HIGH PERFORMANCE COMPUTING

Code: 28511

Main Scientific Area: Computer Architecture, Distributed Systems and Cybersecurity

Lecturer: Nuno Alberto Ferreira Lopes

Language of Instruction: Portuguese

Regime: S2

Contact Hours: 30h Total Workload: 138h

ECTS: 6,0

Objectives

This course aims to provide students with the essential knowledge to the development of concurrent and distributed applications in high performance computing. In particular the main techniques used for concurrent programming, their problems and possible approaches.

Learning Outcomes

Students will be able to develop applications with capabilities bidders, i.e. take advantage of multiple processors (cores) in the existing computers, as well as developing distributed applications, i.e. applications that run on multiple machines. Finally, students will be able to use the main AI libraries in parallel and distributed computers.

Course Contents

1.Parallel programming Paradigms

a)Shared MemoryandMessage Passing

b)FlynnComputer taxonomy

c)Foster Methodology

2.Parallel Programming Libraries

a)Message Passing Interface (MPI)

b)OpenMP

c)Pthreads

d)CUDA

e)OpenCL

3.AI libraries for HPC

a)Tensorflow

b)Pytorch

4.Parallel Application Performance Measurement

Recommended Bibliography

Peter Pacheco. (2011) An Introduction to Parallel Programming, Morgan Kaufman.

Learning and Teaching Methods

The development of applications able to take advantage of multi-core processors requires knowledge of concurrent programming techniques, which is the main topic covered in this program. Additionally, communication between distributed applications require other techniques which in turn are part of the program, specifically on the distributed programming.

Assessment Methods

The methodology used to evaluate students will consist in one online test (40%) and an individual practical assignment (60%), to be made during the lecture period.

All evaluation components have a minimum required score of 7 on a 20 scale for approval.

The delivery of the practical assignment outside the normal lecturing period will have a penalty of 5 values.