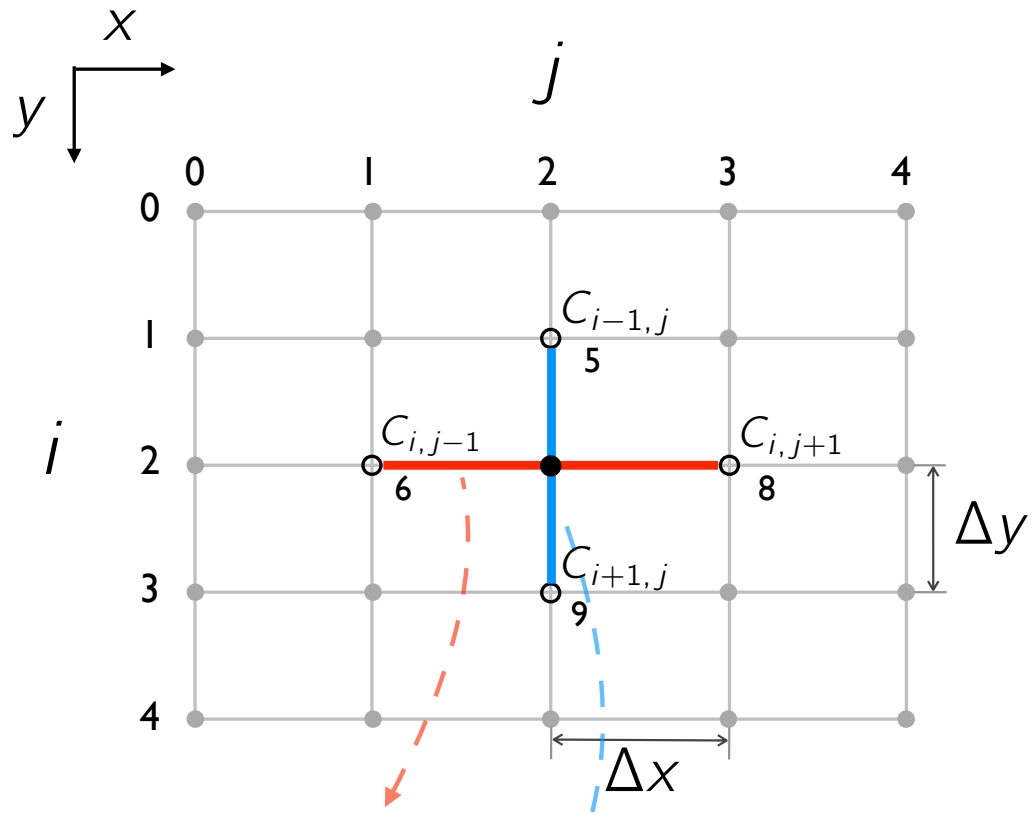
Calculating the gradient of a function on a discrete grid

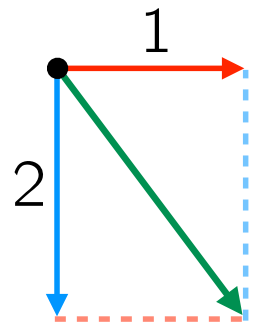
$$\nabla f(x,y) = \begin{bmatrix} \frac{\partial f(x,y)}{\partial x} \\ \frac{\partial f(x,y)}{\partial y} \end{bmatrix} \approx \begin{bmatrix} \frac{\Delta f}{\Delta x} \\ \frac{\Delta f}{\Delta y} \end{bmatrix}$$



$$\Delta x = \Delta y = 1$$

$$\frac{\partial f(x,y)}{\partial x} \approx \frac{\Delta f}{\Delta x} = \frac{f(x+\Delta x) - f(x-\Delta x)}{2\Delta x} = \frac{C_{i,j+1} - C_{i,j-1}}{2} = \frac{8-6}{2} = 1$$

$$\frac{\partial f(x,y)}{\partial y} \approx \frac{\Delta f}{\Delta y} = \frac{f(y+\Delta y) - f(y-\Delta y)}{2\Delta y} = \frac{C_{i+1,j} - C_{i-1,j}}{2} = \frac{9-5}{2} = 2$$



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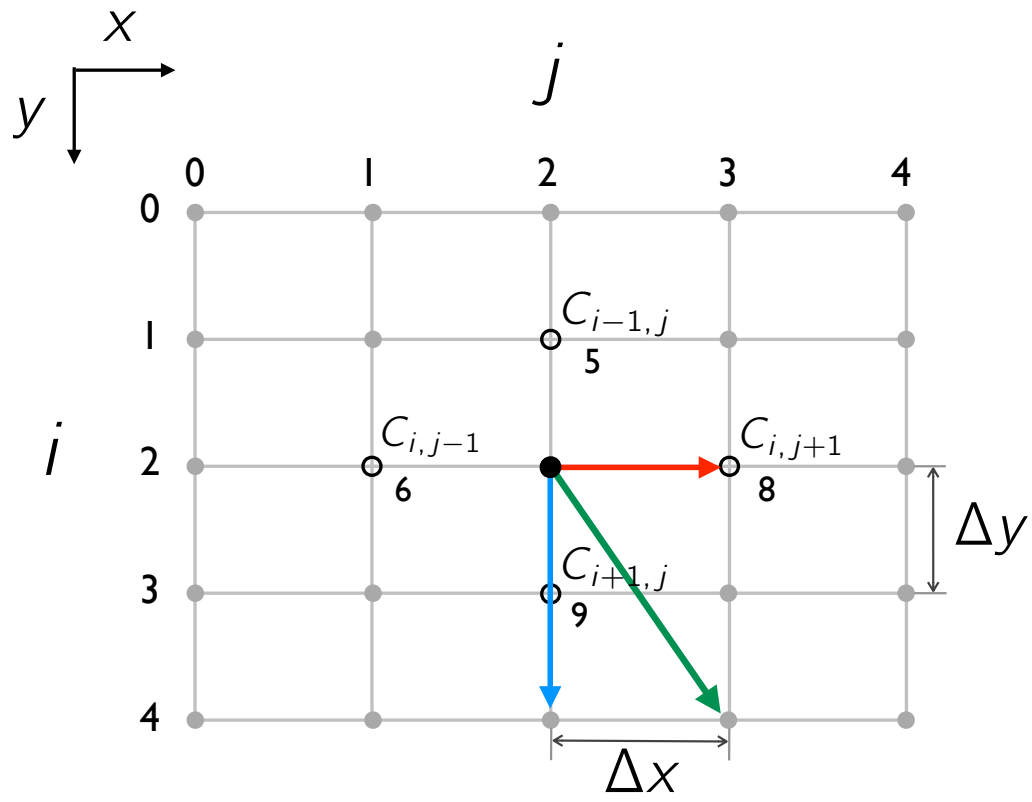

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