Visualization
– Interpolation (Questions)

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Possible Questions

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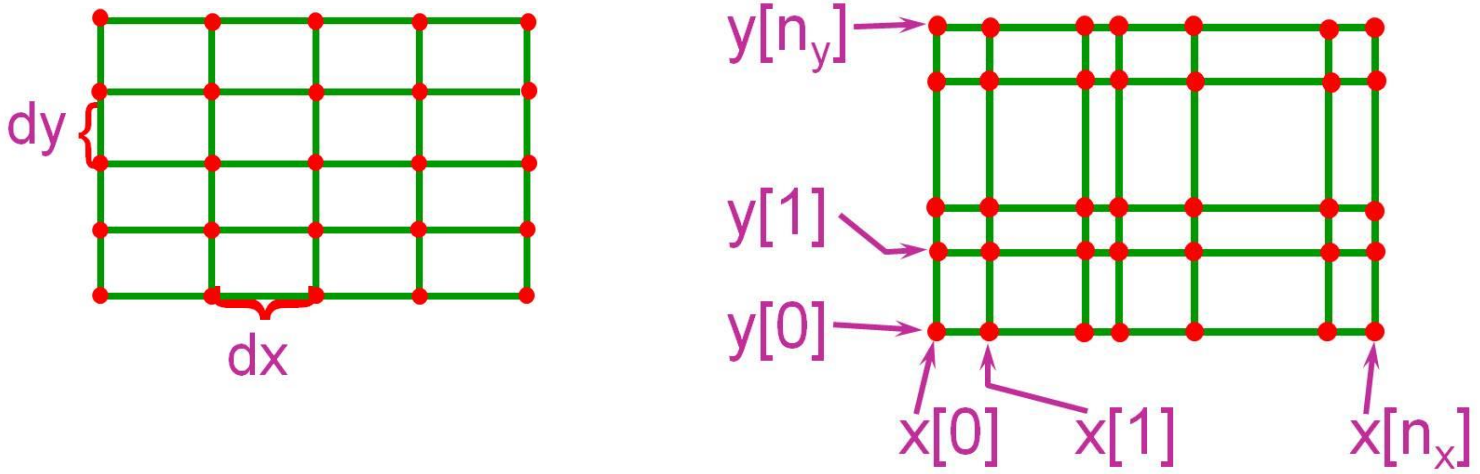

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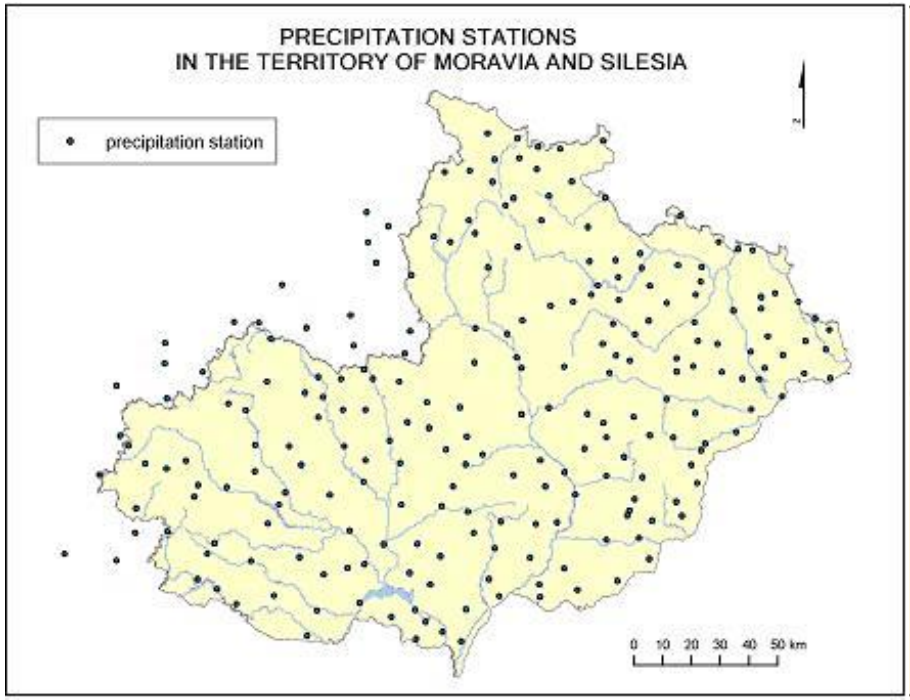

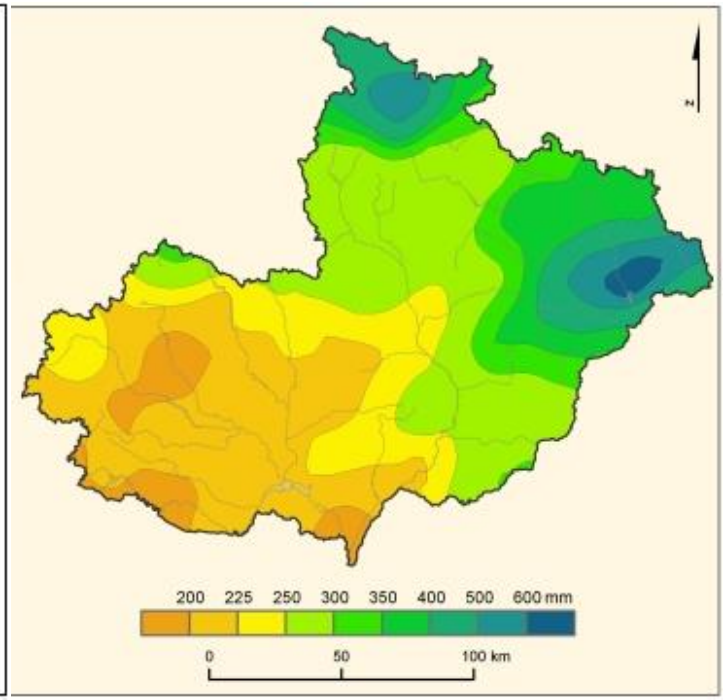

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- Given are three points, write down the equation system with the radial functions that interpolate the data

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$$f(1) = 1$$
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$$f(x) = w_1\varphi(|1-x|) + w_2\varphi(|3-x|) + w_3\varphi(|4-x|)$$

$$w_1\varphi(0) + w_2\varphi(2) + w_3\varphi(3) = 1$$
$$w_1\varphi(2) + w_2\varphi(0) + w_3\varphi(1) = 2$$
$$w_1\varphi(3) + w_2\varphi(1) + w_3\varphi(0) = 0$$

Possible Questions

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  - Every sample point has influence on whole domain
  - Adding a new sample requires re-solving the equation system
  - Computationally expensive (solving a system of linear equations)

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- When applying the edge flip algorithm, when do we have to flip an edge?

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- When the edge is illegal, meaning the circumcircle of one of the incident triangles contains another vertex/point

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- Given is the triangle with the points $(x_0, y_0) = (0, 0)$, $(x_1, y_1) = (1, 0)$, $(x_2, y_2) = (0, 1)$ and the values $f_0 = 1$, $f_1 = 8$, $f_2 = 2$. What is the interpolated value at $(x_0, y_0) = (0.5, 0.5)$

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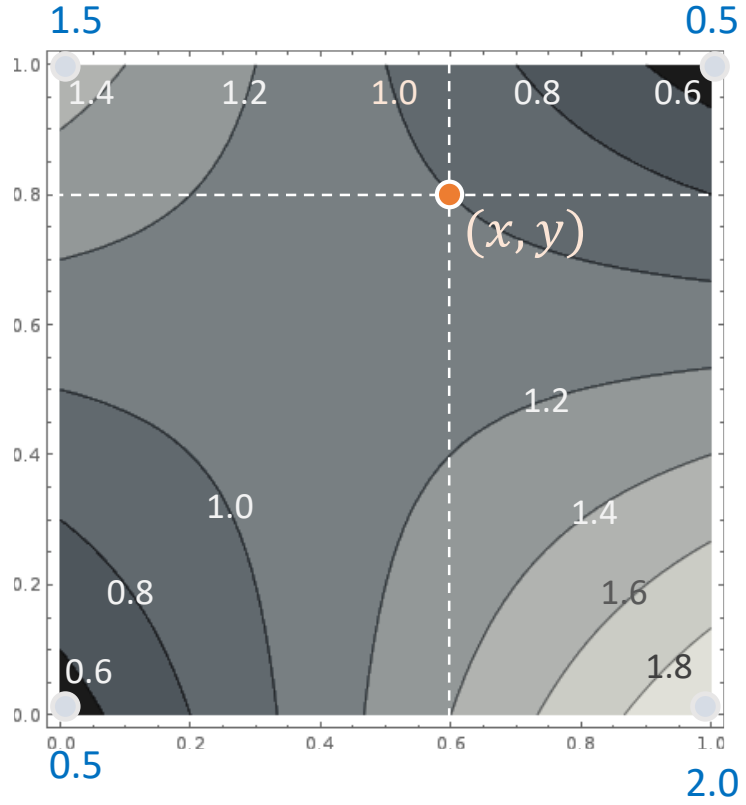
- We have $f(\boldsymbol{x}) = a + bx + cy$, obtain a, b, c by solving the system

$$\begin{bmatrix} 1 & 0 & 0 \\ 1 & 1 & 0 \\ 1 & 0 & 1 \end{bmatrix} \begin{bmatrix} a \\ b \\ c \end{bmatrix} = \begin{bmatrix} 1 \\ 8 \\ 2 \end{bmatrix}$$

$a = 1, b = 7, c = 1$
$f(x, y) = 1 + 7x + 1y \rightarrow f(0.5{,}0.5) = 5$

Possible Questions

- Determine $f(0.6,0.8)$ with bilinear interpolation



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- Determine $f(0.6,0.8)$ with bilinear interpolation

$$f(\alpha,\beta) = (1-\alpha)(1-\beta)\, f_{i,j} + \alpha(1-\beta)\, f_{i+1,j} + (1-\alpha)\beta\, f_{i,j+1} + \alpha\beta\, f_{i+1,j+1}$$

$$\begin{aligned} f(0.6/1, 0.8/1) &= (0.4)(0.2)\cdot 0.5 + (0.6)(0.2)\cdot 2.0 \\ &\quad + (0.4)(0.8)\cdot 1.5 + (0.6)(0.8)\cdot 0.5 \\ &= 0.04 + 0.24 + 0.48 + 0.24 \\ &= 1 \end{aligned}$$