Poisson's equation in two-dimensional space

Problem: Find the scalar field $u(\boldsymbol{x})$ defined by the equation

$$\nabla^2 u(\boldsymbol{x}) = f(\boldsymbol{x}), \quad \boldsymbol{x} \in [-1, 1]^2$$

with $u = 0$ at the boundary. The problem is solved with f such that the exact solution is

$$u(x, y) = \sin(\pi x) \sin(\pi y)$$

To run this example, go to the $\sim$/examples/poisson_2d folder, run make, and then execute ./poisson_2d. To configure the running mode (CPU or GPU), edit the $\sim$/src/config.h file to enable or disable USE_CPU_ONLY before running make.

Meshes: Three versions of the mesh are included for this example: coarse, fine, and super fine.

Run times of dg-on-cuda: Comparison of the CPU (serial) execution on Nvidia Jetson Xavier NX (Carmel ARMv8.2 64-bit 6MB L2 + 4MB L3) with the GPU execution (Volta GPU with 384 CUDA cores) on the fine mesh (1,064 elements) is shown below. The GPU executions are all timed with block size 64.

	CPU			GPU		
Approx. order	1	2	3	1	2	3
Time (s)	40.7	366.2	1404.2	22.0	131.6	607.9

As can be seen, the speedups are slightly worse than those obtained in other example problems.