Introduction to High Performance and Data Intensive Computing (4 CFU)

Coordinator: Nico SANNA

Objectives: The aim of the course is to supply the basic concepts of information science and technology necessary to understand and interact with modern computing architectures. The study of computing technology behind human interface will be supplemented with the theoretical models they refer to with a comprehensive coverage of hardware and software computing systems. Lab sessions and hands-on will further complete the training by providing practical knowledge in accessing, programming and deploy computational workflows in different scientific domains.
The course is organized in modules.

Programme:

	Module
1.	Computing architectures. Computer architectures by hardware design. Network topologies. Flynn taxonomy. Memory models and program driven approach. Scalability. Amdhal and Gustafsson laws.
2.	Software. Software design of modern computing systems. Architectures of Operating System. Unix/Linux OS. Software stack and services. Network services. Introduction to storage I/O. Hadoop approach.
3.	Lab: Linux hands-on. Introductory mini-course on linux/unix with hands-on on DIBAF cluster.
4.	Recent advances. Cloud driven computing. Docker containers and kubernetics. Quantum Computing.
5.	Lab: Azure hands-on. Introductory mini-course on Azure powershell with hands-on on Microsoft Azure.
6	Programming. Introduction to programming technics and methodologies in C and FORTRAN. Compilers. HPC libraries and tools. Programming examples in linear algebra.
7	Lab: programming hands-on. Learning by examples in C and FORTRAN programming under Linux OS and tools.
8.	Neural network. Introduction to neural networks with focus on supervised machine learning techniques and methods. Classification models.
9.	Lab: ML hands-on. Learning by examples in SML with docker containers on-premise and on-cloud.

Didactic method: lectures, numerical exercises
II Semester: May – June, 2019
Final examination: written exam.