

# Please log onto Brightspace and download the data and code for today's lecture

The screenshot shows a Brightspace module page titled "Week 6 - Spring 2021 ASM591". The left sidebar lists weeks from Week 1 to Week 6, each with a "Download" button. Week 6 is currently selected. The main content area includes a "Roadmap of the Module" with a bullet point about processing raster data in ArcGIS Pro, a "Total Lecture Time" of ~100 minutes, and a "Total Lab Time" of ~100 minutes. A "Download" button is available. Below this, a progress bar indicates "100 % 1 of 1 topics complete". The "Lecture 6" section is expanded, showing a "Web Page" link with an "Updated ✓" status. It also displays "Run Time: XX:XX" and two sections: "Lecture 1:" and "Lecture 2:". The "Lecture 1:" section contains a "Data" item with a yellow icon and a "Code" item with a blue icon. Both items are highlighted with a red border.

Week 1      1

Begins January 19

Week 2      3

Begins January 24

Week 3      2

Begins January 31

Week 4      2

Begins February 7

Week 5      1

Begins February 15

Week 6      ✓

Begins February 22

• process raster data in ArcGIS Pro with spatial analysis toolbox

**Roadmap of the Module**

1. reading list: chapters 10.3-10.8, and 10.12 in Python Scripting for ArcGIS Pro

**Total Lecture Time:** ~100 minutes

**Total Lab Time:** ~100 minutes

**Download**

100 % 1 of 1 topics complete

**Lecture 6**      ✓

Web Page

Run Time: XX:XX

Lecture 1: []

Data: Data for hands-on week6 lecture1

Code: NumPy Hands-on code week6 lecture1

Lecture 2: []

# **ASM591/ILS595 GEOSPATIAL PROGRAMMING AND DATA SCIENCE**

Introduction to Geospatial Data Science - Spatial Analysis and Statistics

Week 6 Lecture 1, Spring 2021

*"Information is the oil of the 21<sup>st</sup> century, and analytics is the combustion engine."* - Peter Sondergaard, Senior VP, Gartner Research



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[Gang Shao](#)

Assistant Professor of Data Science

PLSIS, Purdue University

# Content:

- Vector analysis (review)
- Raster analysis (part 1/2)
- Numpy Hands-on



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## Vector Analysis (Review)



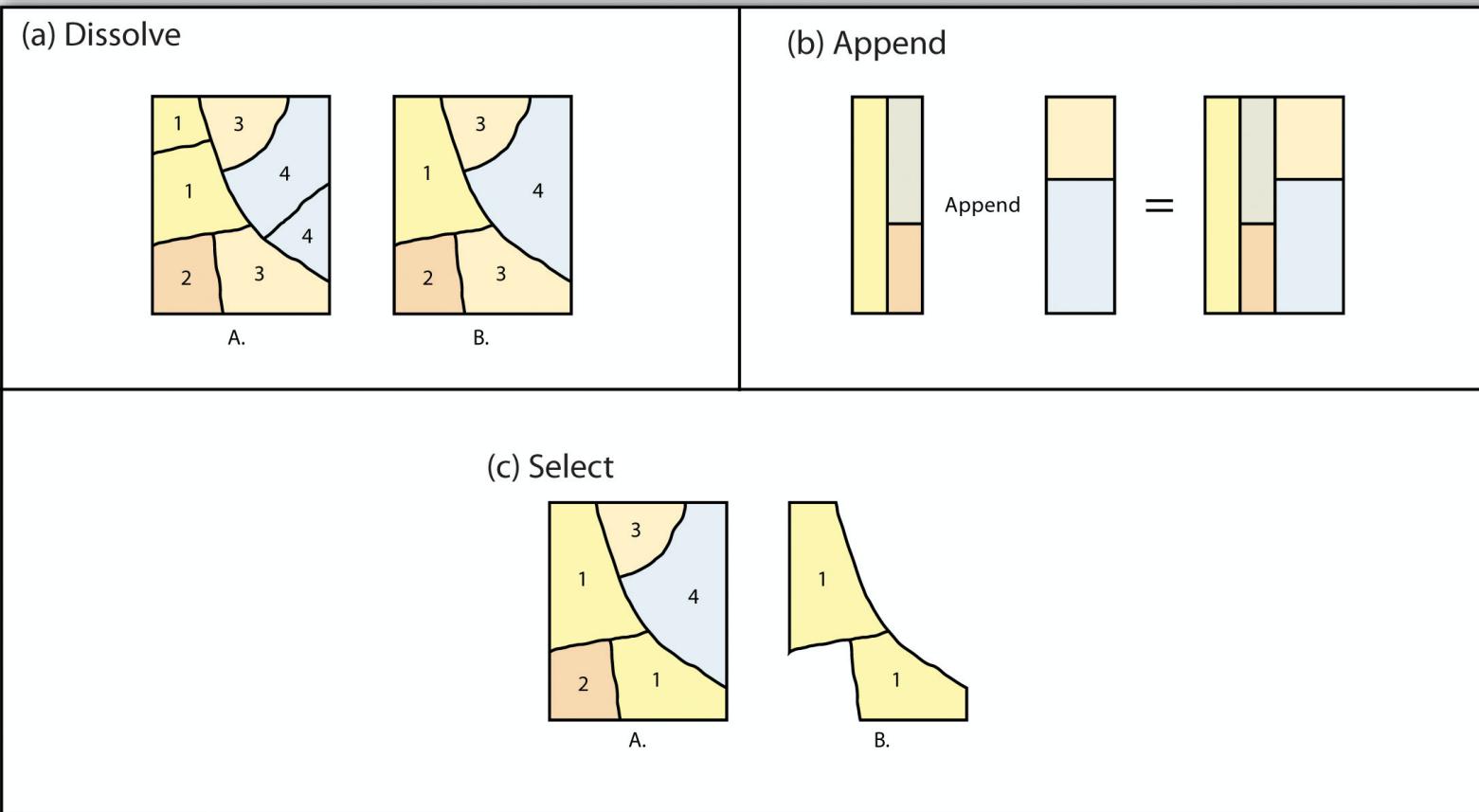
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Reference : <https://ltb.itc.utwente.nl/498/concept/81774>

# *Vector analysis*

## Single layer geoprocessing



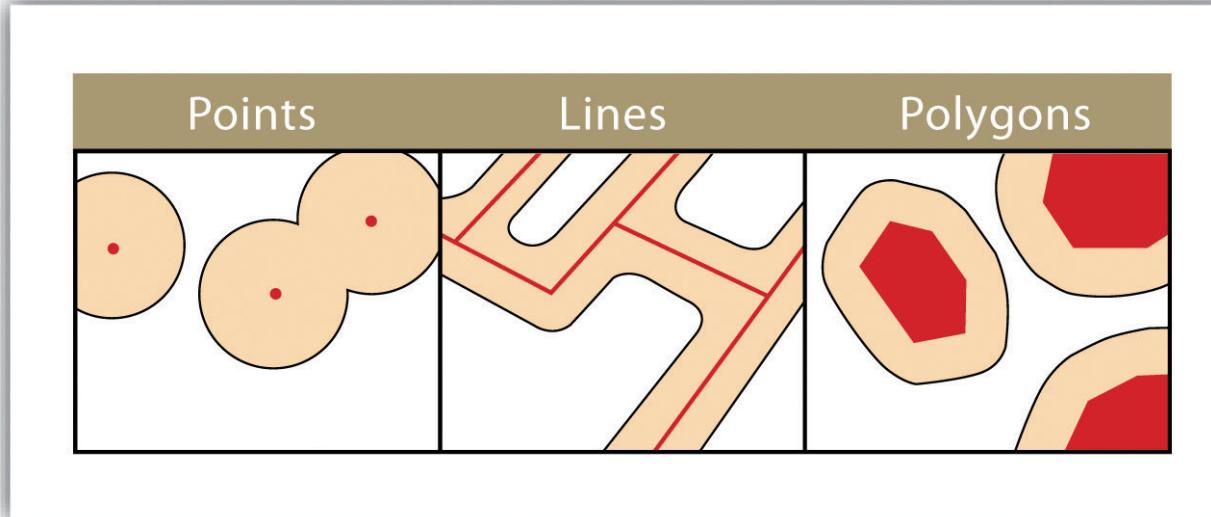
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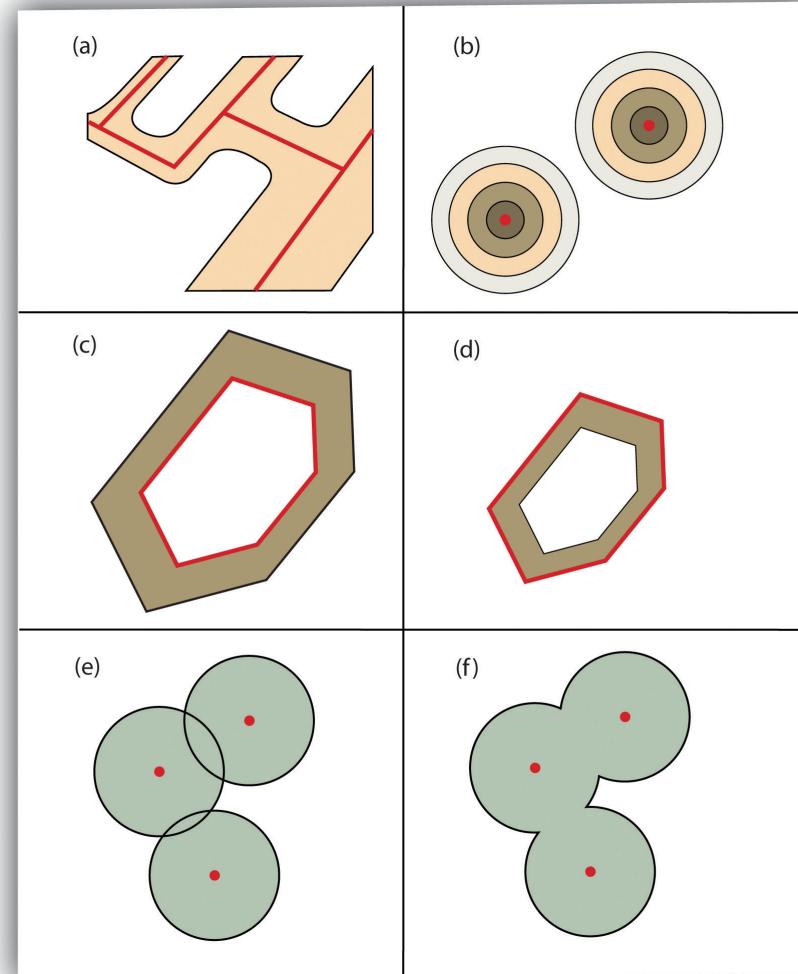
Reference : [https://saylordotorg.github.io/text\\_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html](https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html)

# Vector analysis

## Buffering

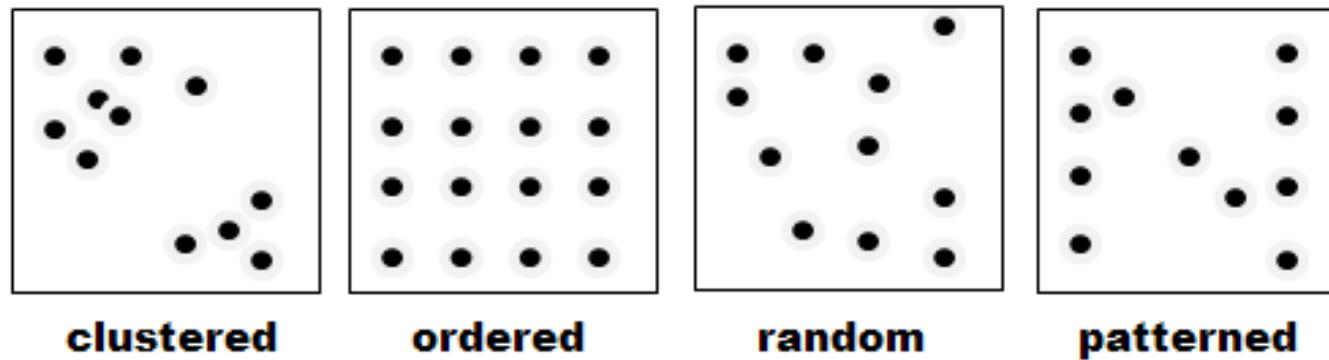


*Additional Buffer Options around Red Features:*  
(a) Variable Width Buffers, (b) Multiple Ring Buffers,  
(c) Doughnut Buffer, (d) Setback Buffer,  
(e) Nondissolved Buffer, (f) Dissolved Buffer

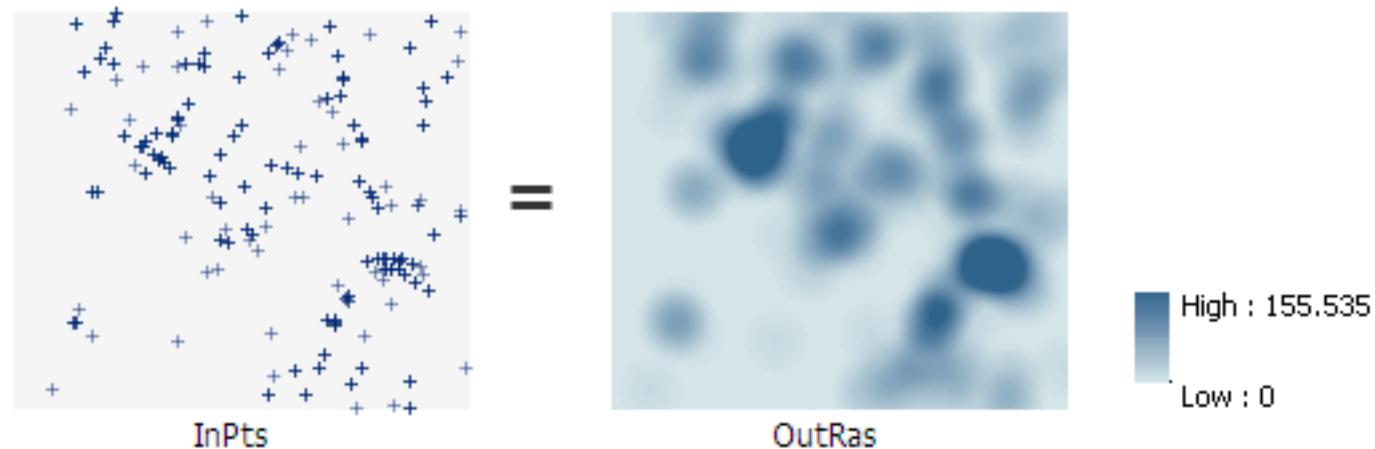


# *Vector analysis*

## Distributions

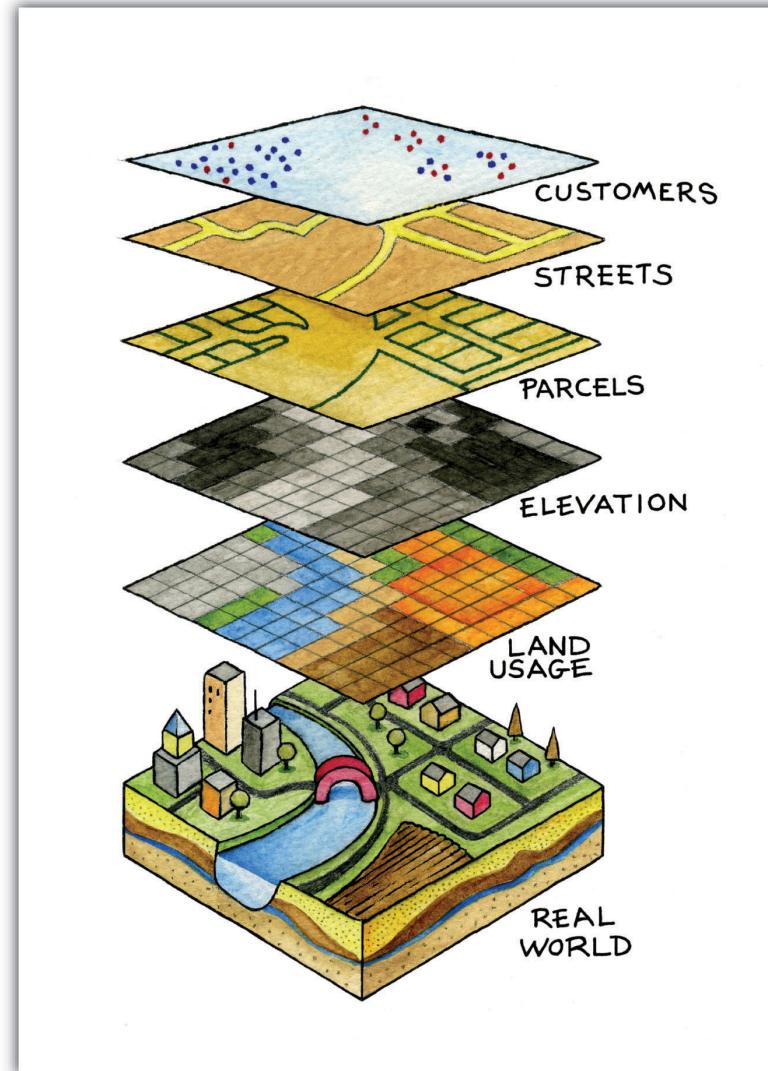


## Kernel density



# *Vector analysis*

Multiple layer processing



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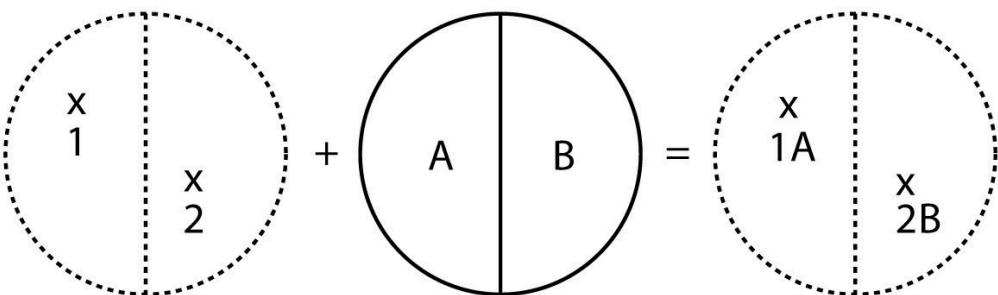
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Reference : <https://geol260.academic.wlu.edu/course-notes/shape-analyses/distribution-of-points-lines-and-polygons/>

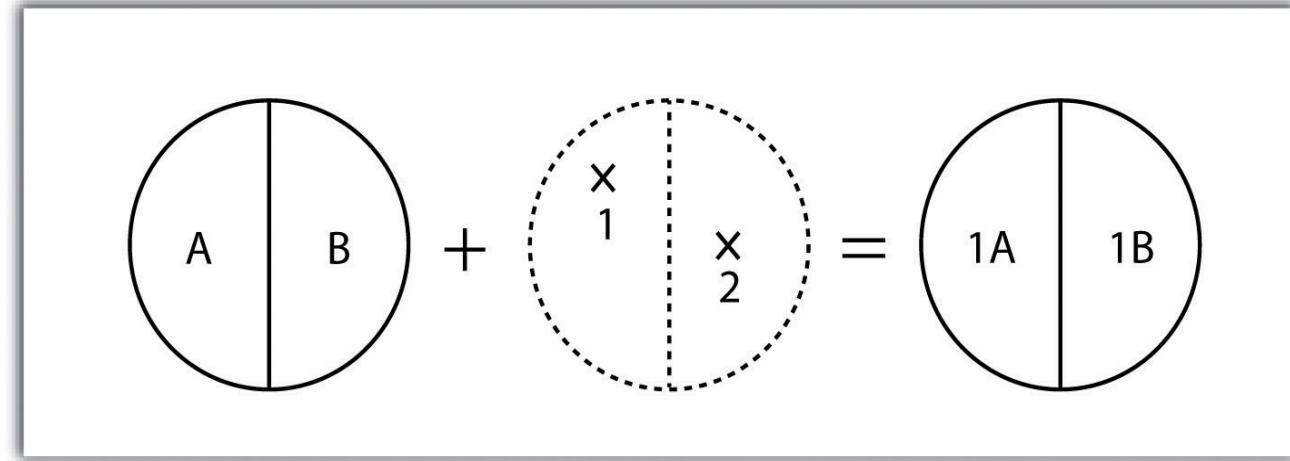
# *Vector analysis*

Multiple layer processing

**Input layer** + **Overlay layer**



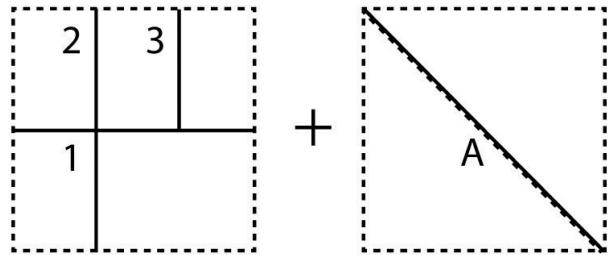
**point-in-polygon overlay**



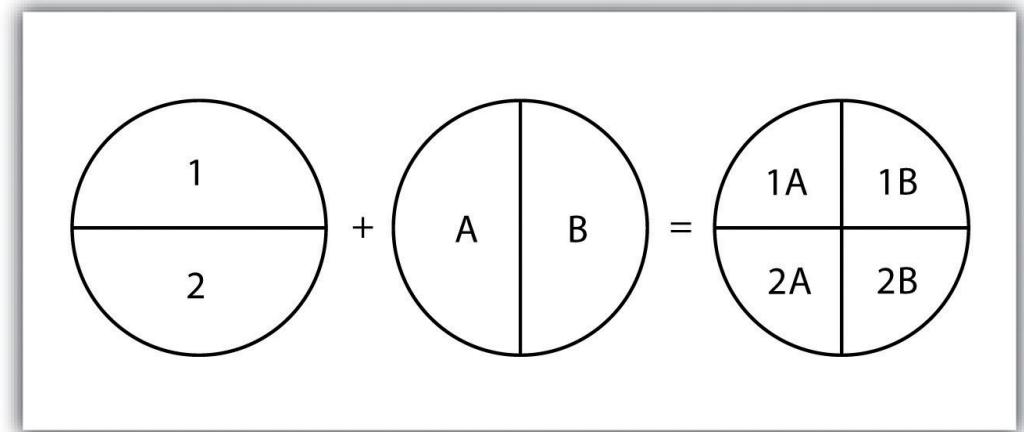
**Polygon-on-point overlay**

# *Vector analysis*

## Multiple layer processing



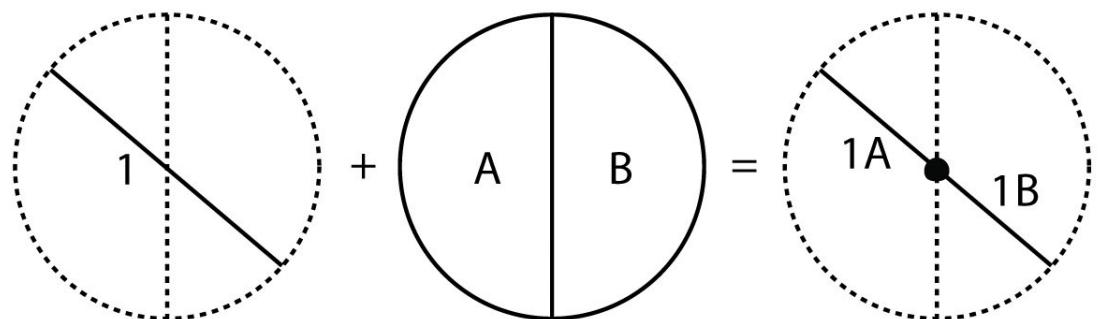
**line-on-line overlay**



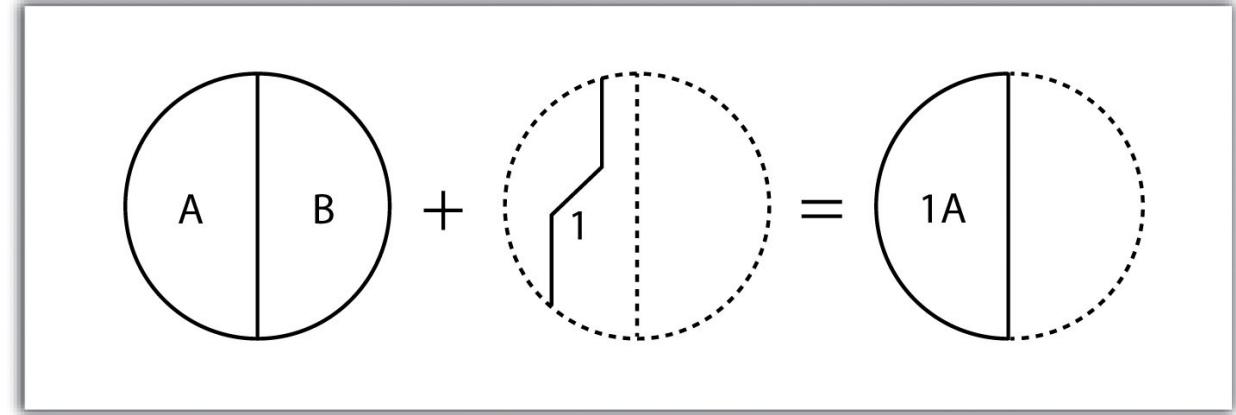
**polygon-in-polygon overlay**

# *Vector analysis*

## Multiple layer processing



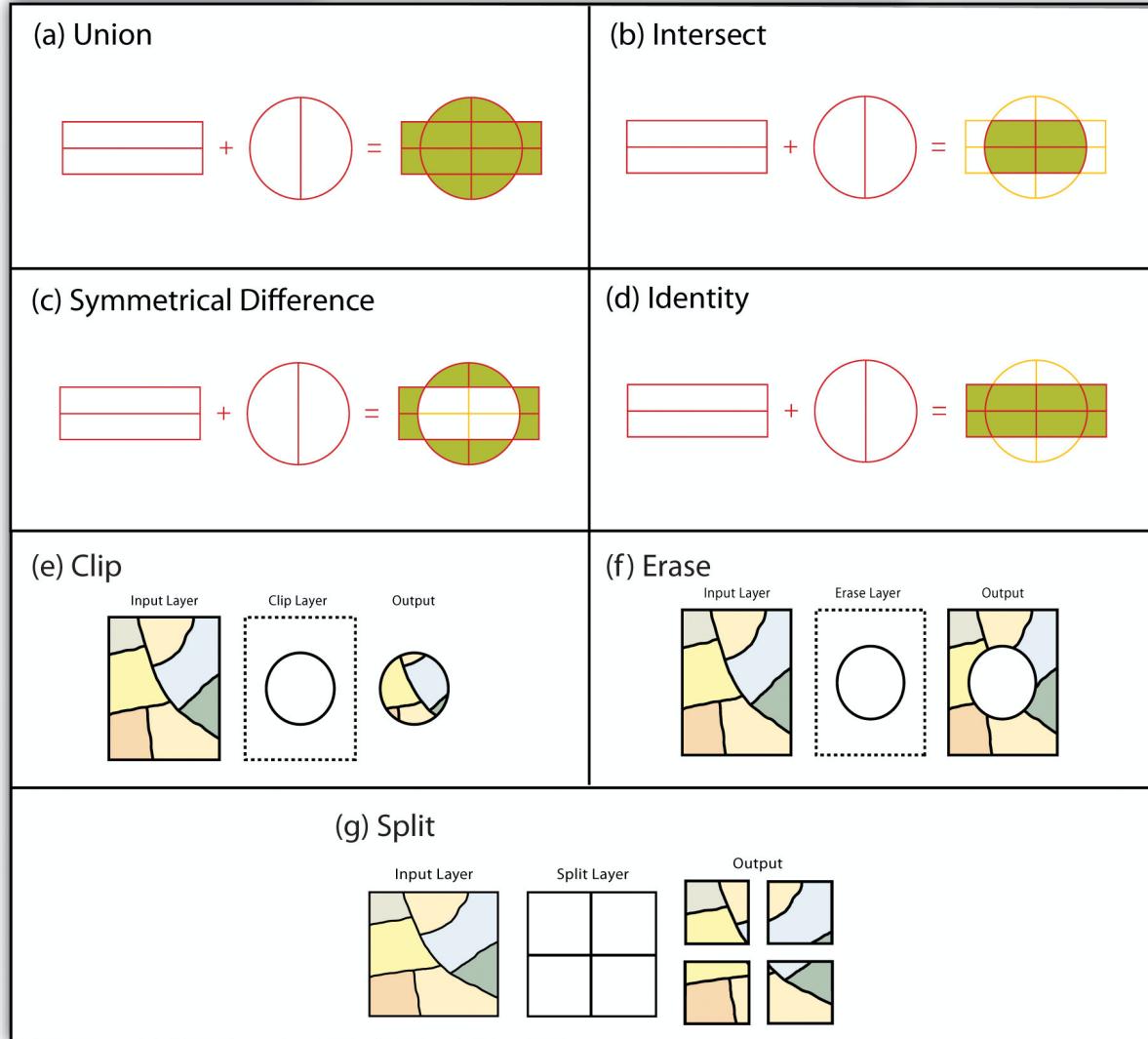
**line-in-polygon overlay**



**polygon-on-line overlay**

# *Vector analysis*

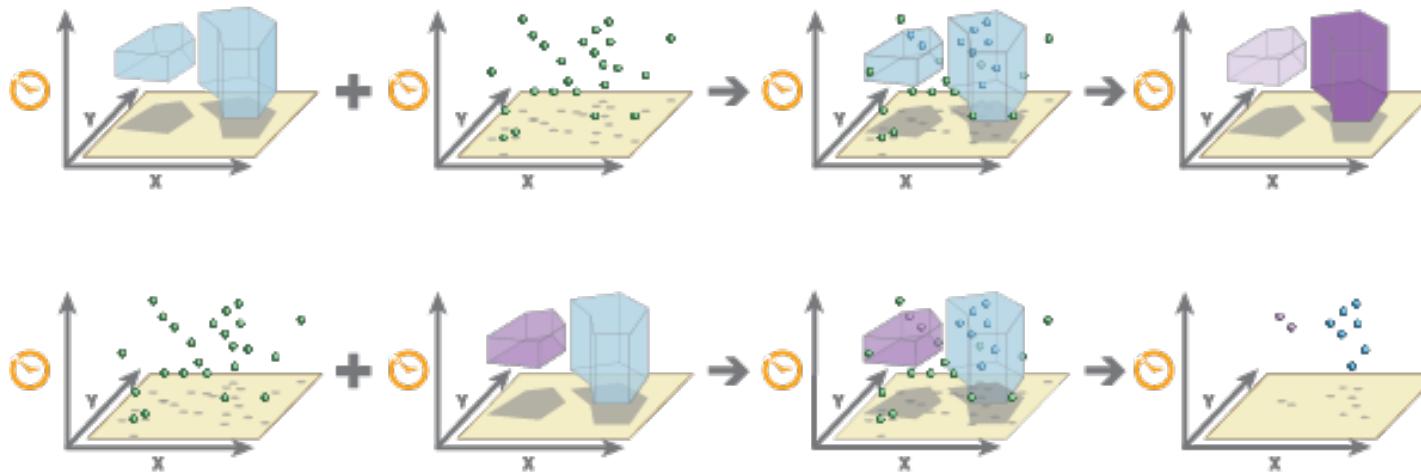
## Multilayer Overlay



Reference : [https://saylordotorg.github.io/text\\_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html](https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s11-geospatial-analysis-i-vector-o.html)

# Vector analysis

## Join features



Fields to match

Type	Key	Building_Name	Occupants
Apartment	A	Silverbirch Estates	130
House	B	Pine Ridge	8
Commercial	C	Lake View	250
		Yellow	3

Target Layer

Building_Type_ID	Building_Name	Occupants
A	Silverbirch Estates	130
A	Pine Ridge	8
A	Lake View	250
B	Yellow	3

Join Layer

Join one to many

Type	Key	Building_Name	Occupants
Apartment	A	Silverbirch Estates	130
Apartment	A	Pine Ridge	8
Apartment	A	Lake View	250
House	B	Yellow	3

Join one to one

Type	Key	Count
Apartment	A	3
House	B	1

Keep all target features = **False**

Type	Key	Count
Apartment	A	3
House	B	1
Commercial	C	0

Keep all target features = **True**

## Raster Analysis part 1/2

# Raster analysis

## Raster overlay ( $\mathbf{A} + \mathbf{B}$ )

Input 1			Input 2			+	Output		
1	3	3	10	11	11				
2	2	4	10	12	12				
1	1	3	11	14	12				

## scale ( $a \times \mathbf{A}$ )

Input Raster				
456	416	364	326	243
448	364	315	276	218
359	325	268	234	164
306	296	201	133	44
274	231	184	65	5

↓

Output Raster ( $\times 10$ )				
4560	4160	3640	3260	2430
4480	3640	3150	2760	2180
3590	3250	2680	2340	1640
3060	2960	2010	1330	440
2740	2310	1840	650	50



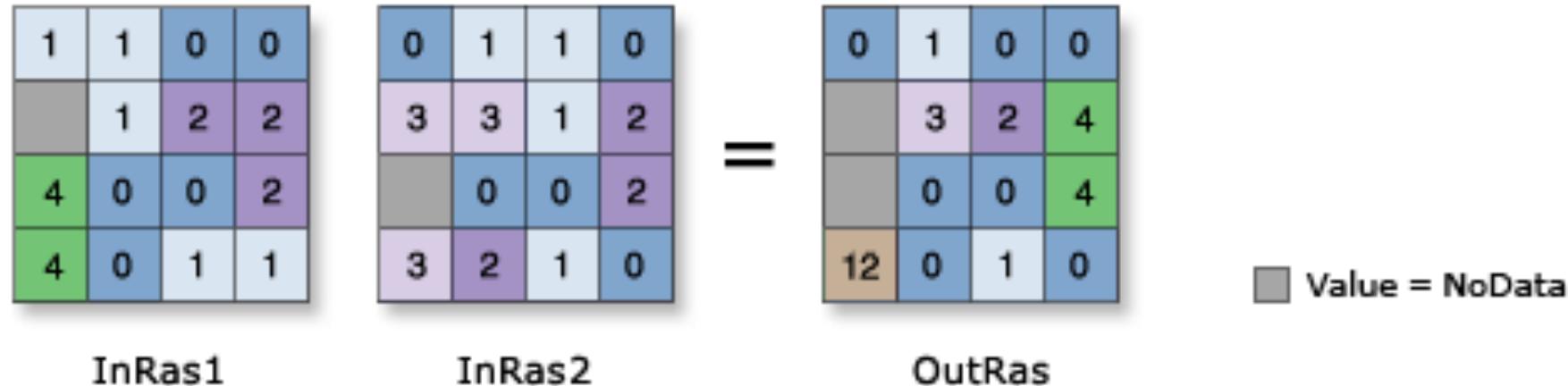
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Reference : [https://saylordotorg.github.io/text\\_essentials-of-geographic-information-systems/s12-geospatial-analysis-ii-raster-.html](https://saylordotorg.github.io/text_essentials-of-geographic-information-systems/s12-geospatial-analysis-ii-raster-.html)

# Raster analysis

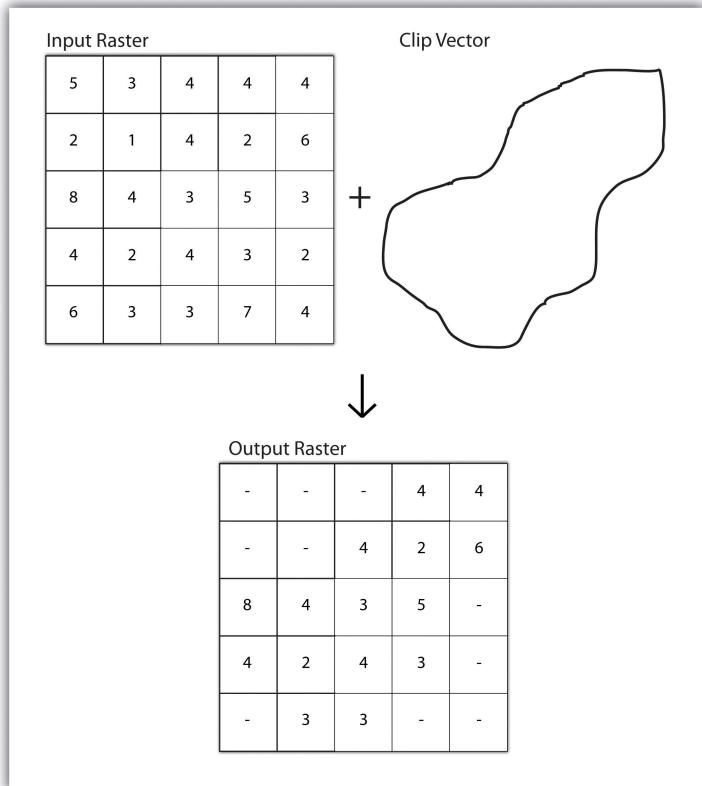
## Raster Multiplication ( $\mathbf{A} \times \mathbf{B}$ )



**OutRas = Raster("InRas1") \* Raster("InRas2")**

# Raster analysis

## Raster clip



## Slicing

