis to ECG tasks, including the participation to hackathons
- Development of consistent industrial projects in collaboration with Industry and Research partners

Competitions & Hackathons

Jan - April 2022 **CyberChallenge.IT** – *Politecnico di Torino*

- Member of the regional training team at PoliTo (Politecnico di Torino), after a two-step selection process
- Acquired skill and knowledge about both theoretical and practical aspect of cybersecurity

Oct 17 – 18, 2021 **IEEE SMC 2021** – *Virtual BR41N.IO Hackathon* – g.tec medical engineering GmbH

- Data Analysis Project with SSVEP data: usage of the ROCKET (RandOm Convolutional Kernel Transform) algorithm for the extraction of time serie spectral features

June 23 – 29, 2021 **EO Dashboard Hackathon** – *ESA in collaboration with NASA and JAXA*

- Development of a comparison metrics of emission trends by different countries using and AutoEncoder-based approach
- Work selected for the last judgement round

April 17 – 18, 2021 **BCI & Neurotechnology Spring School 2021** – *BR41N.IO Brain-Computer Interface Designers' Hackathon*

- Data Analysis project with P300 Speller data: usage of autoencoders for time serie feature extraction and signal detection

2015 – 2018 **Olimpiadi Italiane di Fisica** – *olifis.it*

- Selected amongst the 5 best student in three different editions (3rd, 4th and 1st place respectively) of school selection, passed the regional selection test on the 2015 and 2018 editions

Skills & Background Knowledge

Coursera's Specializations

Jan 2021 **Natural Language Processing with Classification and Vector Spaces** (DeepLearning.ai)

July 2021 **Effective High-Performance Computing & Data Analytics with GPUs** (CSCS-USI Summer School 2021)

Programming Languages, Softwares and Services

Python, **C/C++**, **Julia**, **CSS, HTML, Javascript**, **CUDA**, **Git**, **MPI**, **Tensorflow**, **Pytorch**, **SpaCy**

Languages

Italian, *Native.* **English**, *Advanced.*

Interests

Personal Projects

Dec 2020 - Present **Parallel N-Body**: *an MPI-based N-Body physics simulation* – github repository

- Development of a Python library for computing N-Body physics problem using MPI (mpi4py) and numba. The long term goal of this project is to provide a clear, understandable yet fast code for beginners in "Python for Physics" and parallel calculations using the Python language.

Feb 2020 - Present **Implicit information extraction using ontology-based reasoning** - *(not published)*

- Development of a framework for the extraction of implicit information from text
- Development of a nested structure for information storage that enables logic-based inference and query (semantic-triplets ontology)

Publications and Conferences

Talks

April 23th, 2024 **RAG: la frontiera dell'AI come strumento di supporto al Business** - Fondazione DIG421

- EN: **RAG: AI's frontieer as business support instrument**
- An event showing how RAG technologies can be included into business processes. An *Open Innovation* conference addressed at manager and entrepreneurs
- Hosted by the *Fondazione DIG421*

Oct 19th, 2023 **Utilizzo dell'Intelligenza Artificiale nell'e-commerce: casi d'uso** - Ecommerce Day 2023

- EN: **Using Artificial Intelligence for e-commerce: use cases**
- A talk about how Generative AI (text, image and video) can be used to transform multiple aspects of online selling and IT management

Feb 17th, 2023 **Machine Learning, Spesa e ChatGPT: cosa hanno in comune** - Fondazione DIG421

- EN: **Machine Learning, Grocery Shopping and ChapGPT: what they have in common**

- A divulgative conference about the working of ChatGPT and its then-relation to Clevi's products
- Video available at *https://www.youtube.com/watch?v=STnwUvLGE5E*
- Hosted by the *Fondazione DIG421*

May 25th, 2022 **Intelligenza artificiale per un futuro brillante!** - Fondazione DIG421

- EN: **Artificial Intelligence for a bright future!**
- An educational conference for the presentation of the Machine Learning Journal Club's activities to a public of professionals and students, focusing on the importance of such activities in the personal growth of its members and the benefit for the society as a whole of student-led scientific initiatives
- Hosted by the *Fondazione DIG421*

April 12th, 2022 **Continual Learning: la (necessaria) rivoluzione del Machine Learning** - *Toolbox Coworking & online*

- EN: **Continual Learning: the (necessary) revolution of Machine Learning**
- Introductory educational conference about Continual Learning concepts, methodologies and use cases.
- Code available here

July 29, 2021 **Physics-Informed ML Simulator for Wildfire Propagation** – JuliaCon (online event) (Talk Video)

Articles

2022 **Unsupervised learning of geometrical features from images by explicit group actions enforcement** – Peer-reviewd paper accepted at the "NeurIPS 2022 Workshop NeurReps". Available at (OpenReview.net)

2021 **NeuralPDE: Automating Physics-Informed Neural Networks (PINNs) with Error Approximations** – Preprint available on arXiv (preprint)

2021 **Physics-Informed ML Simulator for Wildfire Propagation** – Peer-reviewed publication presented at the AAAI 2021 "Combining Artificial Intelligence and Machine Learning with Physical Sciences" (AAAI-MLPS 2021 proceedings)