

# **5th Summer School on INtelligent signal processing for FrontIER Research and Industry**



**Sunday 12 May 2019 - Sunday 26 May 2019**

**Huazhong University of Science and Technology in Wuhan, China**

## **Scientific Programme**

The school programme will comprise as usual in this school series, plenary morning lectures (8am to noon) parallel Lab sessions in the afternoon (2 to 5pm) and after dinner a plenary keynote lecture (6:30 to 8pm) sometime opened to larger public audience.

The school is an **high-level interdisciplinary** school. It aims to gather Ph.D. and some Master students as well as postdocs from the fundamental and applied research worlds together with high tech engineers students in a **cross-disciplinary spirit** towards a common focus: **the intelligent signal processing**.

It applies to the new instruments under development to explore the ultimate constituents of the Matter (High Energy Particle Physics, HEP) or the distant Universe (Astrophysics) as well as the deep understanding of the human body functioning or disfunctioning (Medical Physics).

The signal processing of the instruments, able to investigate these very different fields of the Knowledge, present common high performances and thus advanced high technology needs.

The school programme will lead the school attendants through the signal and data transmission chain from the very front-end to the very far end of the instrument.

This **journey through the signal processing chain**, will be achieved, taking as examples a few key projects in Fundamental or Applied Frontier Research.

They correspond to Instruments expected to run in the next decades of the XXIst century, able to confront the new highly competitive challenges of Science and related Frontier High Tech Industry.

The Frontier Research Examples covered by the school will include:

**Astrophysics:** Examples from Underground to terrestrial to Space Projects: Gravitational Waves (KAGRA), Dark Matter Exploration, Terrestrial Telescope (E-ELT) and key-examples of Space Projects.

**Particle Physics:** Neutrinos (JUNO, DUNE, HyperKamiokande) and machines and experiments in projects for Future electron-positron and proton-proton accelerators, with examples of new detectors in development (microvertex, tracking, calorimetry, timing etc..) for the HL-LHC which are pioneering the ones to be built for the future machines.

**Medical Physics:** Focus on the Brain Exploration

The journey across the signal and data processing chain will focus during the first week on how to include **"intelligence" on the instrument** at the very front end.

It will thus show how **very advanced sensors technologies and embedded very deep submicron-electronics** will allow confronting the highly challenging demands in performances from Frontier Science thanks to these related innovative high tech domains. Showing the applications of these technologies to a few key-projects will be instrumental for a deeper understanding of the topic.

During the second week, the journey will go across **the high rate, high speed data transmission issues** and related advance technologies (*photonics, optoelectronics, fibers, networking, etc..*).

The **far-end signal processing** will be the final stop of this journey. These are the **Big data** aspects with *Massive and Parallel computing, Machine and Deep learning* etc.. All these AI (**Artificial Intelligence**) aspects will be **taught through some specific examples** in fundamental or applied research tackled in the School.

**Worldwide experts from academia and industry will share their insights on technical developments as well as present scientific overviews, alongside hands-on lab sessions** involving demonstrators and subject specific master classes on science and technology.

**The series of labs and classes with computer-based exercises serve as support and complementary training to the lectures.** They will promote collaborative friendly exchanges

between the students, lecturers and tutors.

\*\*\*The timetable is now available in the TIMETABLE PAGE; the Table of LABS is posted in the LABS PAGE. \*\*\*

**FYI: the programme of the previous INFIERI school editions and a condensed summary of this School edition, SEE:**

The Websites of previous INFIERI Schools in the overview page or this Website Frontpage

The **file HUST-Programme-ATGLANCE in the overview page**