UNIVERSITY of HOUSTON
CENTER FOR ADVANCED COMPUTING & DATA SYSTEMS

Scientific Computing

Project Details

Premise

- Experience writing a scientific code from start to finish
- Explore your own PDE of interest *

Requirements

- Requirements (several of the following, but *=mandatory)
- Report *
- Written in either MATLAB, C, C++ or Fortran *
- Employs checkpoint/restart capability *
- Uses source control *
- Uses visualization *
- *Performance/efficiency measurement*
- *Code verification/validation*

Process

- Create the directories in your git repo
  - project
  - project/doc/ {for Abstract, Final Report}
  - project/src/ {for all code}
  - project/bin/ { for executable(s)}
  - project/tests/ {for test cases}

Report

- Abstract: Half page description of an application that you plan on implementing. (This is an "elevator" pitch with purpose and features of the project.)
- Mathematical statement of the problem
- Discretized version of the equations
- Description of the numerical method (pseudo code included)
- Technical specifications of the computer used
- Results (include graphs and comments)
  - Specifications of parameters used in simulations
  - Evaluate the effect of number of points used for discretization
  - Perform grid convergence study
  - Evaluate the effect of diffusive CFL*
  - Comparison of results with expected theoretical behavior
  - Verify the order of spatial accuracy of discretization
- Commit your report to your git repository

Ideas

- One of the projects will be assigned
- Project A - 2D Poisson/Helmholtz equation in a rectangle
  - Choose and compare 2 linear solvers among Gauss elimination, Gauss-Seidel, and Successive Over Relaxation (SOR).
- Project B - 2D Diffusion equation in a rectangle
  - Choose and compare 2 time integration methods among explicit, implicit, Crank-Nicolson and Runge-Kutta (RK).
- Contact one of the instructors to receive a detailed description of your project