

High Performance Computing, Tools and methodologies for software development

Introducing

Description

Program (detailed content):

HPC

- Computation of eigenvalues for large systems (2 Lectures, 1 Lab Work)

- Machine architecture: calculation units and typology (CPU, GPU and others), cache memory hierarchy, interconnection networks, principles of spatial and temporal locality, vectorization, etc.

- Parallelization: degrees of parallelism (Amdahl's law, scalability, etc.), shared memory paradigm with OpenMP, distributed memory paradigm with MPI, principles of reduction, data race, etc.

Subtotal: (4 Lectures, 3 Lab Works)

IT tools and methods

- IT development tools and methods: desirable interdisciplinary project implementing IT project management logic: agile project management methods and tools, software engineering methods and tools (object-oriented design and production, advanced algorithmics), collaborative tools, programming support tools, continuous integration tools. The acquisition of the knowledge necessary for the implementation of the tools and methods will be done through self-training through a series of micromodules provided (agile method, Monday, Teams, Trello, GitLab, Linter, Mattermost, Jira, etc.).

(1 Lab Works, 1 Mentored Project=36h)

Objectives

At the end of this module, the student will have understood and will be able to explain (main concepts):

- General concepts of project management and collaborative IT development
- General concepts of high performance computing with parallelization techniques.
- Galerkin approximation of an eigenvalue problem, Krylov spaces and the Arnoldi process

The student must be able to:

- Structuring an IT development project according to its main dimensions and an agile method: organization and comitology, sizing, planning, sprints and main milestones, collaborative development and continuous integration tool chain, communication, documentation
- Know the vocabulary of high performance computing and know the basic elements of parallelization.
- Implement the Arnoldi method for calculating extreme eigenvalues of a matrix

Évaluation

L'évaluation des acquis d'apprentissage est réalisée en continu tout le long du semestre. En fonction des enseignements, elle peut prendre différentes formes : examen écrit, oral, compte-rendu, rapport écrit, évaluation par les pairs...

Practical info

Location(s)

