

High-Performance Computing Lab

Fall 2020

Student: FULL NAME

Discussed with: FULL NAME

Solution for Project 7

Due date: 06.12.2020 23:59 (midnight)

HPC Lab 2020 — Submission Instructions
(Please, notice that following instructions are mandatory:
submissions that don't comply with, won't be considered)

- Assignments must be submitted to Icorsi (i.e. in electronic format).
- Provide both executable package and sources (e.g. C/C++ files, Matlab). If you are using libraries, please add them in the file. Sources must be organized in directories called:
Project_number_lastname_firstname
and the file must be called:
project_number_lastname_firstname.zip
project_number_lastname_firstname.pdf
- The TAs will grade your project by reviewing your project write-up, and looking at the implementation you attempted, and benchmarking your code's performance.
- You are allowed to discuss all questions with anyone you like; however: (i) your submission must list anyone you discussed problems with and (ii) you must write up your submission independently.

1. Parallel Space Solution of a nonlinear PDE using MPI [in total 40 points]

- 1.1. Initialize and finalize MPI [5 Points]**
- 1.2. Create a Cartesian topology [10 Points]**
- 1.3. Extend the linear algebra functions [5 Points]**
- 1.4. Exchange ghost cells [10 Points]**
- 1.5. Scaling experiments [10 Points]**

2. Python for High-Performance Computing (HPC) [in total 60 points]

- 2.1. Sum of ranks: MPI collectives [5 Points]**
- 2.2. Domain decomposition: Create a Cartesian topology [5 Points]**
- 2.3. Exchange rank with neighbours [5 Points]**
- 2.4. Change linear algebra functions [5 Points]**
- 2.5. Exchange ghost cells [5 Points]**
- 2.6. Scaling experiments [5 Points]**

3. A self-scheduling example: Parallel Mandelbrot [30 Points]

Additional notes and submission details

Submit the source code files (together with your used `Makefile`) in an archive file (tar, zip, etc.), and summarize your results and observations for all exercises by writing an extended Latex report. Use the Latex template provided on the webpage and upload the Latex summary as a PDF to iCorsi3.

- Your submission should be a gzipped tar archive, formatted like `project_number_lastname_firstname.zip` or `project_number_lastname_firstname.tgz`. It should contain
 - all the source codes of your MPI solutions;
 - your write-up with your name `project_number_lastname_firstname.pdf`.
- Submit your `.zip/.tgz` through iCorsi.