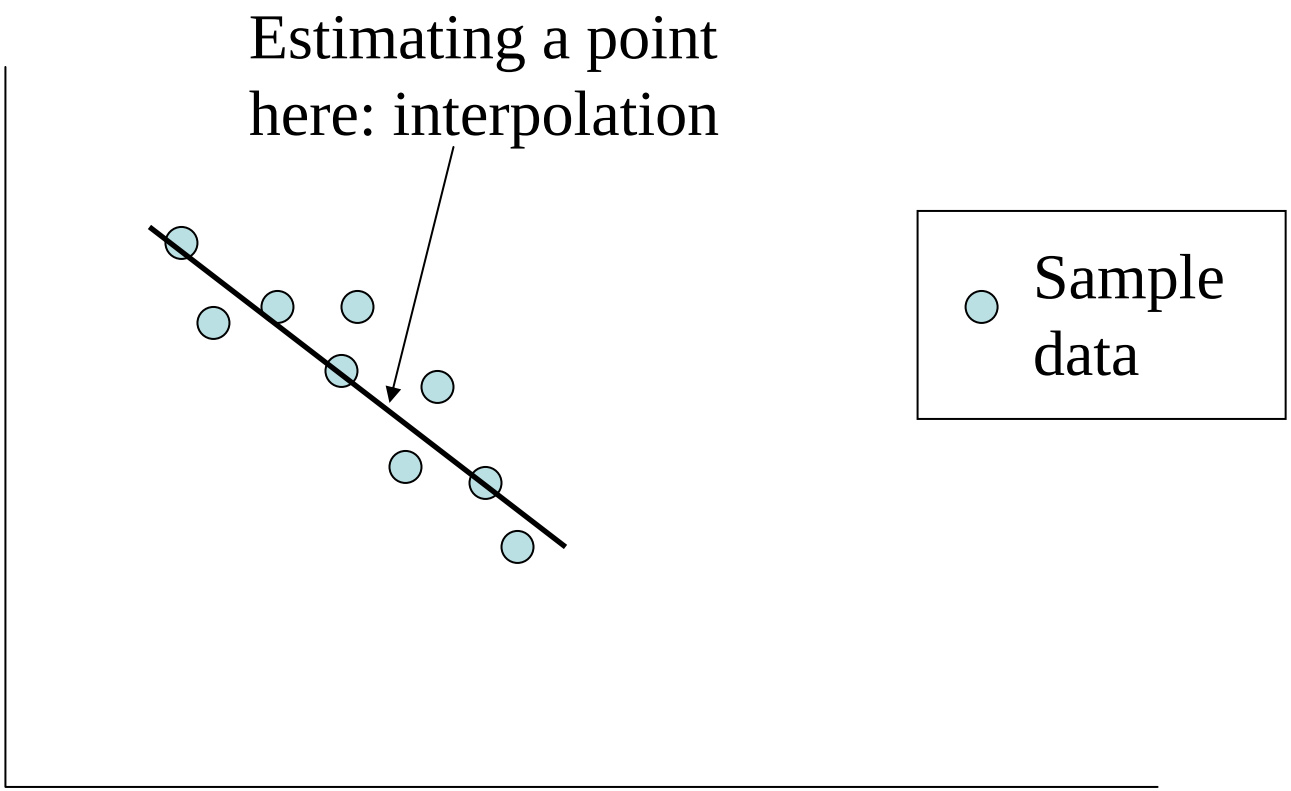
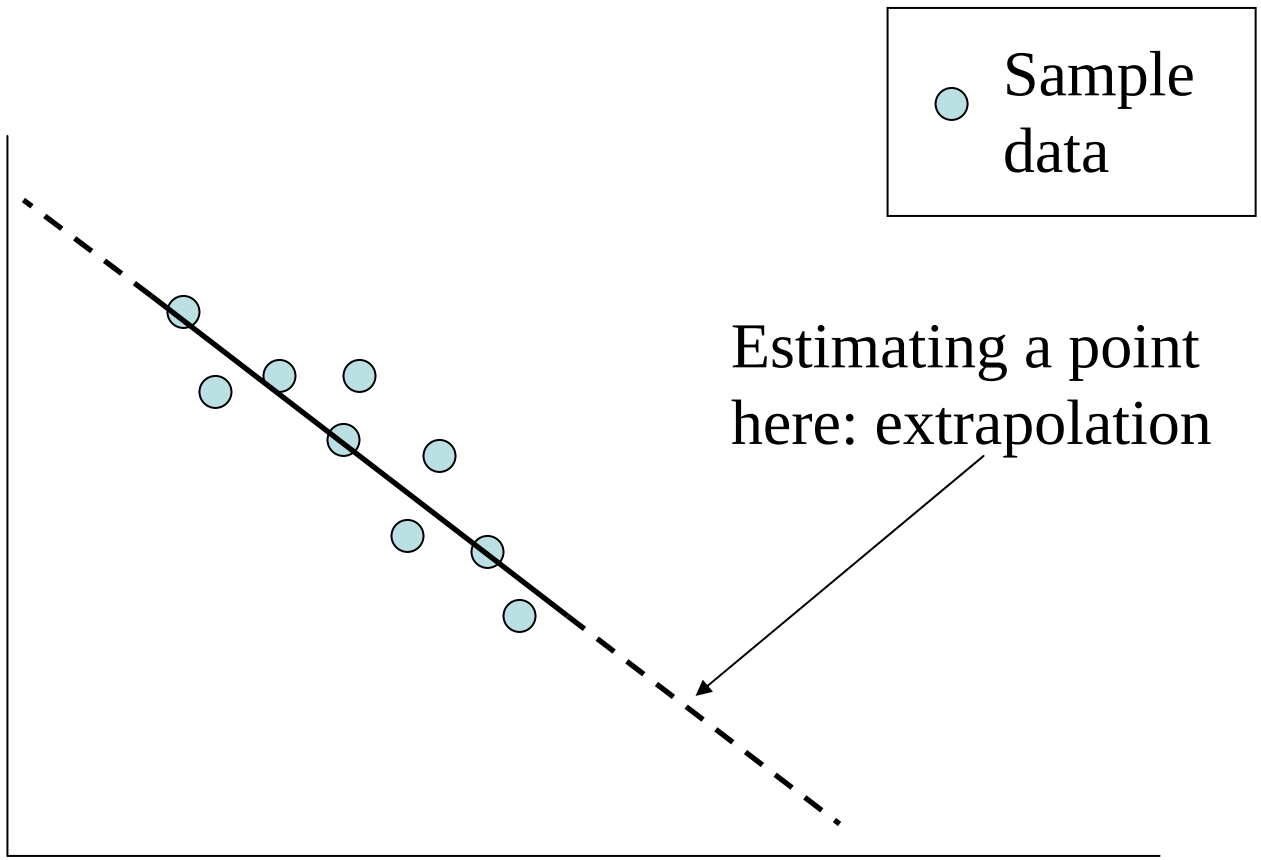
Spatial Interpolation

Spatial Interpolation is a process of using points with known values to estimate values at the other points.

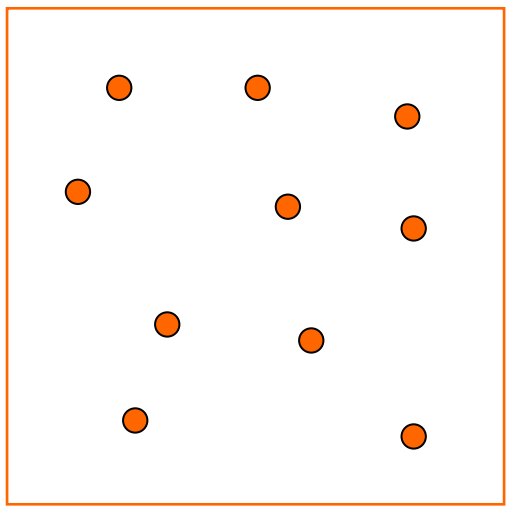
Interpolation concept



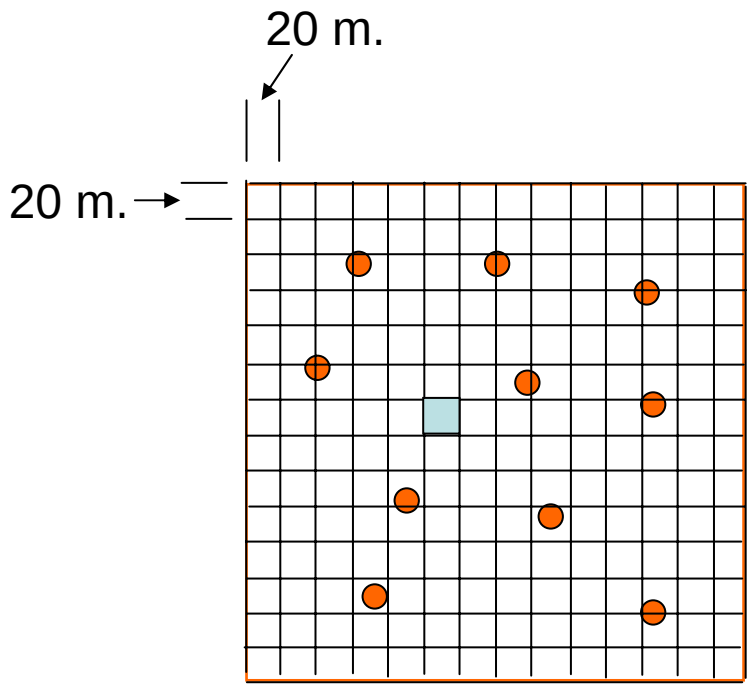
Extrapolation concept



Spatial Interpolation

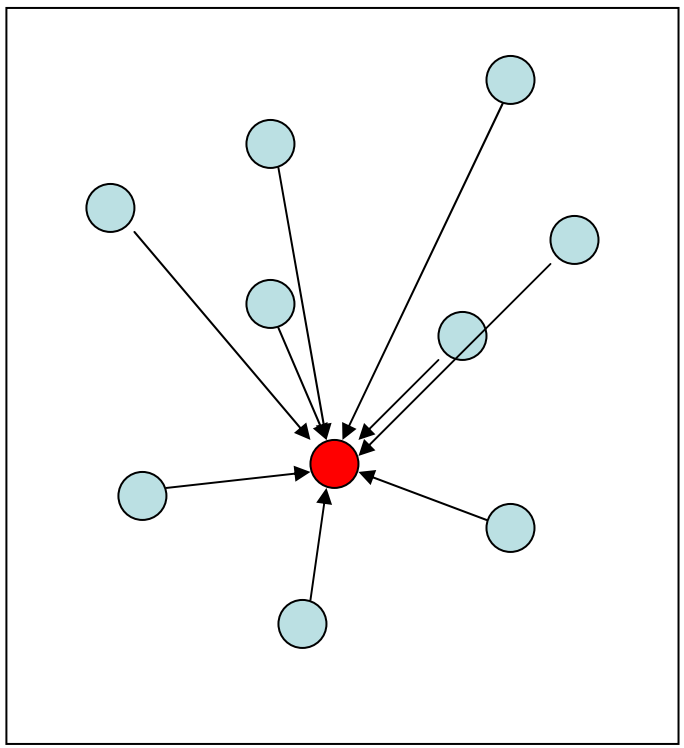


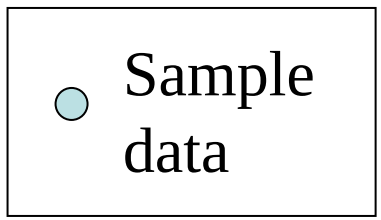
Sampling points



Global Interpolation

Uses all known sample points to estimate a value at an unsampled location



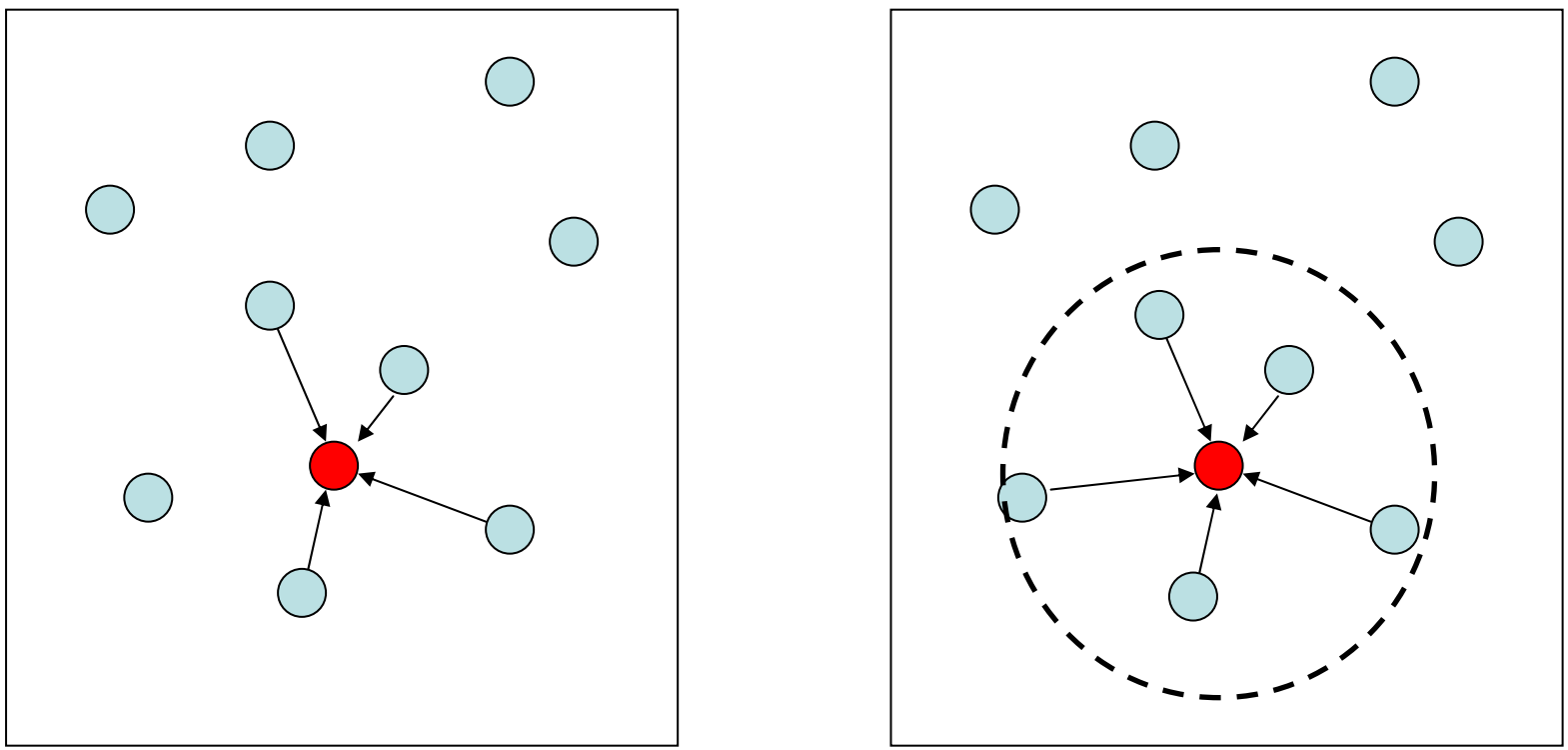


Local Interpolation

Uses a neighborhood of sample points to estimate a value at an unsampled location

Local neighborhood,

closest *4* number of points, or within a given search radius



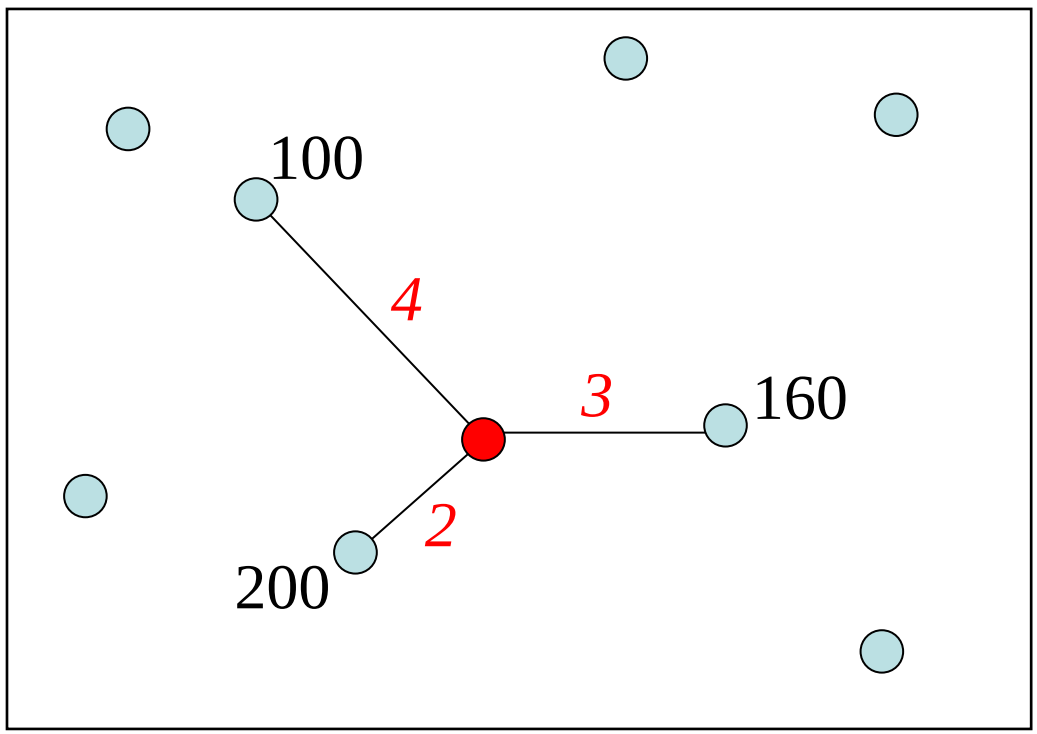
Spatial Interpolation Methods

There are a lot of methods

- Inverse distance weighting (IDW)
- Spline
- Trend surface
- Kriging
- etc.

Inverse Distance Weighted (IDW): Example

$$\hat{z}_j = \sum_{i=1}^{m} w_{ij} z_i \quad , \quad \text{where} \quad w_{ij} = \frac{1/d_{ij}^k}{\sum_{i=1}^{m} 1/d_{ij}^k}$$



z_i = 100, 160, 200

d_{ij} = 4, 3, 2

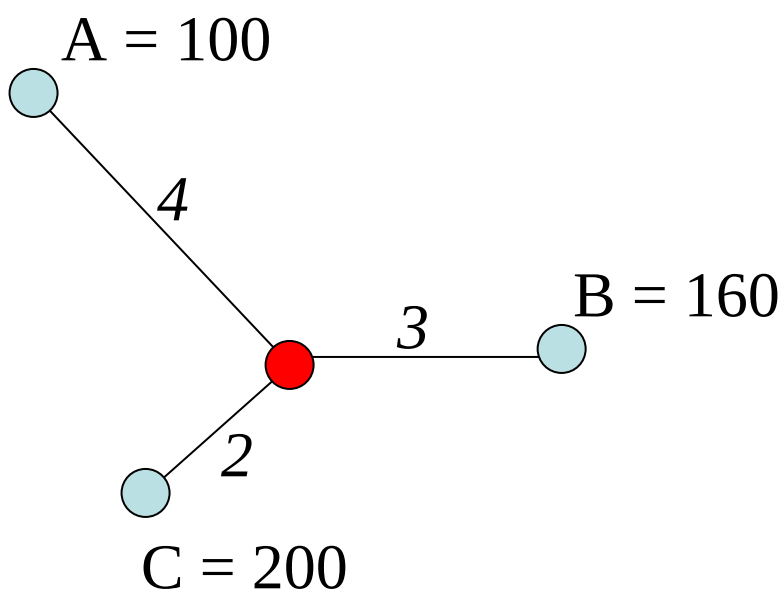
m = 3

k = 1

Inverse Distance Weighted (IDW): Example

$1/d_{ij}^{k}$

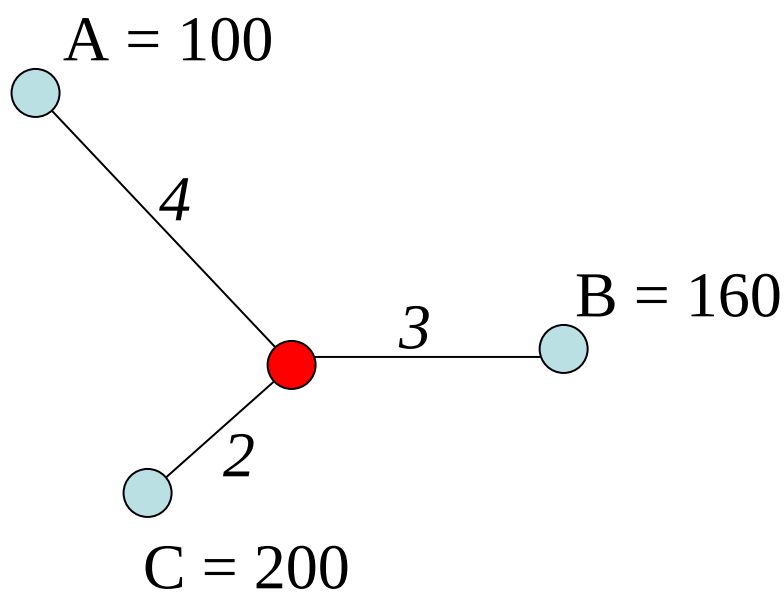
A B C	



Inverse Distance Weighted (IDW): Example

	$1/d_{ij}^{k}$
A	1 / 4 = .25
B	1 / 3 = .33
C	1 / 2 = .50

The weight = inverse of the distance

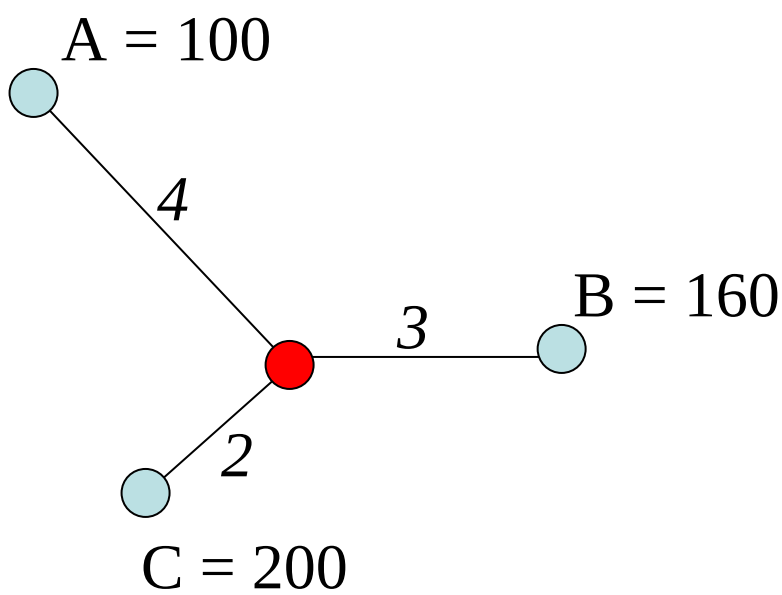


Inverse Distance Weighted (IDW): Example

$$w_{ij} = \frac{1/d_{ij}^{k}}{\sum_{i=1}^{m} 1/d_{ij}^{k}}$$

	$1/d_{ij}^{k}$	w_{ij}
A	1 / 4 = .25	.25 / 1.08 = .231
B	1 / 3 = .33	.33 / 1.08 = .306
C	1 / 2 = .50	.50 / 1.08 = .463

$$\sum_{i=1}^{m} 1/d_{ij}^{k} = 1.08$$

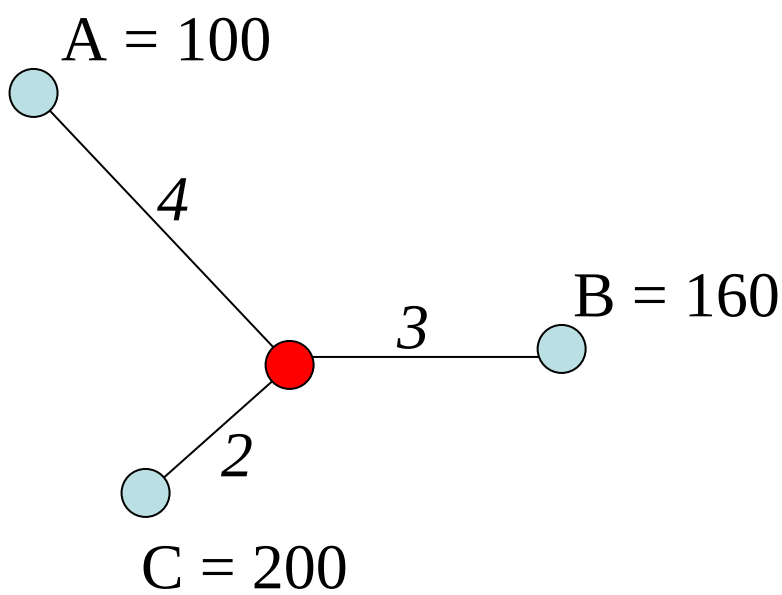


Inverse Distance Weighted (IDW): Example

$$w_{ij} = \frac{1/d_{ij}^{k}}{\sum_{i=1}^{m} 1/d_{ij}^{k}}$$

	$1/d_{ij}^{k}$	$w_{ij}z_i$
A	1 / 4 = .25	.25 / 1.08 = .231	100 x .231 = 23.1
B	1 / 3 = .33	.33 / 1.08 = .306	160 x .306 = 48.9
C	1 / 2 = .50	.50 / 1.08 = .463	200 x .463 = 92.6

$\sum_{i=1}^{m} 1/d_{ij}^{k} = 1.08$



Inverse Distance Weighted (IDW): Example

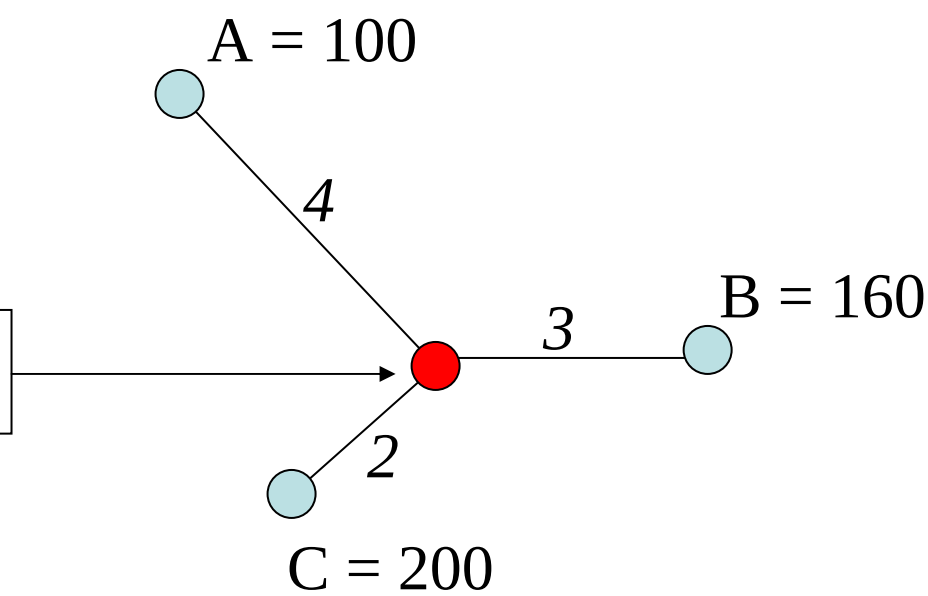
$$w_{ij} = \frac{1/d_{ij}^{k}}{\sum_{i=1}^{m} 1/d_{ij}^{k}}$$

	$1/d_{ij}^{k}$	$w_{ij}z_i$
A	1 / 4 = .25	.25 / 1.08 = .231	100 x .231 = 23.1
B	1 / 3 = .33	.33 / 1.08 = .306	160 x .306 = 48.9
C	1 / 2 = .50	.50 / 1.08 = .463	200 x .463 = 92.6

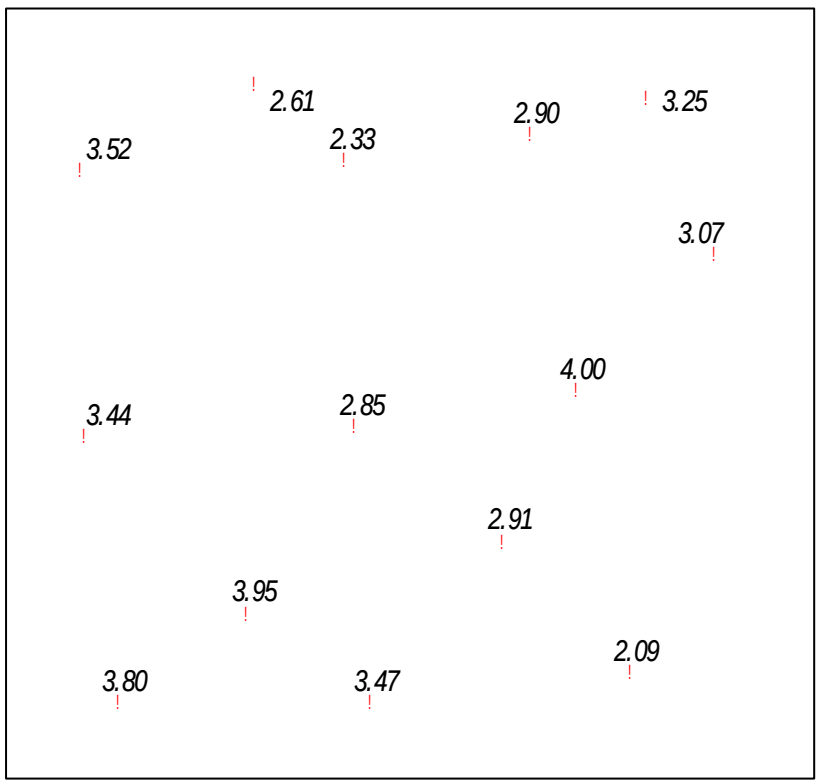
$$\sum_{i=1}^{m} 1/d_{ij}^{k} = 1.08$$

$$\hat{z}_j = \sum_{i=1}^{m} w_{ij} z_i$$

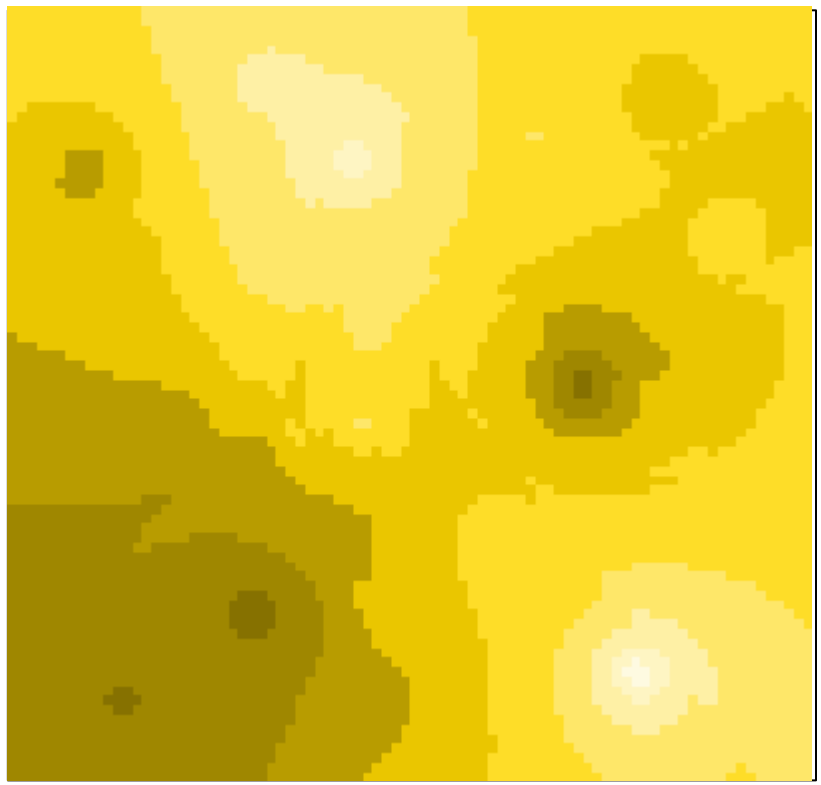
23.1 + 48.9 +92.6 = **164.6**



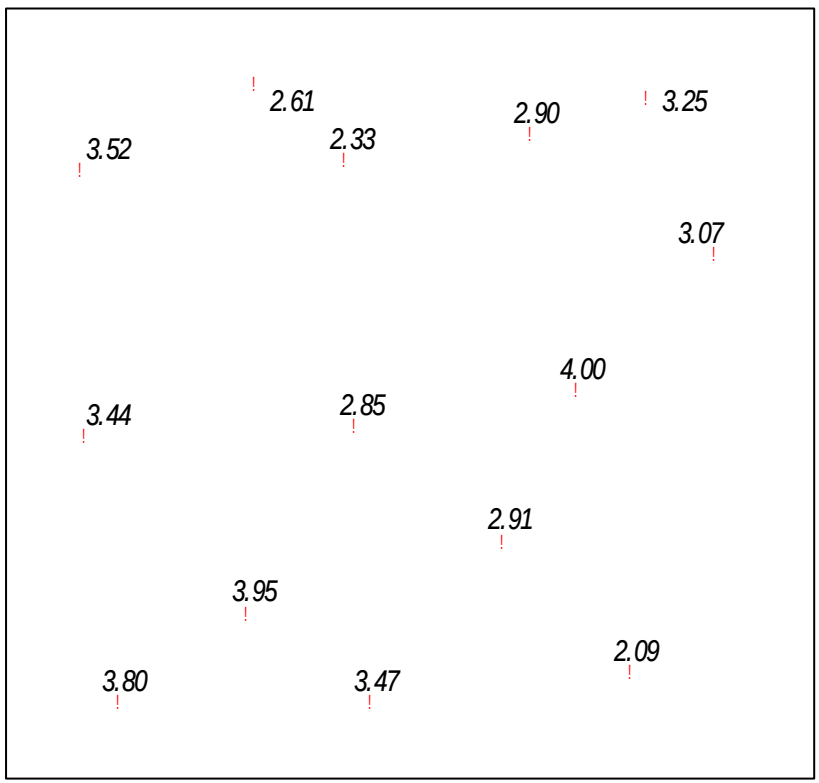
Sampling points



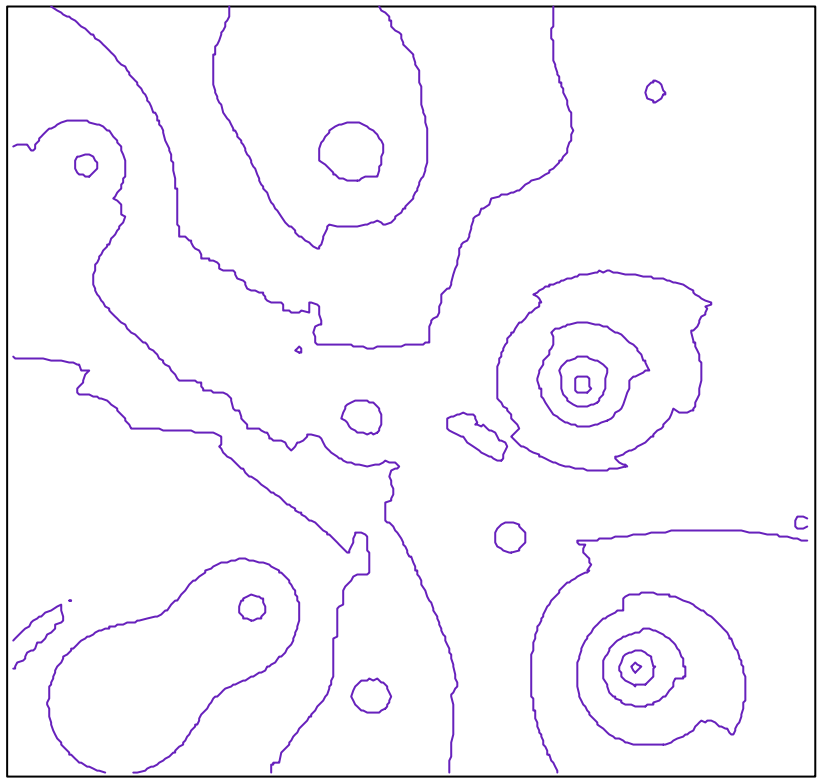
Surface



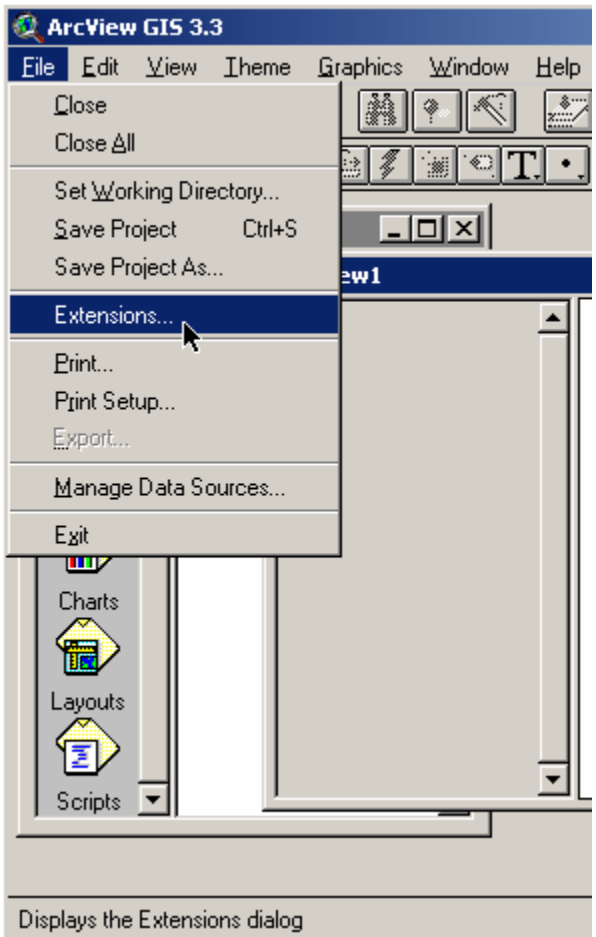
Sampling points

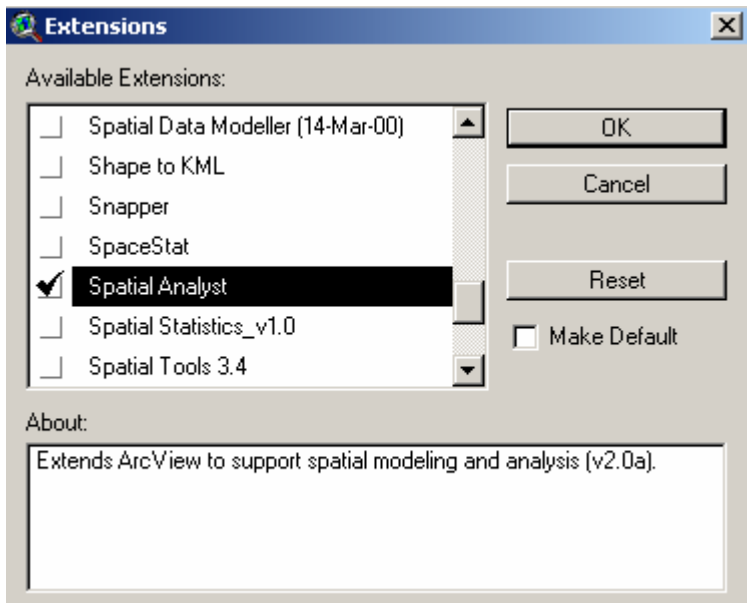


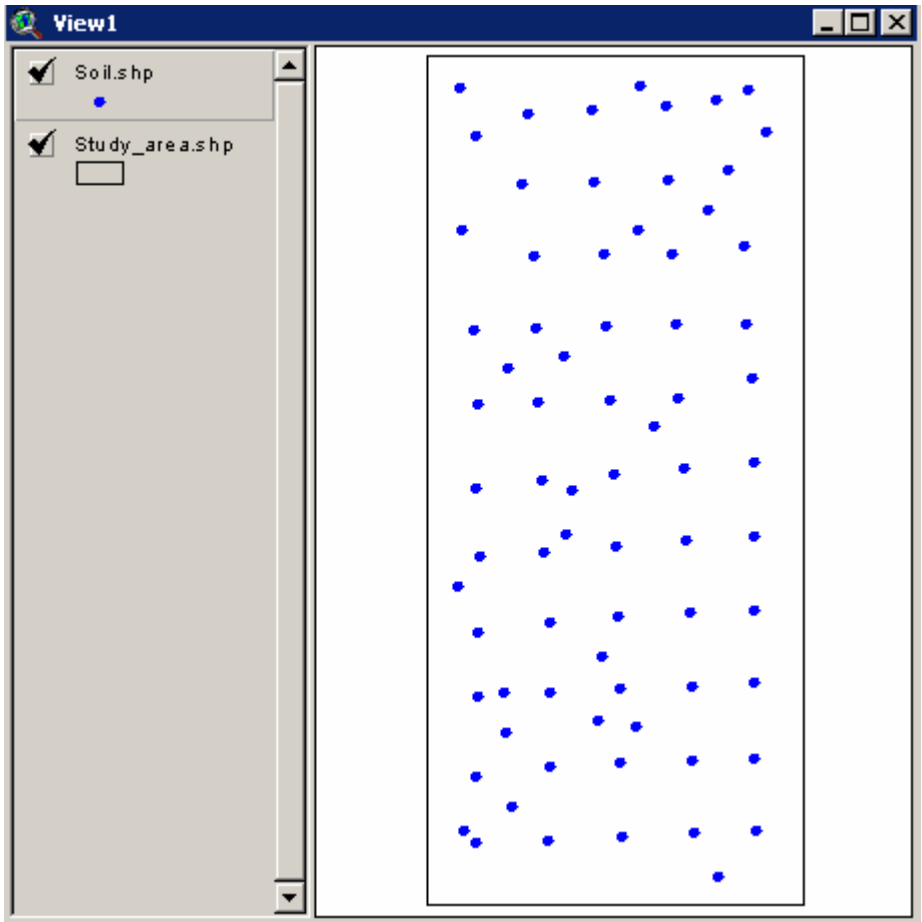
Contour



ArcView – Spatial Analyst Extension






View1
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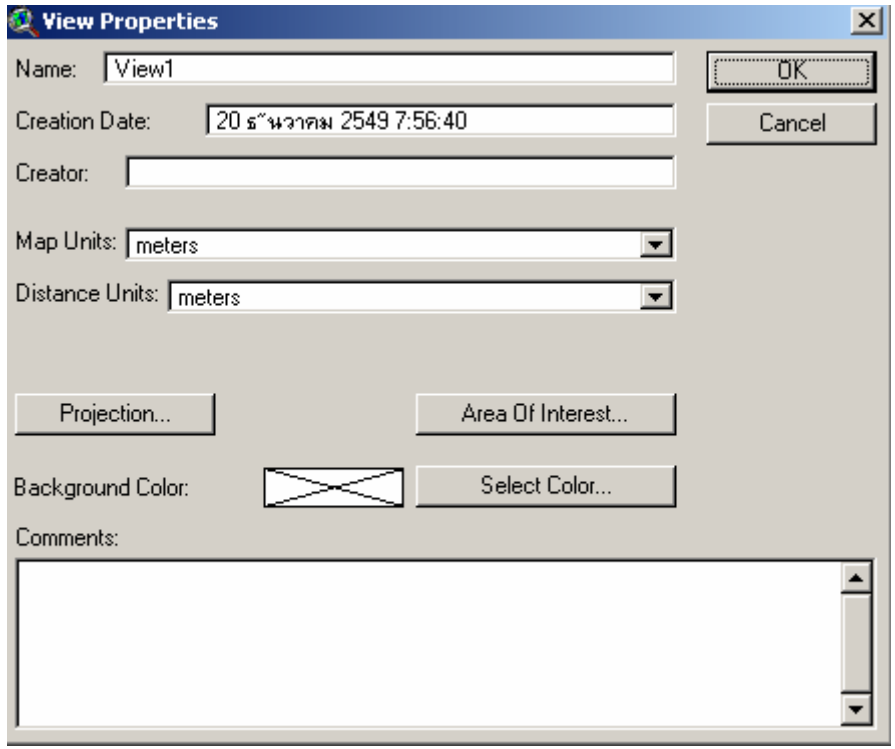
Study_area.shp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Cancel
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Area Of Interest...
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Comments: