

# Project 1 Milestone 1

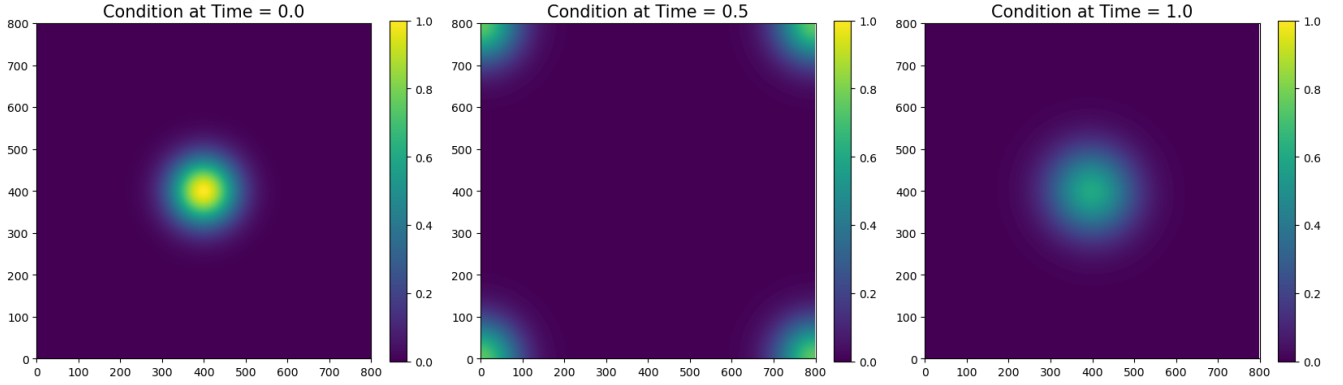
## Introduction

Name: Annabelle Huang  
CNET ID: ahuang02

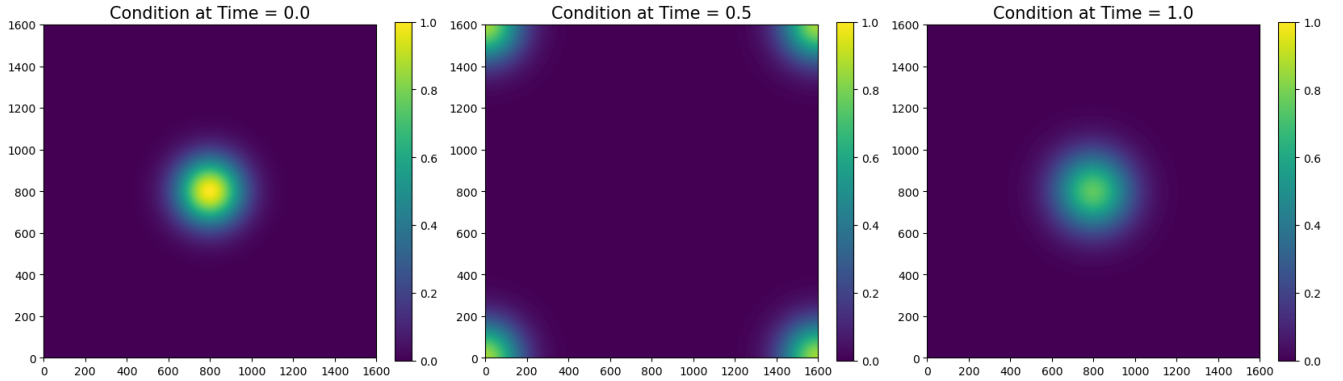
## Verification

For each of the four cases specified in the performance section, we have the image of initial condition, the image at time  $T/2$ , and the image at time  $T$  using parameter values specified for the performance comparisons in the next section with the initial condition for all tests as  $C(x, y, 0) = \exp\left(-\left(\frac{x^2}{2\sigma_x^2} + \frac{y^2}{2\sigma_y^2}\right)\right)$  with  $\sigma_x^2 = \sigma_y^2 = \frac{1}{200}$  and using the periodic boundary conditions.

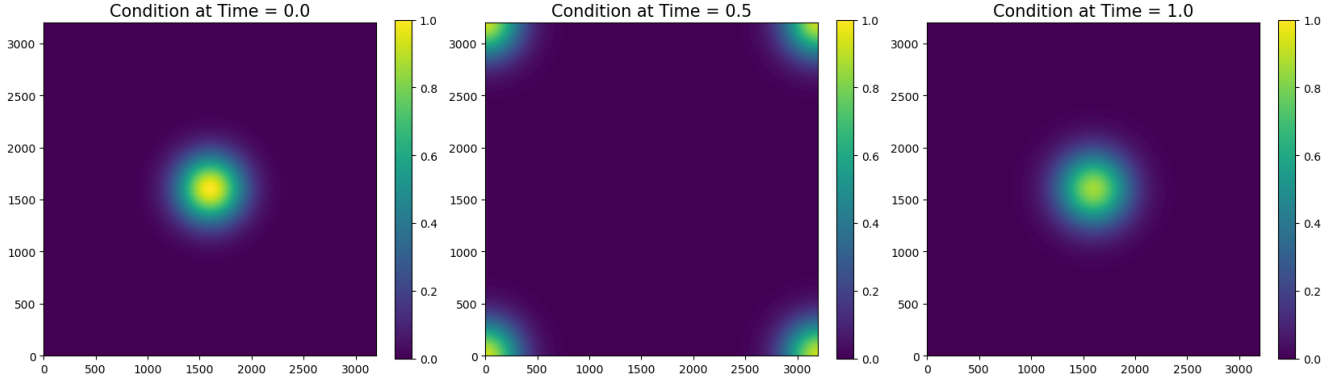
### Advection with N = 800



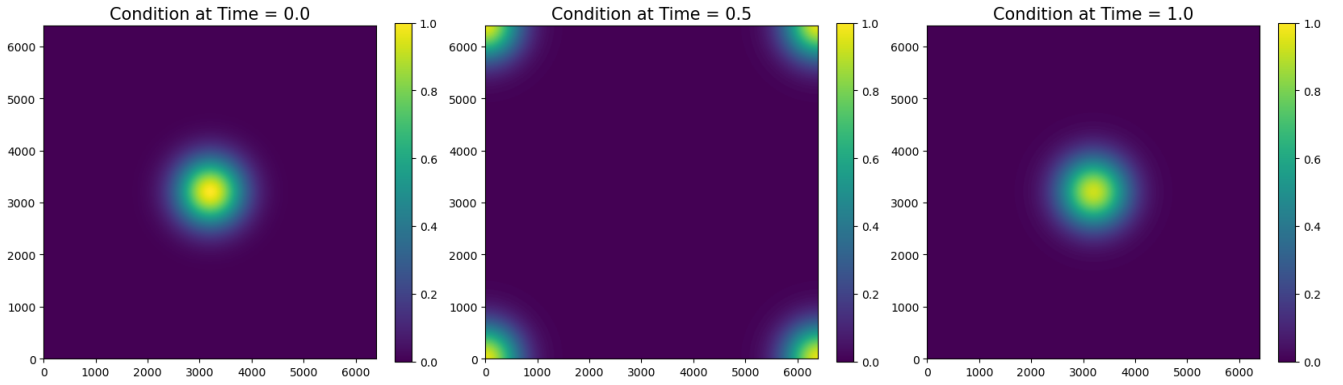
### Advection with N = 1600



### Advection with N = 3200



### Advection with N = 6400



An animation of the full simulation for the  $3200 \times 3200$  case is in the GitHub repository.

### Performance

Fill out the tables below with the requested information.

Problem Size (NXN)	Grind Rate ( $\frac{cells}{sec}$ )	time to solution (s)
$800 \times 800$	1,498,773,115	1.92
$1600 \times 1600$	1,056,307,476	21.92
$3200 \times 3200$	1,152,969,401	160.71
$6400 \times 6400$	1,058,944,837	1400.13

Table 1: Performance of Lax Method for a range of grid resolutions. All experiments should use  $L = 1.0m$ ,  $u = 1.0 \frac{m}{s}$ ,  $v = 1.0 \frac{m}{s}$ , and  $T = 1.0s$  with  $\delta x = \frac{L}{N-1}$ ,  $\delta t = 0.25 \frac{\delta x}{\sqrt{u^2+v^2}}$ .

This is on a Macbook Air (2020) with Apple M1 chip with 8-core CPU: 4 performance cores and 4 efficiency cores.