Eidgenössische Technische Hochschule Zürich
Swiss Federal Institute of Technology Zurich

**High-Performance Computing Lab for CSE** **2024**

Student: Benedict Armstrong Discussed with: FULL NAME

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**Solution for Project 5** Due date: Monday 13 May 2024, 23:59 (midnight).

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# 1. Parallel Space Solution of a nonlinear PDE using MPI [in total 60 points]

## 1.1. Initialize/finalize MPI and welcome message [5 Points]

## 1.2. Domain decomposition [10 Points]

## 1.3. Linear algebra kernels [5 Points]

## 1.4. The diffusion stencil: Ghost cells exchange [10 Points]

## 1.5. Implement parallel I/O [10 Points]

## 1.6. Strong scaling [10 Points]

## 1.7. Weak scaling [10 Points]

## 1.8. Bonus [20 Points]: Overlapping computation/computation details

# 2. Python for High-Performance Computing [in total 40 points]

## 2.1. Sum of ranks: MPI collectives [5 Points]

## 2.2. Ghost cell exchange between neighboring processes [5 Points]

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