1st Conference on Machine Learning for Gravitational Waves, Geophysics, Robotics and Control System

EGO, January 14th -15th 2019

COST ACTION CA17137
A NETWORK FOR GRAVITATIONAL WAVES, GEOPHYSICS AND MACHINE LEARNING

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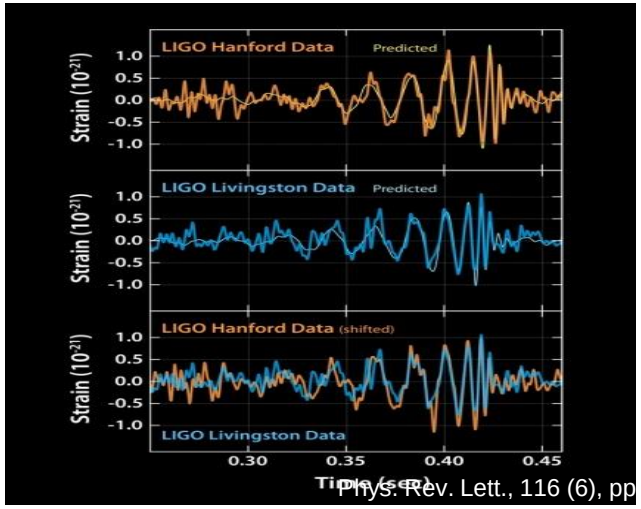
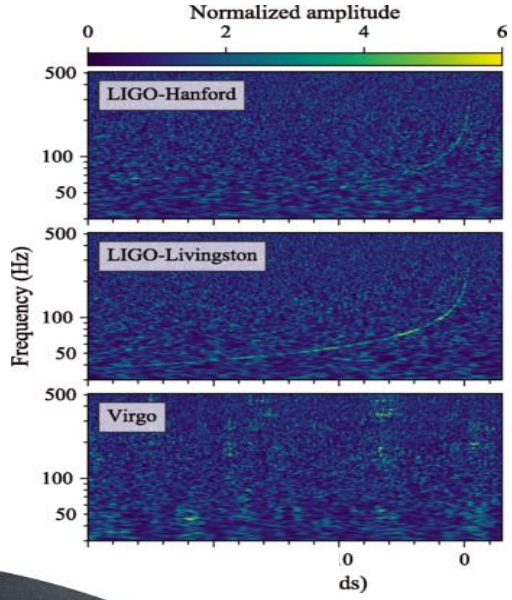
About me

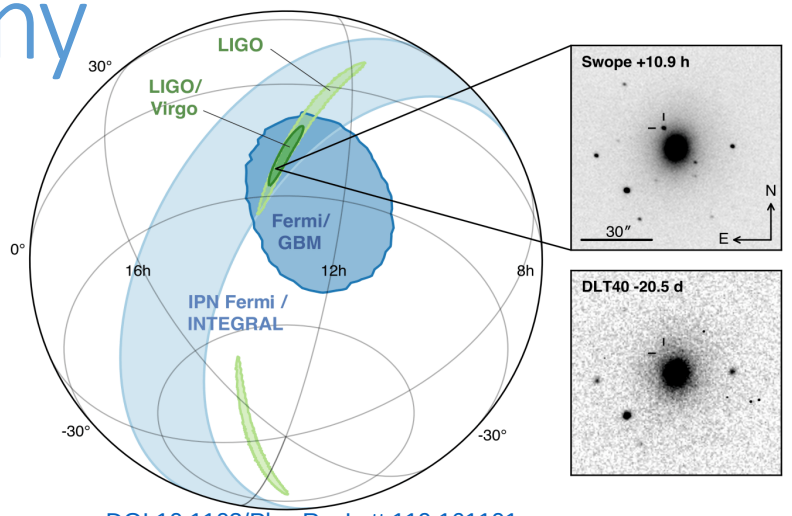
- Physicist of Virgo collaboration since 1995. European Gravitational Observatory staff since 2004.
- Head of Data Science Office at EGO, since March 2018 Associate Faculty at Scuola Normale Superiore
- Data Analyst for Virgo noise and data preprocessing
- Machine learning group co-chair in LIGO/Virgo collaboration

GW discoveries: new era in Astronomy

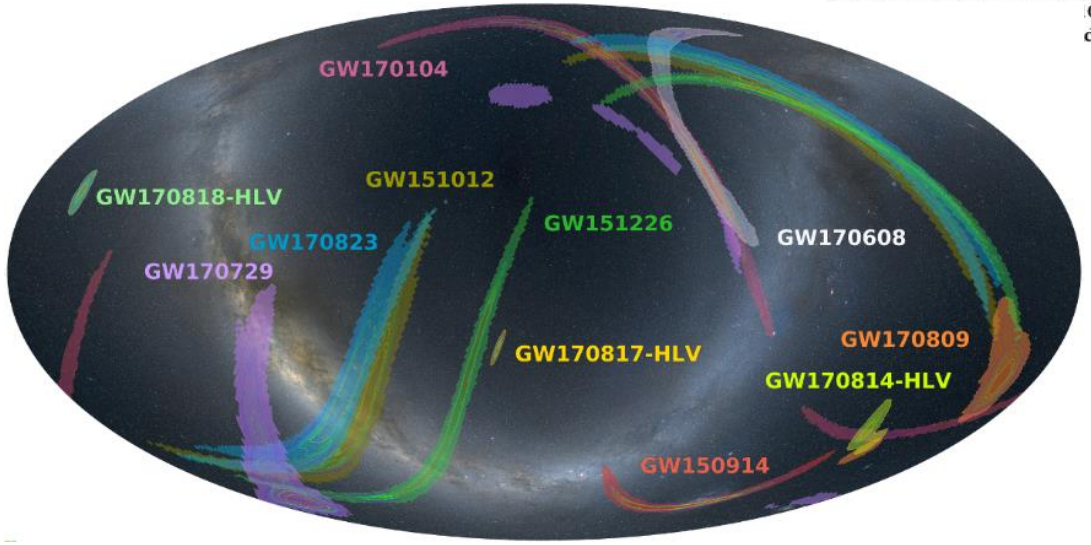


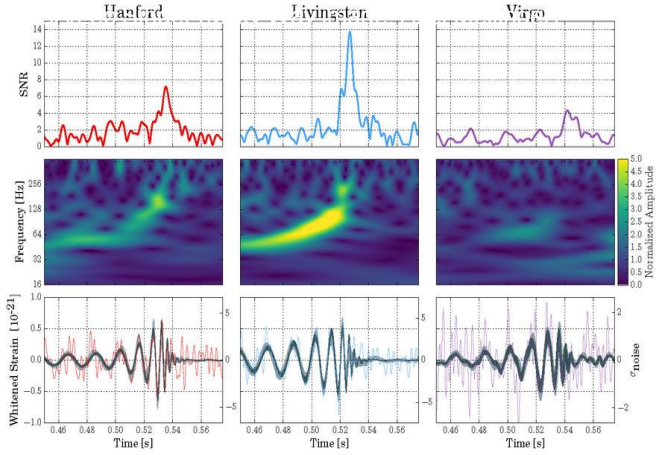
Phys. Rev. Lett., 116 (6), pp





DOI:10.1103/PhysRevLett.119.161101.

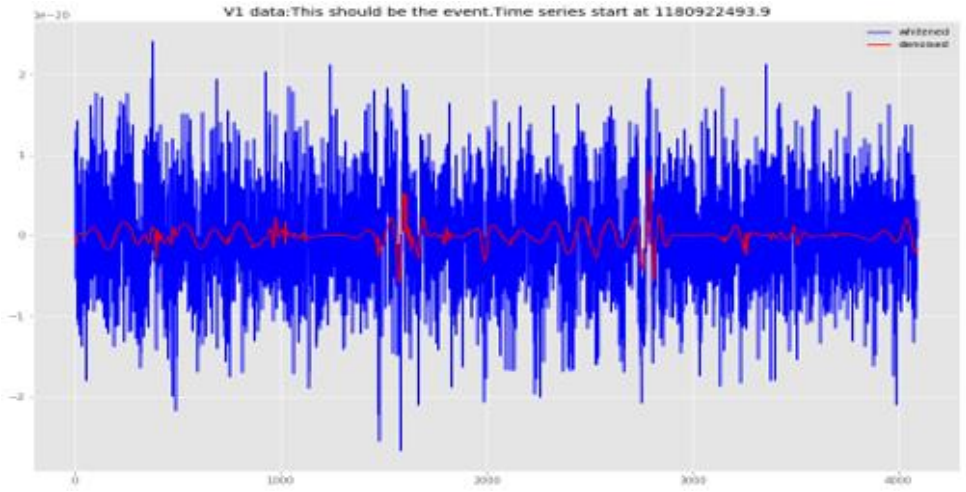




Gravitational Wave Observatories

Common GW detector's problem: noise!!!

DATA 'CLEANING'

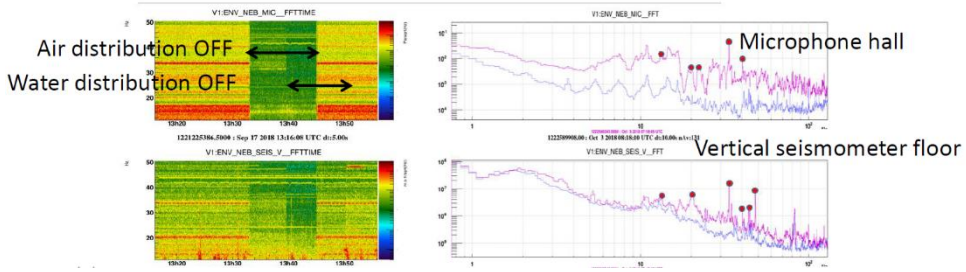


EXPERIMENT 'CLEANING'

I. Fiori and the noise hunting team

AdV+ infrastructure noise mitigation for NN

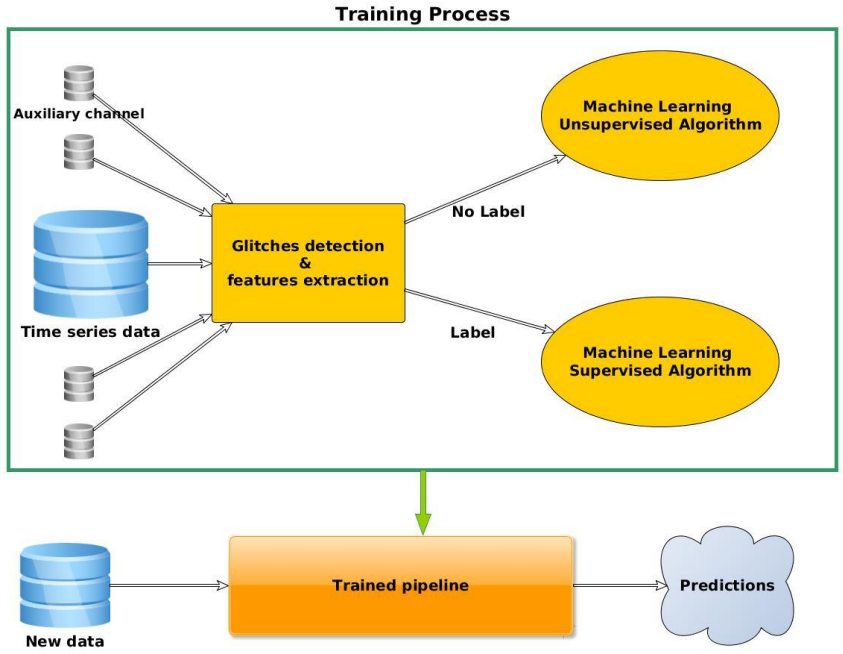
- Evaluate if Air Conditioning noise can impact on NN
- NEB
- Identified noise contributions from air and water distribution systems.
- With help of Robert Schofield, we worked out a preliminary list of mitigation interventions (see F.Paoletti talk at Detector meeting VIR-0674A-18)



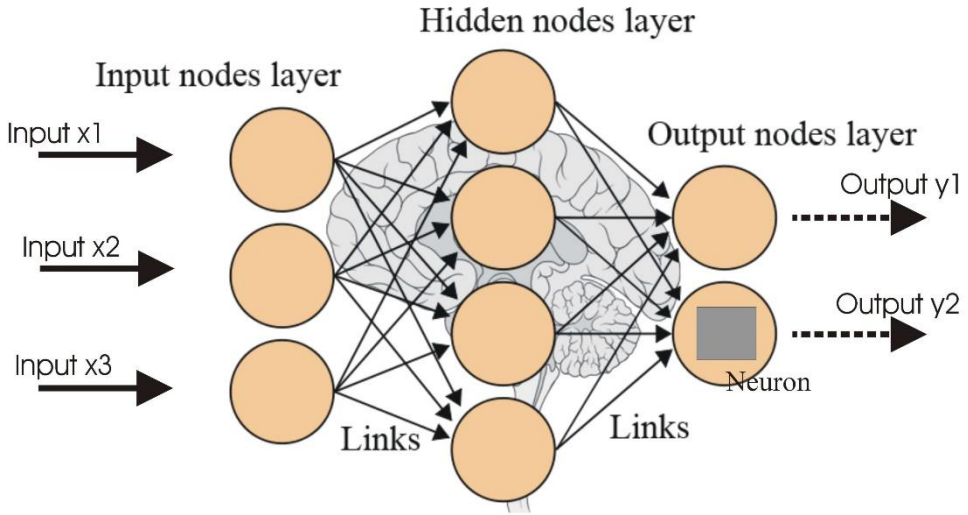
Much more info in the following talks

Innovative data analysis techniques

MACHINE LEARNING



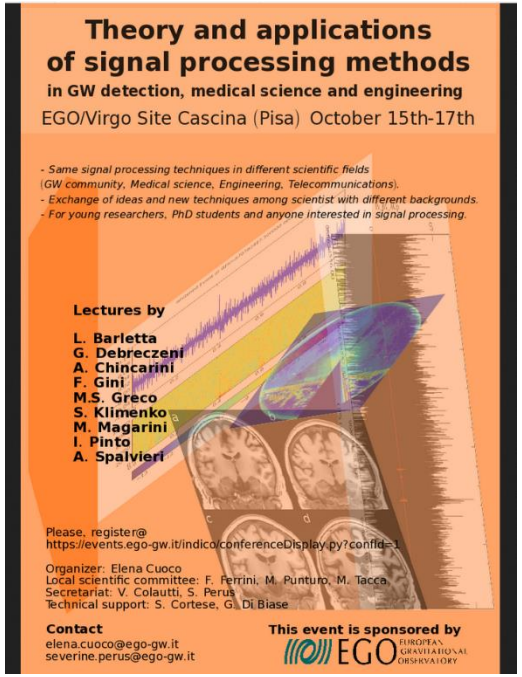
DEEP LEARNING



The dream of mixing the communities

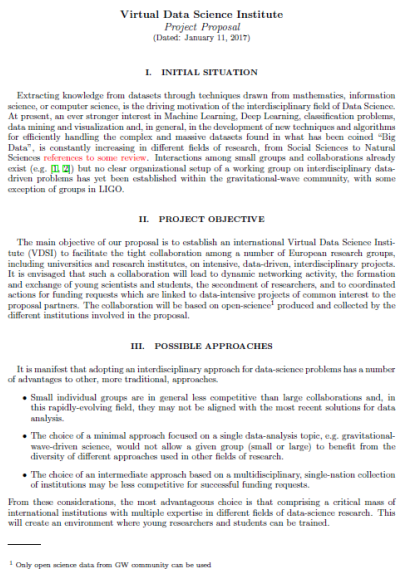
1ST INTERDISCIPLINARY WORKSHOP @EGO

October 2012



1ST COST PROPOSAL PREPARATION

January 2017



Virtual Data Science Institute

Project Proposal

(Dated: January 11, 2017)

I. INITIAL SITUATION

Extracting knowledge from datasets through techniques drawn from mathematics, information science, or computer science, is the driving motivation of the interdisciplinary field of Data Science. At present, an ever stronger interest in Machine Learning, Deep Learning, classification problems, data mining and visualization and, in general, in the development of new techniques and algorithms for efficiently handling the complex and massive datasets found in what has been coined "Big Data", is constantly increasing in different fields of research, from Social Sciences to Natural Sciences references to some review. Interactions among small groups and collaborations already exist (e.g. [1, 2]) but no clear organizational setup of a working group on interdisciplinary data-driven problems has yet been established within the gravitational-wave community, with some exception of groups in LIGO.

II. PROJECT OBJECTIVE

The main objective of our proposal is to establish an international Virtual Data Science Institute (VDSI) to facilitate the tight collaboration among a number of European research groups, including universities and research institutes, on intensive, data-driven, interdisciplinary projects. It is envisaged that such a collaboration will lead to dynamic networking activity, the formation and exchange of young scientists and students, the secondment of researchers, and to coordinated actions for funding requests which are linked to data-intensive projects of common interest to the proposal partners. The collaboration will be based on open-science[1] produced and collected by the different institutions involved in the proposal.

III. POSSIBLE APPROACHES

It is manifest that adopting an interdisciplinary approach for data-science problems has a number of advantages to other, more traditional, approaches.

- Small individual groups are in general less competitive than large collaborations and, in this rapidly-evolving field, they may not be aligned with the most recent solutions for data analysis.
- The choice of a minimal approach focused on a single data-analysis topic, e.g. gravitational-wave-driven science, would not allow a given group (small or large) to benefit from the diversity of different approaches used in other fields of research.
- The choice of an intermediate approach based on a multidisciplinary, single-nation collection of institutions may be less competitive for successful funding requests.

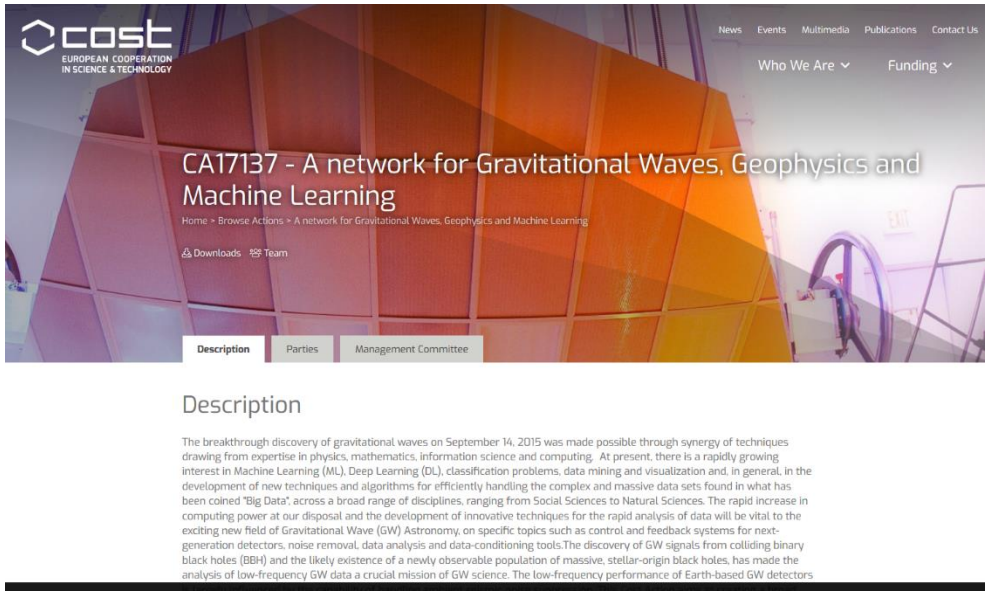
From these considerations, the most advantageous choice is that comprising a critical mass of international institutions with multiple expertise in different fields of data-science research. This will create an environment where young researchers and students can be trained.

[1] Only open science data from GW community can be used

Many thanks to colleagues who accepted with enthusiasm ad helped me

A network for GW, Geophysics and Machine Learning

CA17137



SOME INFO

20 EU countries

3 International Partner Countries

37 MC members

81 **registered participants** on e-cost portal

g2net@ego-gw.it

Scientific goals

Create a broad research network where mixing the expertise of GW researchers, geophysics, computer scientists, robotics experts with the common goals of using cutting-edge machine learning techniques					
Facilitate conceiving innovative solutions for the analysis of the data of Gravitational Wave (GW) detectors.	Investigate new strategies for the handling/suppression of instrumental and environmental noise in current and next-generation detectors using Machine Learning techniques.	Investigate possible solutions to monitor the low-frequency Newtonian noise through the use of adaptive robots.	Investigate new techniques for control systems to deal with non linear noise.	Noise Cancelation solutions in real time or offline	Train a new generation of young scientists with broad skills in Machine Learning, GW, Control and Robotics.

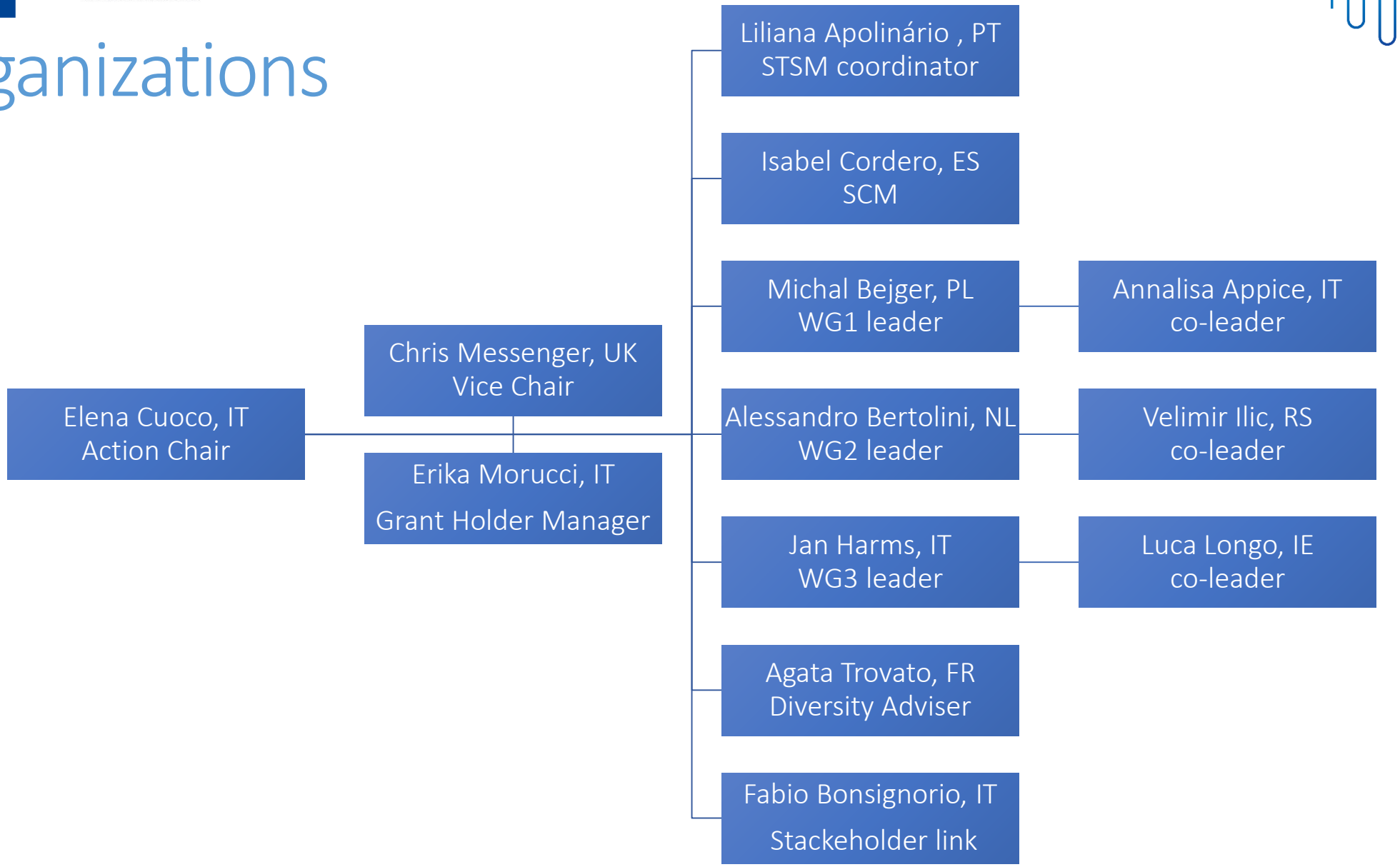
CA17137 Working groups

WG1: ML for Gravitational Waves astronomy

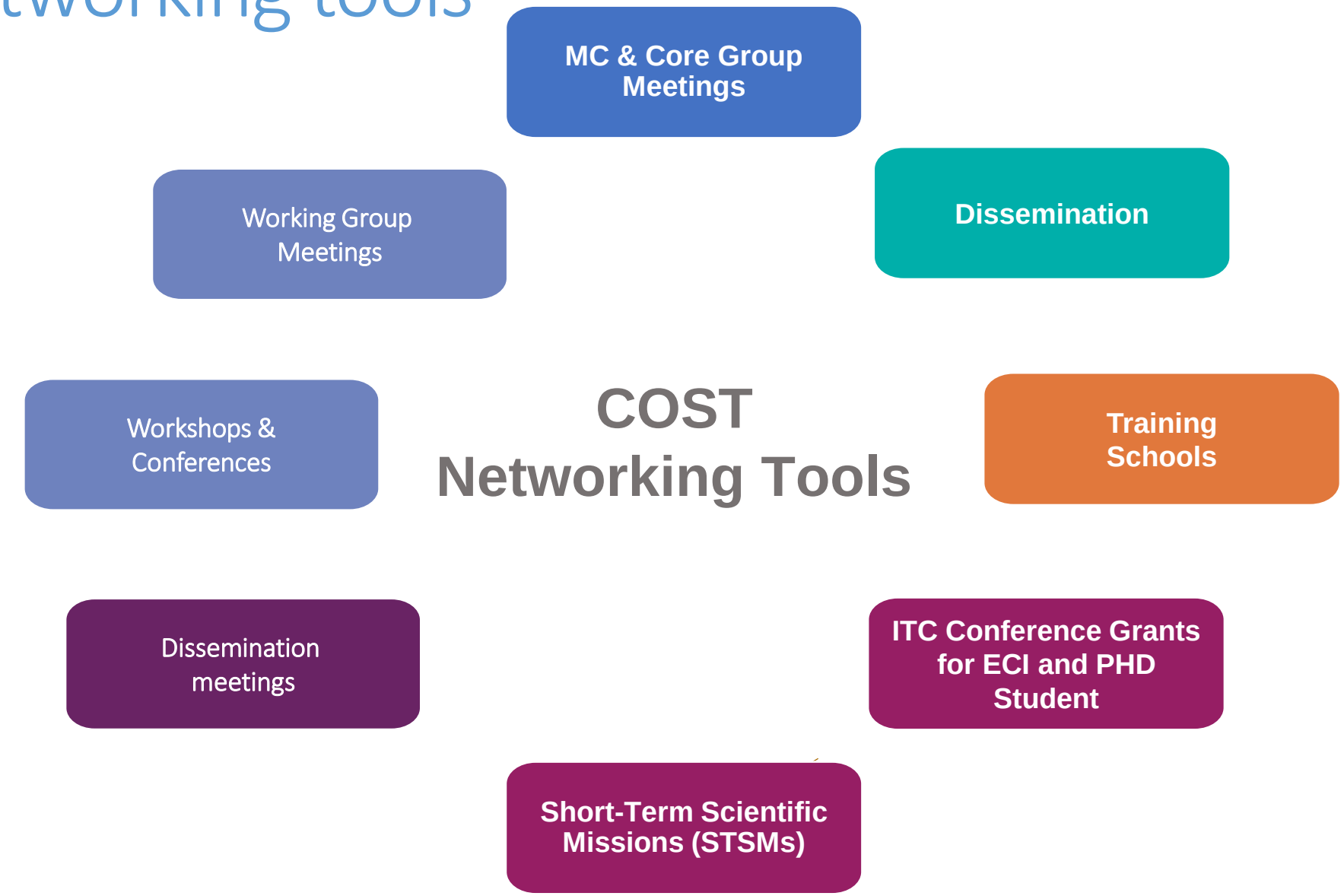
WG2: ML for low frequency seismic measurement

WG3: ML for Advanced Control techniques

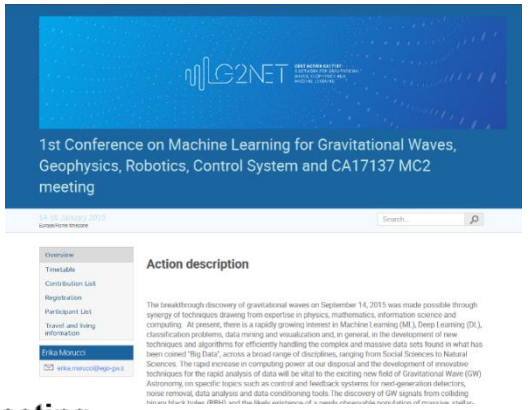
Organizations

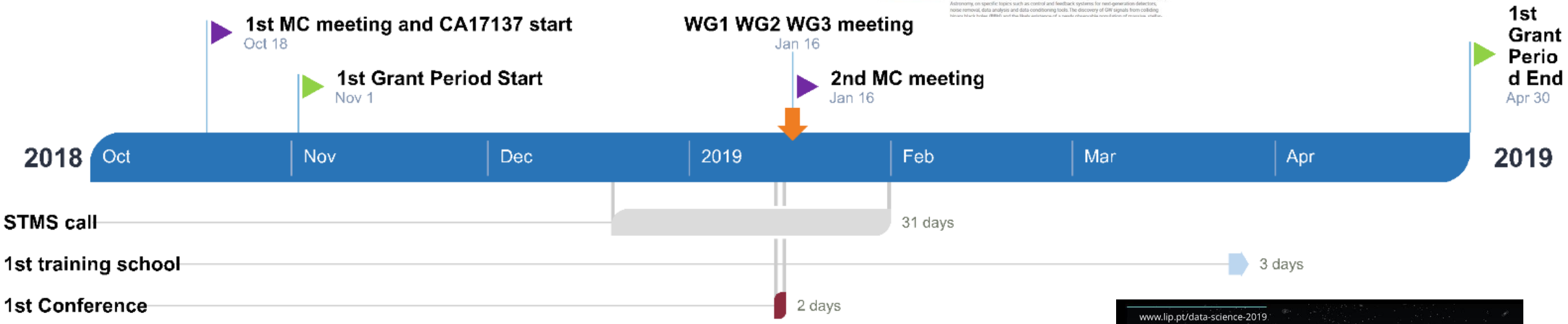


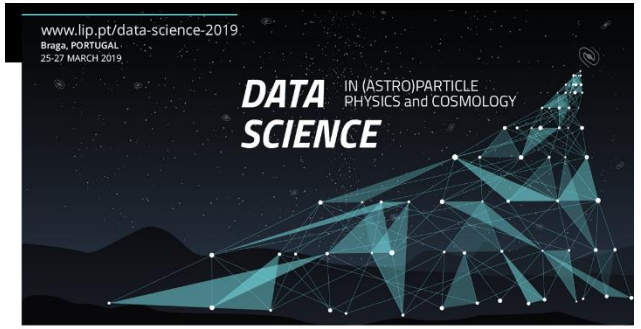
Cost Action networking tools



The first grant period timeline

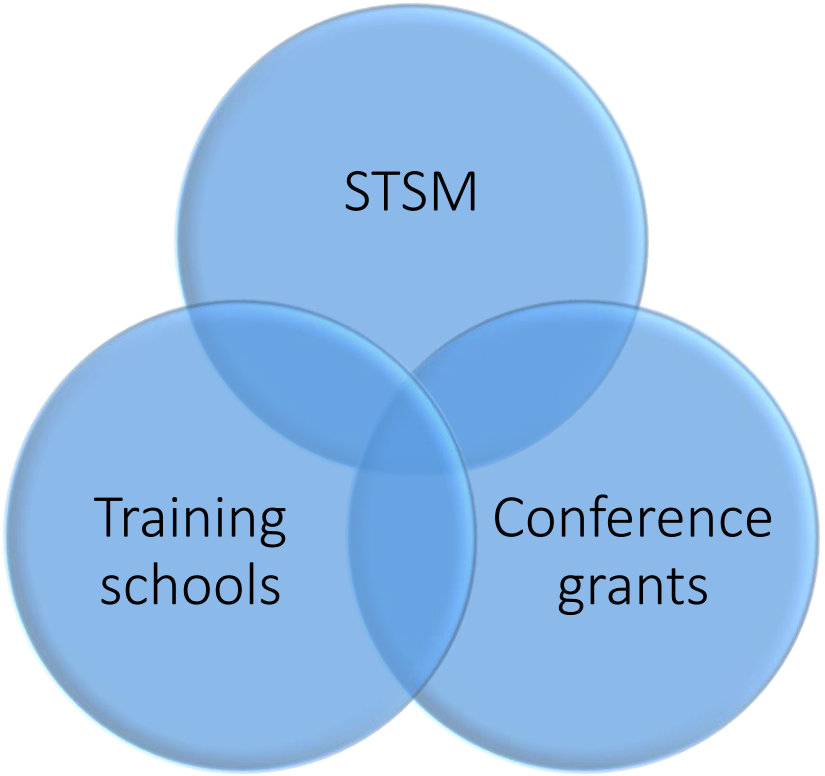






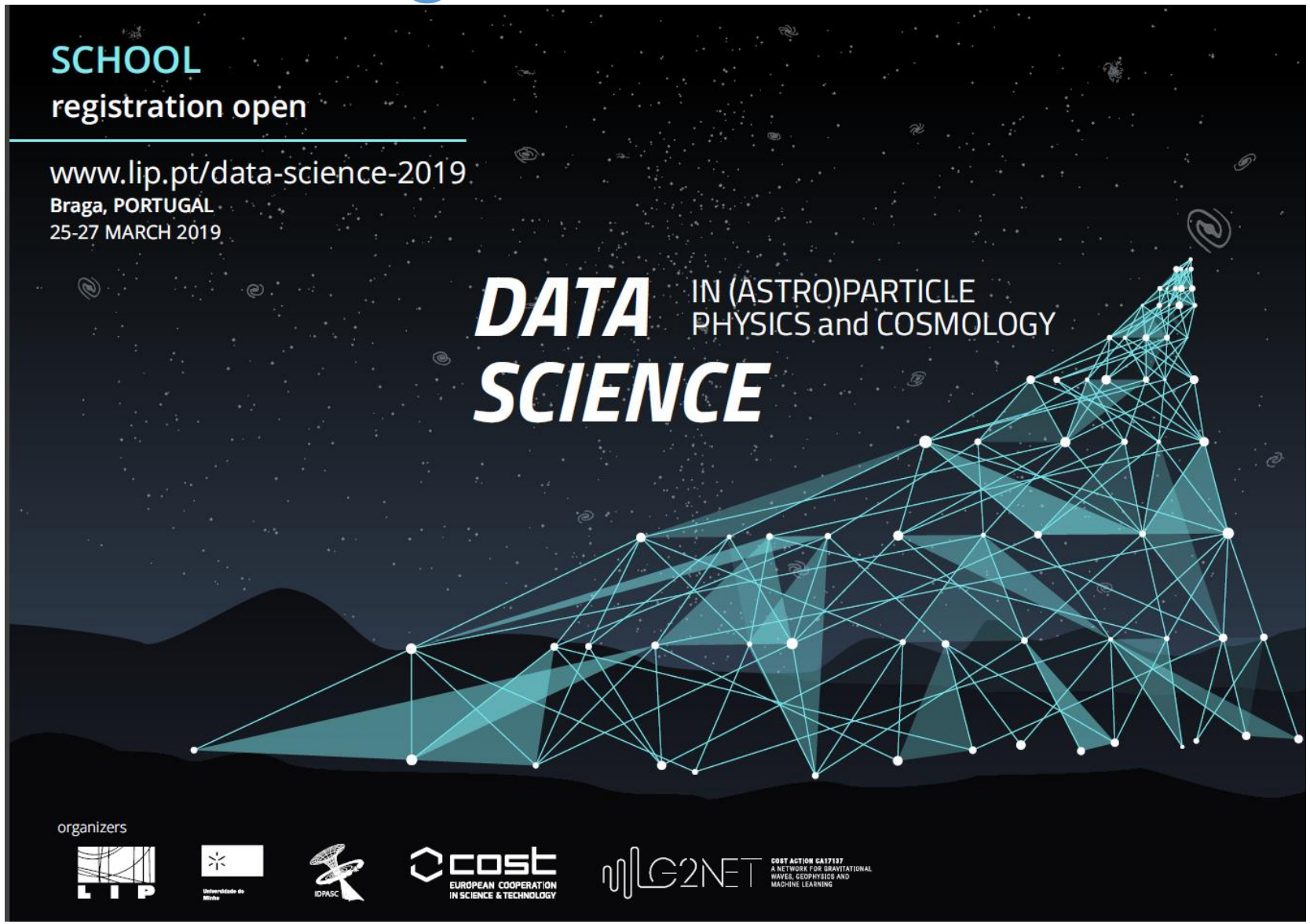
www.g2net.eu

Opportunities for researchers



If you want to officially join the action,
Send an e-mail to core-g2net@ego-gw.it
You need to register to the e-cost portal
Indicate which working group you will join

1° CA17137 training school



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Enjoy the meeting