M.Tech Geoinformatics

Geographic Information System
(24CC03)

## Unit III: Data Representation

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Data Representation

Tessellation

- The division of a two-dimensional area into polygonal tiles, or a three-dimensional area into polyhedral blocks, in such a way that no figures overlap and there are no gaps.
- There are regular and irregular tessellations

Hexagon

Transverse Hexagon

Square

Diamond

Triangle
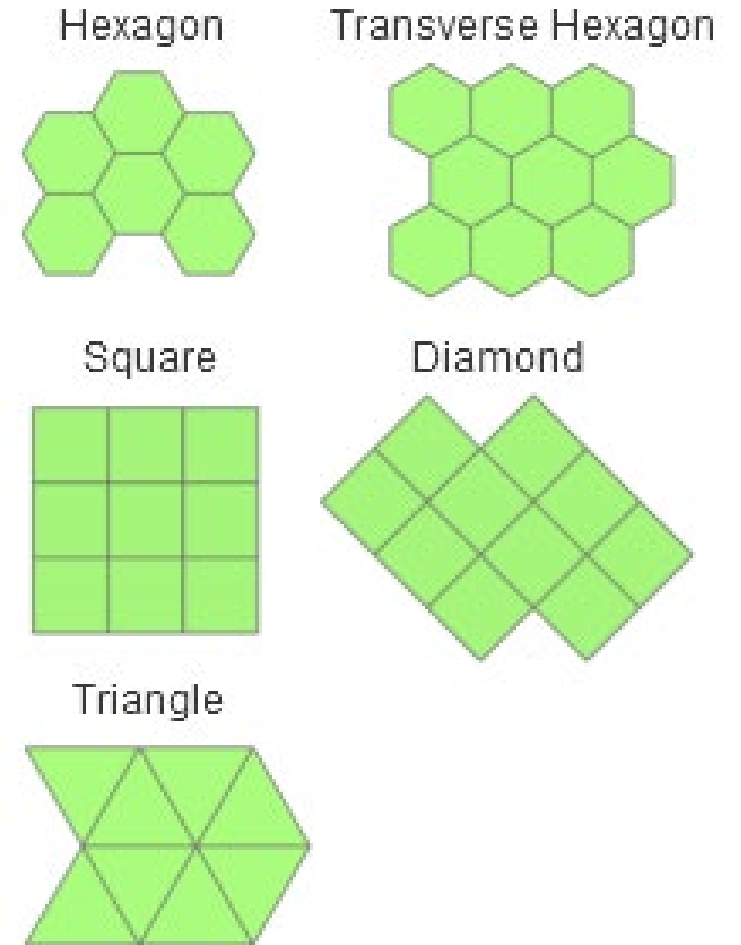
- In a **regular tessellation**, the cells have the same shape and size;
- a simple example of this is a rectangular raster of unit squares, represented in a computer.
- **Irregular Tessellation** are partitions of space into mutually distinct cells, but now the cells may vary in size and shape, allowing them to adapt to the spatial phenomena that they represent.
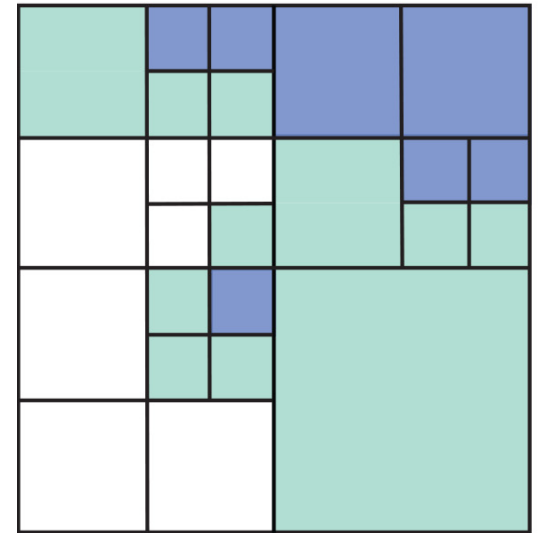
TIN

- Triangular Irregular Networks (TIN) are a digital means to represent surface morphology.

- TINs are a form of **vector-based** digital geographic data and are constructed by triangulating a set of vertices (points).

- The vertices are connected with a series of edges to form a **network of triangles.**

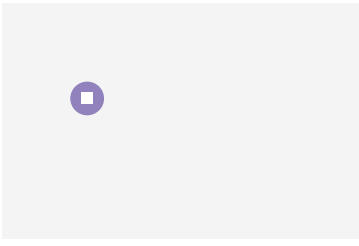- There are different methods of interpolation to form these triangles
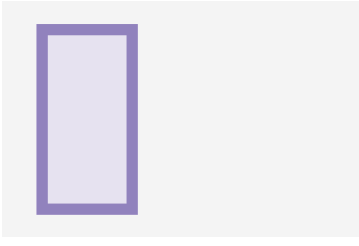

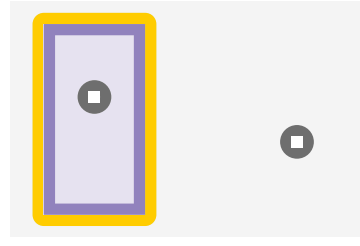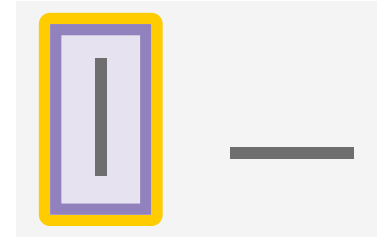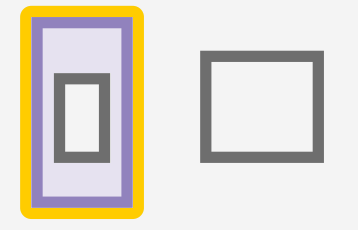A. Highly variable surface   B. Less variable surface
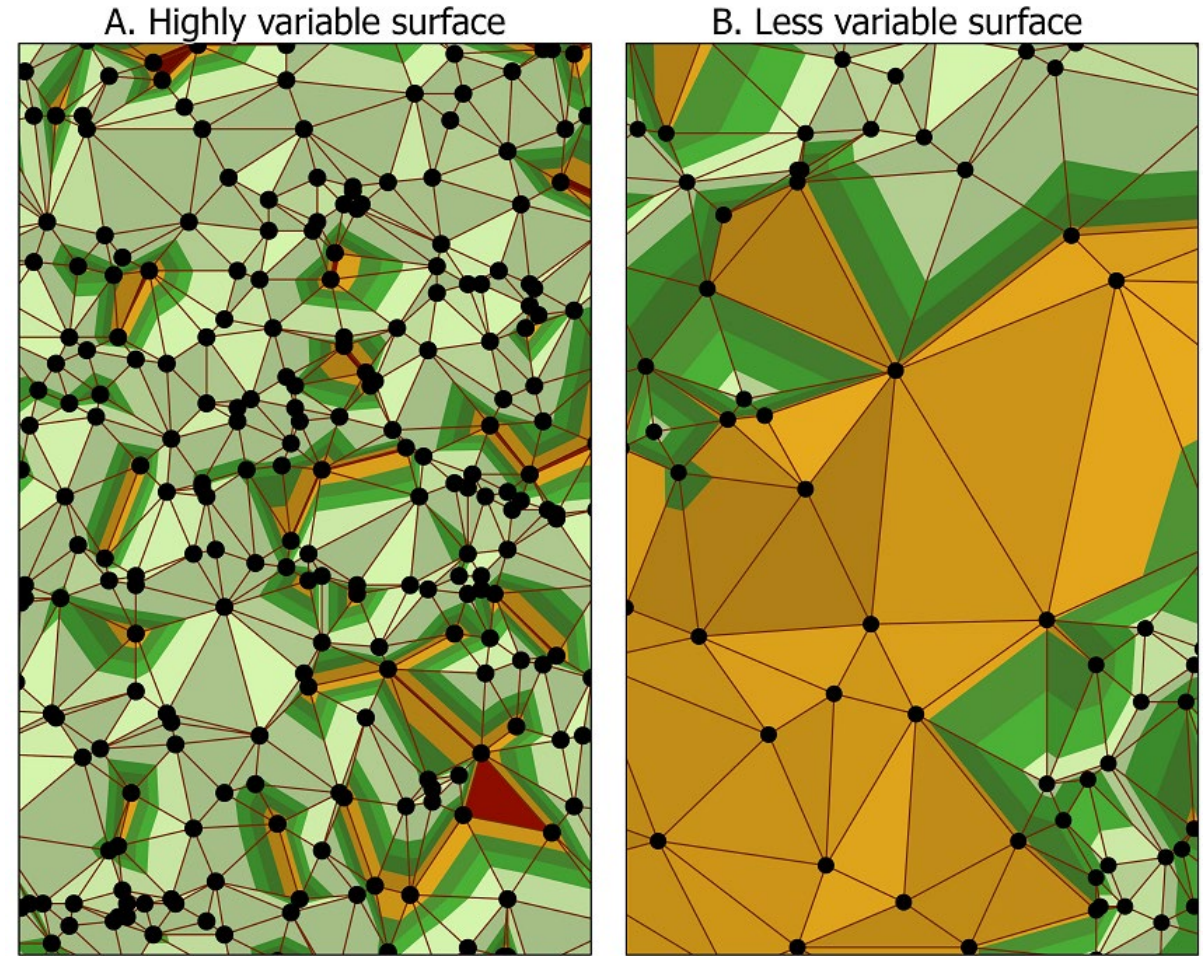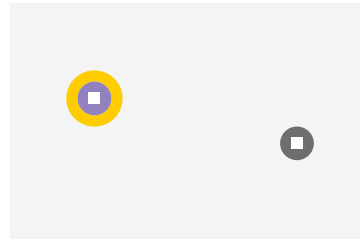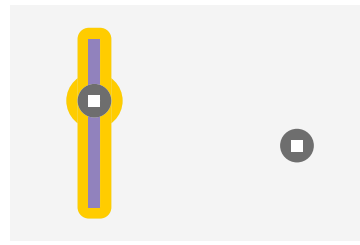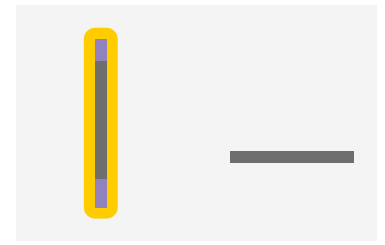
Spatial / Topological Relationships

- A spatial relationship determines the topological association between two geometries.
- For example, you can determine if two geometries
  - Contain
  - Disjoint
  - Intersect
  - Overlap
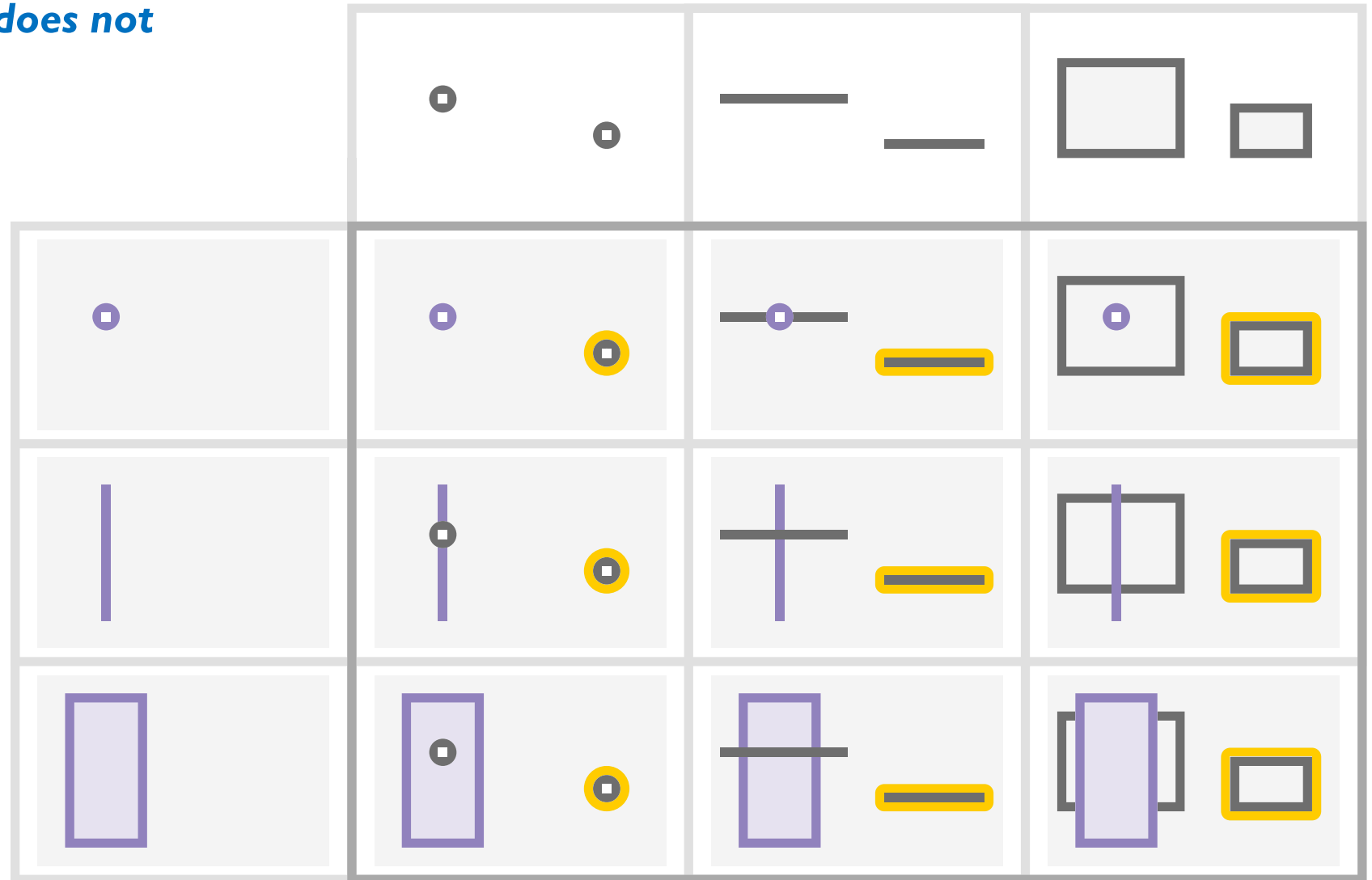 - Touch or
  - Within one another.

Contains

Returns true if one geometry contains another geometry.

Disjoint
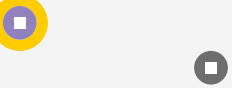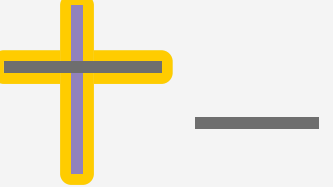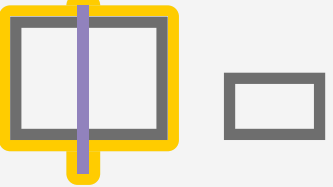
Returns true if one geometry does not intersect another geometry.

Intersects

Returns true if one geometry intersects another geometry.
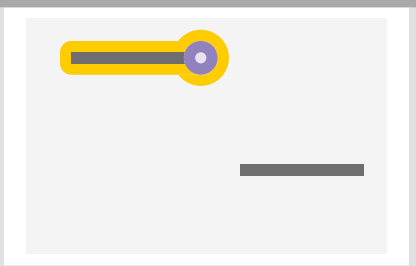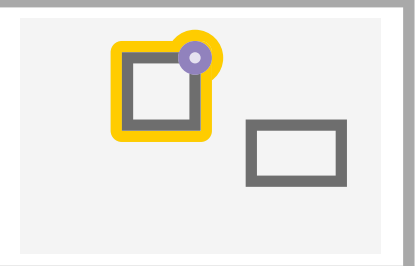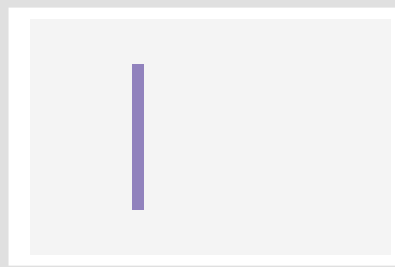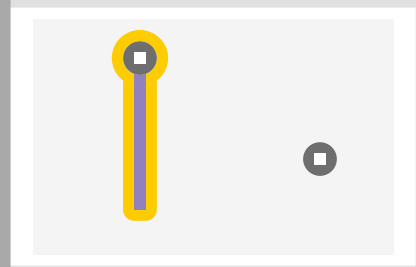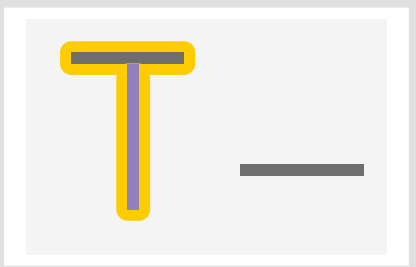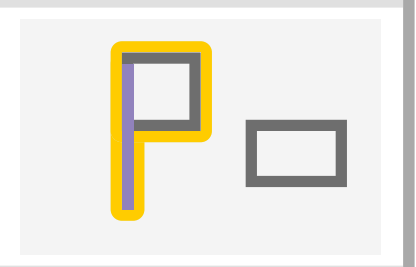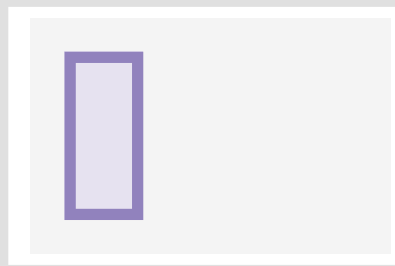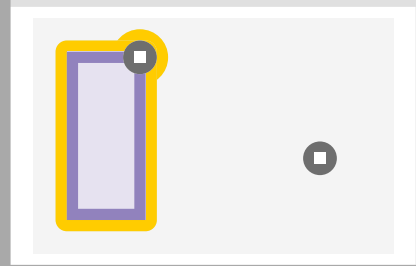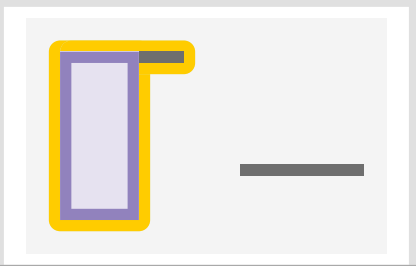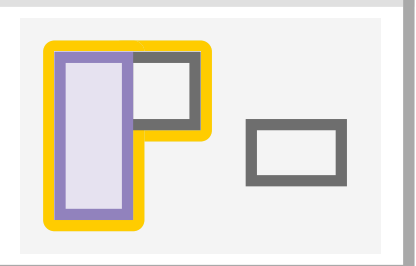
Overlaps

Returns true if one geometry overlaps another geometry. NOTE: Only valid for geometries of the same type or dimension.
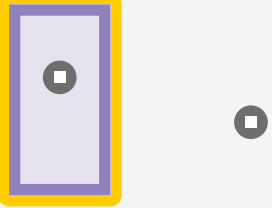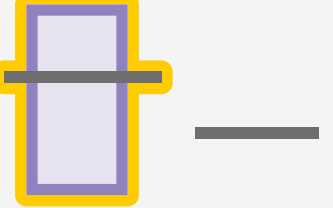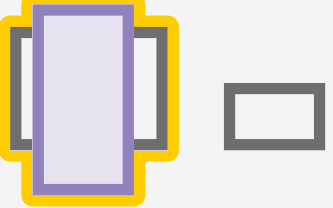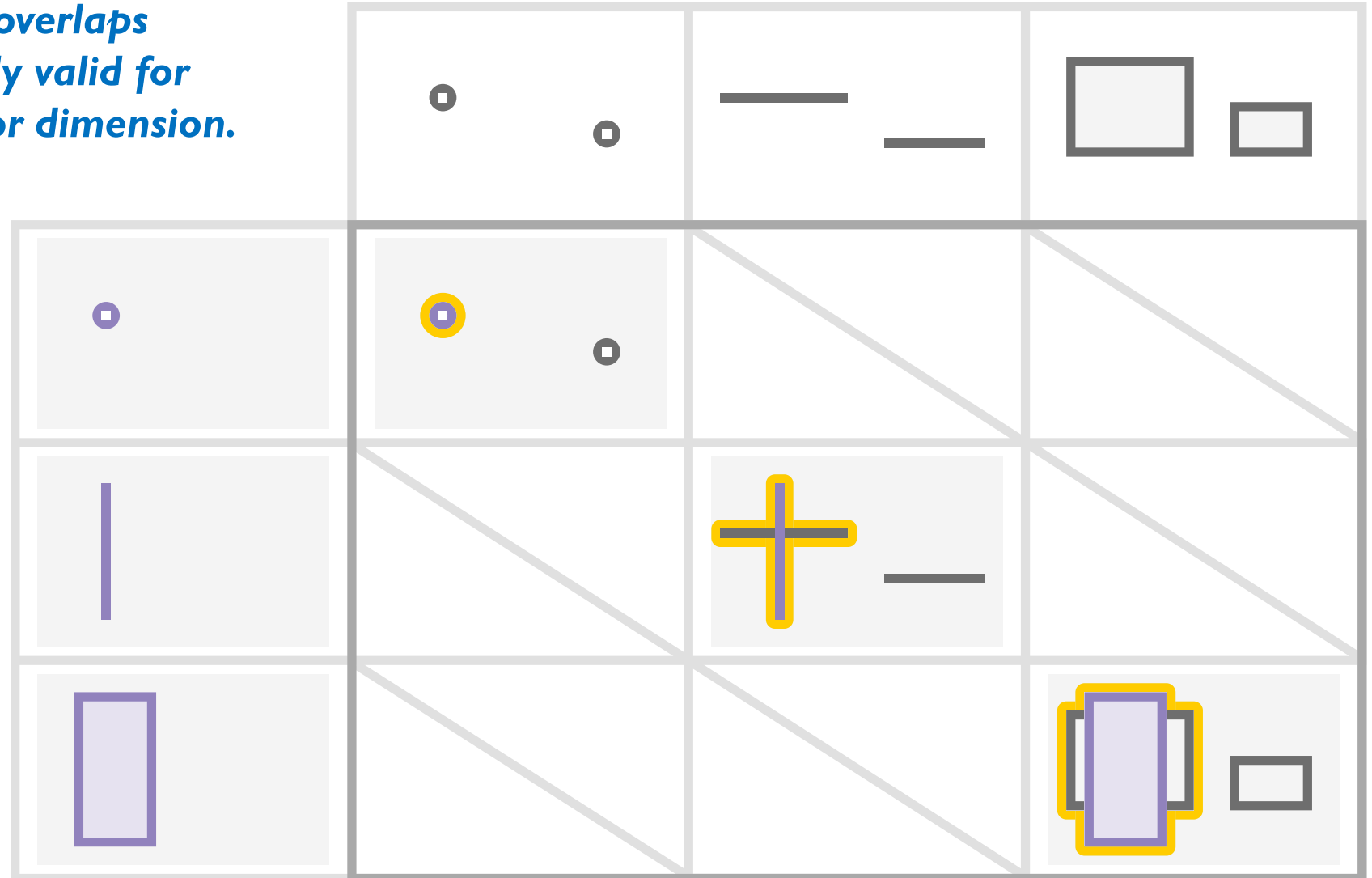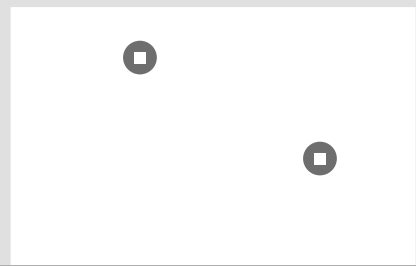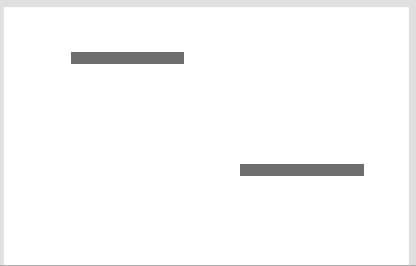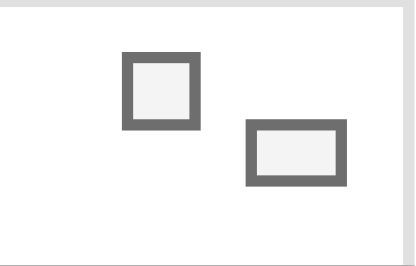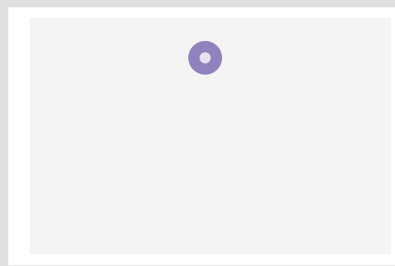
Touches

Returns true if one geometry touches another geometry.

Within

Returns true if one geometry is fully within another geometry.
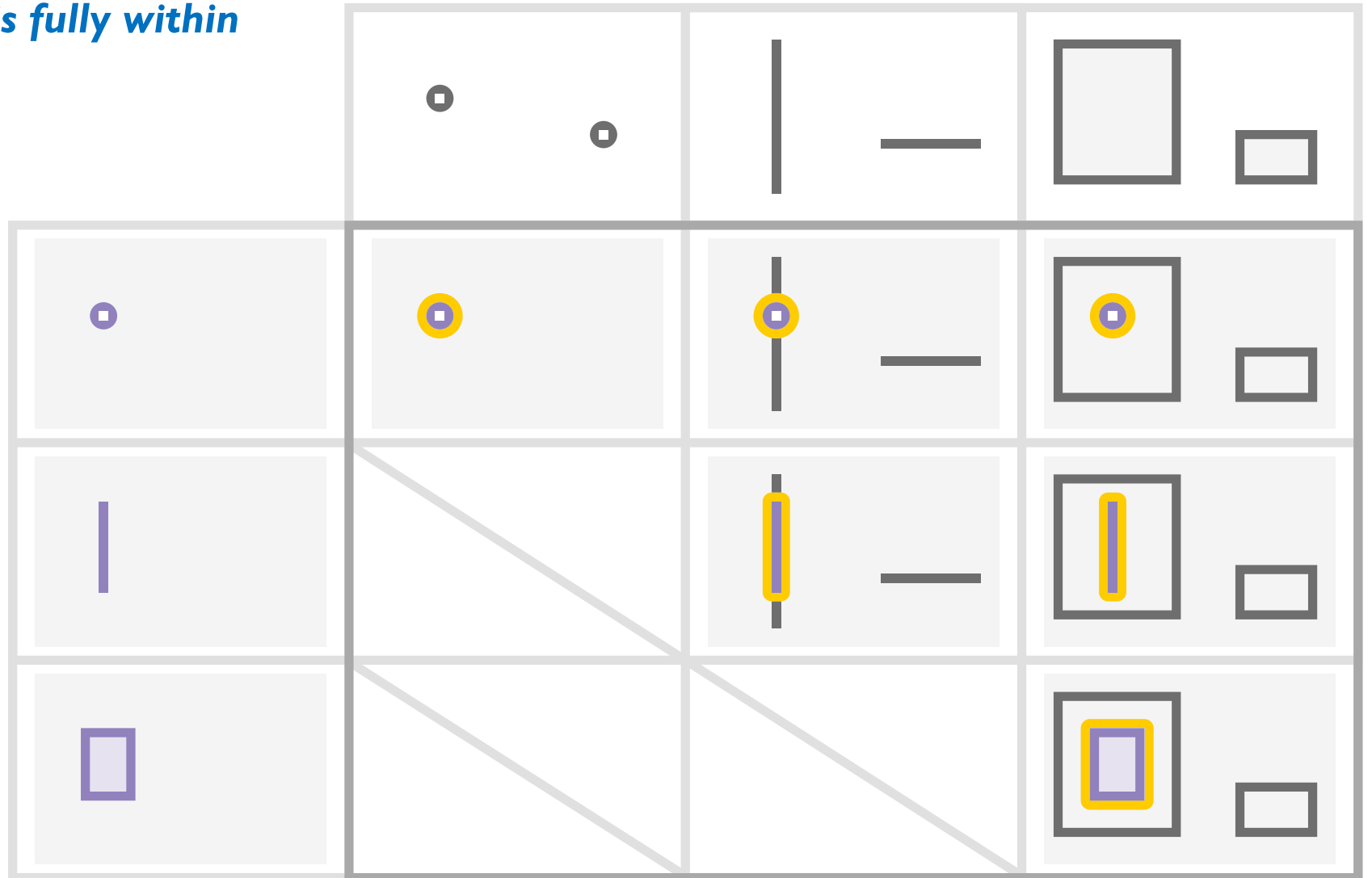
Relation

When you choose Relation as the spatial relationship type, you can compare any possible spatial intersections between two shapes based on the following three aspects:

Interior - The entire shape, except for its boundary. All geometry types have interiors.

Boundary - The endpoints of all linear parts for line features, or the linear outline of a polygon. Only lines and polygons have boundaries.

Exterior - The outside area of a shape. All geometry types have exteriors.

DE-9IM
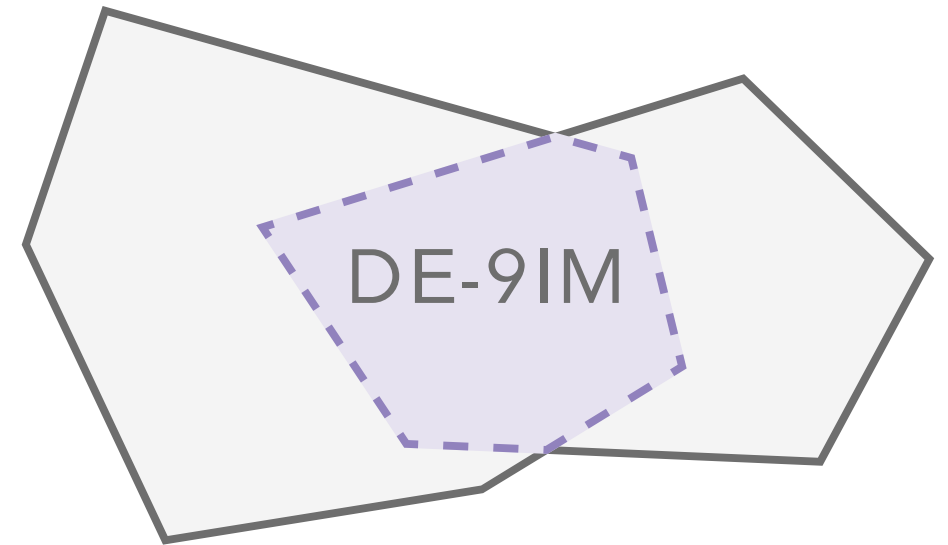
Temporal data

- **Temporal data represents state of a spatial object.**

Discrete	Continuous
Remains constant over a specific time interval - e.g: Forest area, Transport lines	**Varies over time and can have separate values at any given point** - e.g: Temperature, Traffic

Spatial features can vary in terms of:
- Shape
- Location
- Attributes

Spatial features can be visualized over time in two ways:
- The shape and location is **constant** but attribute values can change over time.
- The shape and location of each feature **dynamic** over time.

Components of Time

- Decadal: Census,
- Year: Climate, LU, Vegetation, Biodiversity, SDG Reports
- Monthly: Weather, G-Returns, Medical records, GW level
- Daily: Weather, Passenger data
- Hourly: Weather, Traffic
- Minute: Water discharge

Scale

- **Representations of Map Scale**
  - **Graphic Scale / Scale Bar:**

    0   500   1,000   2,000
    Miles

  - **Verbal Scale:**
    - **One inch on the map equals twenty feet on the ground**
  - **Representative Fraction:**
    - **1:24,000**
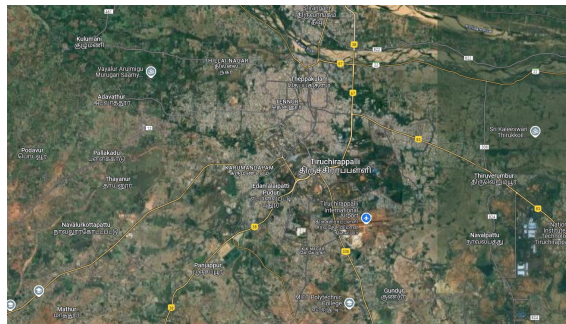
How do you define scale?

Small scale

- 1:5,000 Feet
- Huge amount of detail
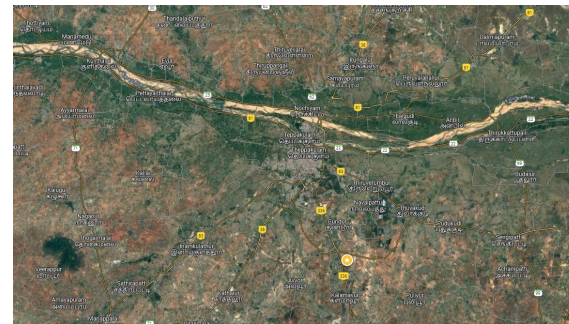- Town / City Maps

Medium scale

- 1:50,000 Feet
- Shows numerous data
- SOI Topographic Sheets (1:50,000)

Large scale

- 1:250,000 Feet
- Generic Data
- SOI Topographic Sheets (1:250,000)
- US Army Toposheets

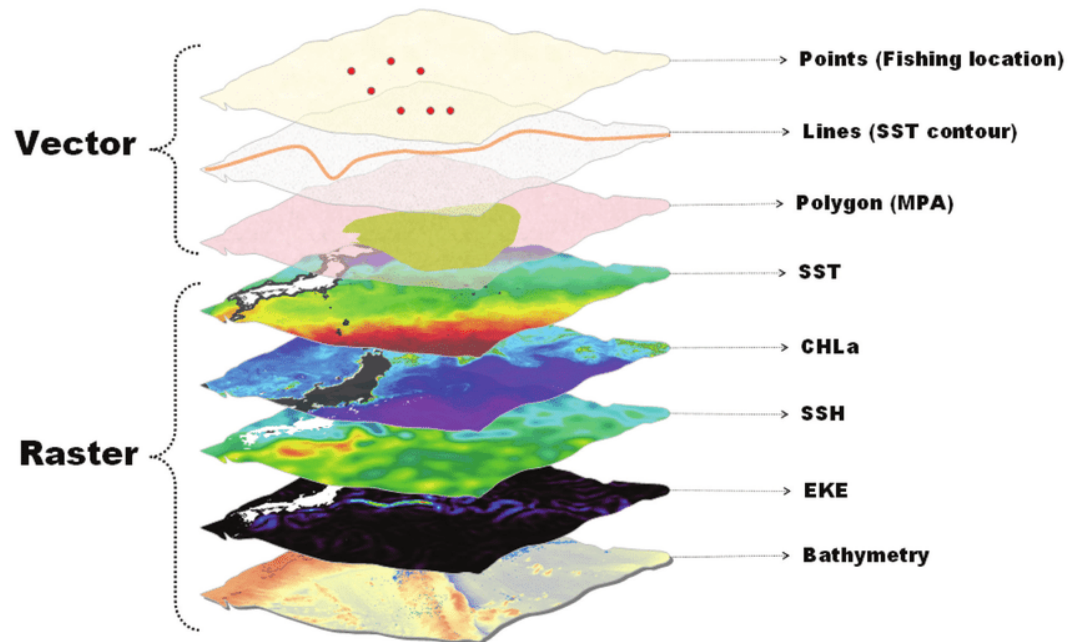*Scale = How much data can you show?*

Resolution

- It generally means one of two things:
  - Either the specific data precision of raster data or
  - more commonly, the spatial accuracy of the data

MMU

- Minimum Mapping Unit
  - the specific size of the smallest feature that is being reliably mapped.
  - MMU helps you know when to collect specific data.
  - For example, if you are collecting building footprints and the MMU is 100 sq.m, you don't need to collect the footprint of buildings less the 100 sq.m.

Spatial Data in Tables

- Spatial data is represented in two ways:
  - Graphical representation
    - Maps, charts, and scatterplots
  - Tabular representation

Thank You!