

KickOff meeting - Spoke 3

27 e 28 Ottobre 2022 – INAF Roma

Università degli Studi di Catania (UniCT): “affiliato” Spoke 3



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INFORMATION ABOUT UNICT

UniCT is the oldest university in Sicily. Research at UniCT is a central pillar and a fundamental lever for competition and employment. The research activities are mainly carried out in the departments (17 in total) which are also committed in favoring the transfer of knowledge.

Departments involved in **spoke 3**:

- Dipartimento di Fisica e Astronomia "Ettore Majorana" (DFA);
- Dipartimento di Ingegneria Elettrica Elettronica e Informatica (DIEEI).

DFA and **DIEEI** are committed in fundamental research activities strongly linked to the *HPC-based* and *Big Data technologies*. There are **expertise/competencies**:

- a. to contribute in developing innovative software and approaches (e.g. machine-learning, bayesian inference, etc) for data analysis, visualizations and numerical simulations;
- b. to support the theoretical understanding of astrophysical phenomena and the new generation of surveys, instruments and observatories;
- c. to contribute to evaluate trust and reputation related to big data collection.

Researchers & Collaborations

8 **professors/researchers** + [1RTDa + 1PhD]:

- | | | | |
|----------------|---------------|---------------|------------|
| - M.L. Pumo* | Ric TDb (DFA) | - M. Malgeri | PA (DIEEI) |
| - V. Carchiolo | PO (DIEEI) | - G. Mangioni | PA (DIEEI) |
| - L. Di Donato | PA (DIEEI) | - G. Manicò | Ric (DFA) |
| - A. Lanzafame | PA (DFA) | - G. Nunnari | PO (DIEEI) |

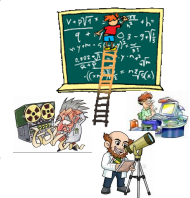
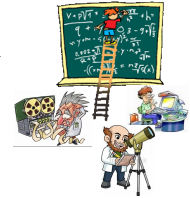
* *contact person*

On-going **international collaborations** (on related topics):

-) ENGRAVE consortium
-) ePESSTO+ (formerly PESSTO and ePESSTO) project
-) GAIA collaboration
-) CTA consortium
-) Cardiff University
-) MPIA Heidelberg

Activities for the “spoke 3”

- Optimization of Monte Carlo Markov Chain (MCMC) inference techniques on parallel/HPC architectures for processing and analysis of Big Data from large Astrophysical surveys (e.g. GAIA)
- Possible **collaborations with companies** on the use of deep learning techniques with integration of physics-based priors to process complex images in order to detect precursors of natural and anthropic disasters
- Development of codes based on machine-learning or other inference methods for modelling Supernovae and similar explosive transients
- Development of strategies of automatic image processing based on machine-learning for the automatic detection of volcanic activity and, in particular, of lava fountains from ground monitoring thermal cameras
- Possible **collaborations with companies** on exploitation and development both bayesian statistical methods and machine learning techniques for big data analysis



WP2. Design of innovative Algorithms, Methodologies, Codes toward Exascale and beyond (*Task: 1, 2, and 4*)

WP3. Big Data Analysis, Machine Learning and Visualization (*Task: 1, 2*)

**Thanks for
your attention!**

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