

Homework #3

ME 471/571

All of your work for this assignment should be turned in using Jupyter Notebooks. Please submit the an HTML version as well as the original notebook.

1. Convert the code `heat_serial.c` to a parallel code. Your code should take as input the mesh resolution and number of time steps to output.

You can use the Jupyter notebook to plot the output.

- Choose the mesh resolution N so that it evenly divides the number of processors your choose (i.e. $N = 2^p$ is a good choice.)
 - Use "no-flux" boundary conditions.
 - Your should provide convincing evidence that your serial code and parallel code produce the same results.
 - You can use rank 0 to write output.
 - Show your timing results for $N = 2048$. What kind of speed-up do you get?
2. Write a serial 2d heat solver. Use this to solve the heat equation in $[-1.1] \times [-1, 1]$. Use a Gaussian as your initial condition, given by

$$q(\mathbf{x}, t) = \exp(-20(x^2 + y^2))$$

- You may use either to use either C or Fortran for updating the solution.