LORENZO MONTI

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WORK EXPERIENCE

Gaia DPAC Catalog Validation for ESA

European Space Agency, ESA

Sep. 2023 – Ongoing Remote

- Implementation of dedicated validation tests for two CUs using Python and Java, to thoroughly assess and improve the quality of the Gaia Catalogue by automating data validation workflows and ensuring reliable, scalable performance.

Post-doc Researcher

National Institute for Astrophysics, INAF

Nov. 2021 – Ongoing Bologna - Italy

- Research on photometric time-series and tabular data from ESA's Gaia telescope, focusing on Deep Learning models for the analysis of RR Lyrae stars and the development of multi-phase semi-supervised clustering algorithms to identify patterns in partially labeled astronomical datasets. Previously, I worked on DISCOS and its simulators, the control software for INAF's radio telescopes.

Visiting Researcher

Macao Polytechnic Institute

Sept. 2019 – Dec. 2019 Macao (SAR)

- Developed a people counting system for smart campus classrooms, utilizing a YOLOv3-based object detection model fine-tuned through Transfer Learning.Implemented on edge devices like Raspberry Pi 4, it processes real-time video feeds from Intel RealSense D415 cameras, ensuring scalability and privacy compliance. This approach achieved high accuracy across various classroom configurations, demonstrating its effectiveness for applications such as occupancy monitoring, energy optimization, and adherence to social distancing protocols.

PROJECTS

CLiMB

CLiMB Repository

- Designed and developed a two-phase semi-supervised clustering algorithm capable of handling datasets with partial labeling. CLiMB combines constrained clustering with density-based filtering to enhance label propagation and structure discovery. It supports modular integration of clustering backends (e.g., DBSCAN, HDBSCAN, OPTICS) and offers intuitive 2D/3D visualizations for cluster validation. The methodology is currently being formalized in a scientific paper under preparation. Implemented in Python, leveraging libraries such as Scikit-learn, Scipy, Numpy, Pandas and Matplotlib.

BIO

"Postdoc at the National Institute for Astrophysics, guitar player, and espresso addict—never forgetting my towel."

STRENGTHS

Creativity & Innovation | Collaboration | Problem-Solving | Continuous Learning

Machine Learning & Deep Learning | Music & Audio Understanding | Programming

LANGUAGES

Italian C2

English B2/C1

EDUCATION

Ph.D. in Computer Science and Engineering

University of Bologna

Nov. 2017 – Oct. 2020

Thesis title: Enabling Human Centric Smart Campuses via Edge Computing and Connected Objects

M.Sc. in Computer Science and Engineering

University of Bologna

Oct. 2014 – Mar. 2017

Thesis title: a wearable device to support many-to-many communication between deaf and blind users.

B.Sc. in Computer Science

University of Bologna

Oct. 2008 – Mar. 2014

Thesis title: Sistema di monitoraggio modulare attraverso tecnologie mobile per la sicurezza in ambiente domestico.

Romagna M_IA: AI & Social Media Awareness Initiative

Youtube videos

- As a city councilor, I initiated and led Romagna M_IA, a €50,000 regionally funded project aimed at promoting awareness of artificial intelligence and responsible social media use. The initiative delivered educational workshops and public discussions across small towns in the Romagna region, fostering community engagement and digital literacy.

Spotify Pedalboard

Spotify Pedalboard PR

- Implemented a custom Fuzz pedal effect within the Spotify Pedalboard framework, replicating the characteristics of a classic fuzz pedal. The project is written in C++/Python.

Distributed System for Social Distancing Analysis

Social distance Repository

- Designed and implemented a distributed system for analyzing social distancing using RGB-D cameras and convolutional neural networks. The system leverages the YOLO deep learning model, adapted through transfer learning to achieve high accuracy for this specific application. Conducted quantitative evaluations to validate the system's effectiveness.

Sonify Species

Sonify Species Site

- I developed the scientific portal that sonifies DNA sequences, transforming genetic data into music to explore biodiversity through sound. I designed and implemented the algorithm, backend, and frontend to ensure processing and interaction.

InspectNoise

InspectNoise Repository

- Led and develop a low-cost real-time sound meter, integrating environmental data and machine learning algorithms to enhance the accuracy of acoustic noise monitoring and analysis. Project developed in Python.

Pyresonant

Pyresonant Repository

- Design and implementation of a tiny platform, which allows users to use any stringed instrument as a PC keyboard by mapping the notes to specific keys. Project developed in Python.

GlovePi

GlovePi paper

- GlovePi is a low cost and open source assistive system exploiting a wearable device in order to support deaf-blind people in communication using the Malossi alphabet. Project developed in C++/Python.

SKILLS

AI

Time-series | Transformers | Computer vision | Deep learning

Programming

Python | C/C++ | Javascript | PHP | Java

Libraries

Tensorflow | Keras | PyTorch | Scikit-learn | TensorRT | Cuda

Other

Git | Gradle | Docker | CI/CD | SQL

REFEREES

Researcher Tatiana Muraveva
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Prof. Giovanni Pau
@ Technology Innovation Institute, Bologna University and UCLA
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VOLUNTEERING

Permesso Negato APS

As a volunteer at Permesso Negato, I contributed to the statistical analysis of online phenomena on Telegram, helping to understand and combat non-consensual pornography through data-driven insights.

DNA of Music

I developed the algorithm that sonifies animal DNA sequences and built the web platform for DNAofMusic, creating a unique fusion of science and art to raise awareness about biodiversity.

City Councilor

Initiated and led Romagna M_IA, a project promoting AI awareness and responsible social media use through workshops across Romagna towns, boosting digital literacy and community engagement.

SELECTED PUBLICATIONS

I authored **more than 20 papers published** by journals and conferences. Google Scholar H-index: 16.

Journal Articles

- L. Monti, T. Muraveva, G. Clementini, and A. Garofalo, "Climb: Charting the milky way's past with multiphase semi-supervised clustering framework," *in preparation, JMLR*,
- L. Monti, T. Muraveva, G. Clementini, and A. Garofalo, "Unified deep learning approach for photometric metallicity estimation of fundamental-mode and first-overtone rr lyrae stars using gaia light curves," *under review, Astronomy and Astrophysics*,
- L. Monti, T. Muraveva, G. Clementini, and A. Garofalo, "Leveraging deep learning for time-series extrinsic regression in predicting the photometric metallicity of fundamental-mode rr lyrae stars," *Sensors*, vol. 24, no. 16, p. 5203, Aug. 2024.
- T. Muraveva, G. A., G. Clementini, A. Garofalo, and L. Monti, "Metallicity of rr lyrae stars from the gaia data release 3 catalogue computed with machine learning algorithms," *Monthly Notices of the Royal Astronomical Society*, Jun. 2024.
- P. Panuzzo, T. Mazeh, F. Arenou, *et al.*, "Discovery of a dormant 33 solar-mass black hole in pre-release gaia astrometry," *Astronomy & Astrophysics*, vol. 686, p. L2, 2024.
- L. Monti, R. Tse, S.-K. Tang, *et al.*, "Edge-based transfer learning for classroom occupancy detection in a smart campus context," *Sensors*, vol. 22, no. 10, p. 3692, 2022.
- L. Monti, M. Vincenzi, S. Mirri, G. Pau, and P. Salomoni, "Raveguard: A noise monitoring platform using low-end microphones and machine learning," *Sensors*, vol. 20, no. 19, p. 5583, 2020.
- C. Prandi, A. Melis, M. Prandini, *et al.*, "Gamifying cultural experiences across the urban environment," *Multimedia Tools and Applications*, vol. 78, no. 3, pp. 3341–3364, 2019.
- C. Prandi, L. Monti, C. Ceccarini, and P. Salomoni, "Smart campus: Fostering the community awareness through an intelligent environment," *Mobile Networks and Applications*, pp. 1–8, 2019.

Conference Proceedings

- M. Buttu, G. Carboni, A. Fara, *et al.*, "A middleware to confine obsolescence," in *Software and Cyberinfrastructure for Astronomy VII*, SPIE, vol. 12189, 2022, pp. 42–47.
- R. Tse, L. Monti, M. Im, S. Mirri, G. Pau, and P. Salomoni, "Deepclass: Edge based class occupancy detection aided by deep learning and image cropping," in *Twelfth International Conference on Digital Image Processing (ICDIP 2020)*, International Society for Optics and Photonics, vol. 11519, 2020, p. 1 151 904.
- L. Monti, S. Mirri, C. Prandi, and P. Salomoni, "Preservation in smart libraries: An experiment involving iot and indoor environmental sensing," in *2019 IEEE Global Communications Conference (GLOBECOM)*, IEEE, 2019, pp. 1–6.
- L. Monti, S. Mirri, C. Prandi, and P. Salomoni, "Smart sensing supporting energy-efficient buildings: On comparing prototypes for people counting," in *Proceedings of the 5th EAI International Conference on Smart Objects and Technologies for Social Good*, 2019, pp. 171–176.
- G. Delnevo, L. Monti, F. Vignola, P. Salomoni, and S. Mirri, "Almawhere: A prototype of accessible indoor wayfinding and navigation system," in *2018 15th IEEE Annual Consumer Communications & Networking Conference (CCNC)*, IEEE, 2018, pp. 1–6.
- L. Monti and G. Delnevo, "On improving glovepi: Towards a many-to-many communication among deaf-blind users," in *2018 15th IEEE Annual Consumer Communications & Networking Conference (CCNC)*, IEEE, 2018, pp. 1–5.
- R. Tse, L. Monti, C. Prandi, D. Aguiari, G. Pau, and P. Salomoni, "On assessing the accuracy of air pollution models exploiting a strategic sensors deployment," in *Proceedings of the 4th EAI International Conference on Smart Objects and Technologies for Social Good*, ACM, 2018, pp. 55–58.
- D. Aguiari, C. Contoli, G. Delnevo, and L. Monti, "Smart mobility and sensing: Case studies based on a bike information gathering architecture," in *International Conference on Smart Objects and Technologies for Social Good*, Springer, 2017, pp. 112–121.
- S. Mirri, C. Prandi, P. Salomoni, and L. Monti, "Fitting like a glovepi: A wearable device for deaf-blind people," in *2017 14th IEEE Annual Consumer Communications & Networking Conference (CCNC)*, IEEE, 2017, pp. 1057–1062.
- L. Monti, G. Delnevo, S. Mirri, P. Salomoni, and F. Callegati, "Digital invasions within cultural heritage: Social media and crowdsourcing," in *International Conference on Smart Objects and Technologies for Social Good*, Springer, 2017, pp. 102–111.
- S. Mirri, C. Prandi, P. Salomoni, and L. Monti, "Social location awareness: A prototype of altruistic iot," in *2016 8th IFIP International Conference on New Technologies, Mobility and Security (NTMS)*, IEEE, 2016, pp. 1–5.