

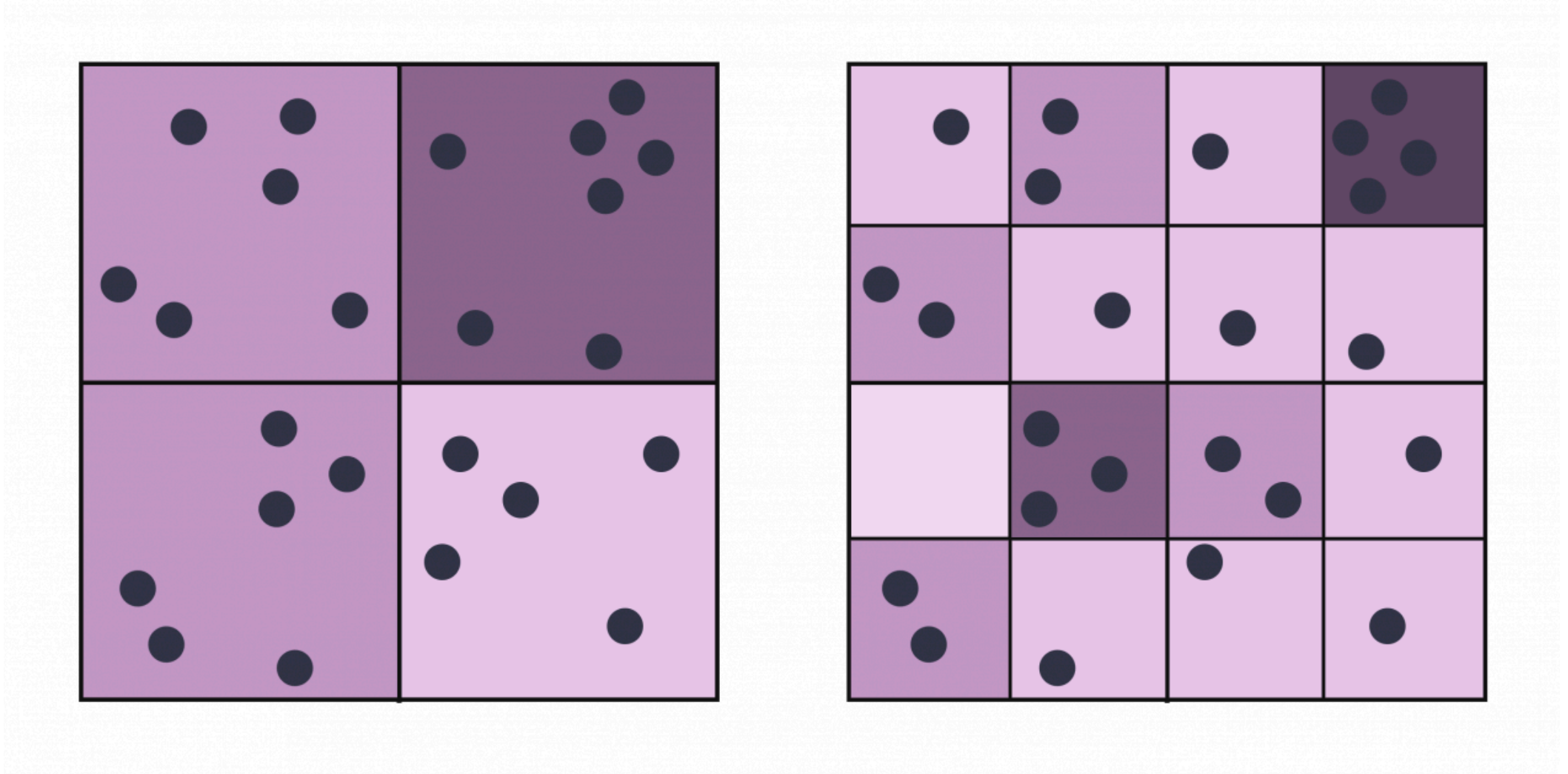
Area data

- We are starting to explore area data this week.
- Due to privacy concerns, especially in the social sciences, access to point-level data is rare.
- For instance, publicly available Canadian census data is aggregated to census geography.

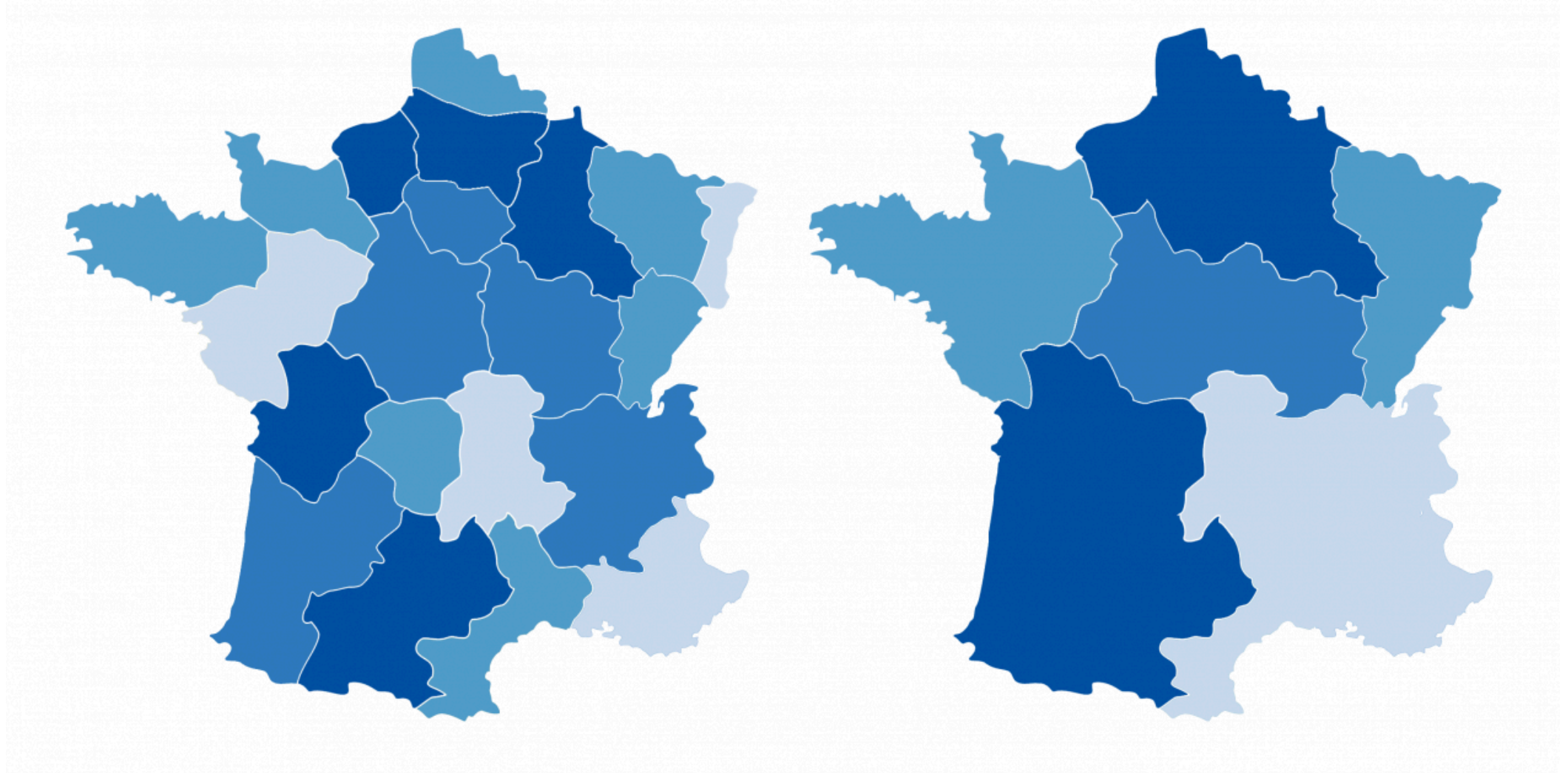
Modifiable Areal Unit Problem (MAUP)

- When aggregating point data into different spatial units, the choice of spatial units impacts analysis results such as hypothesis tests.
- This is because any variations within the spatial unit are lost during aggregation.

Scale effect

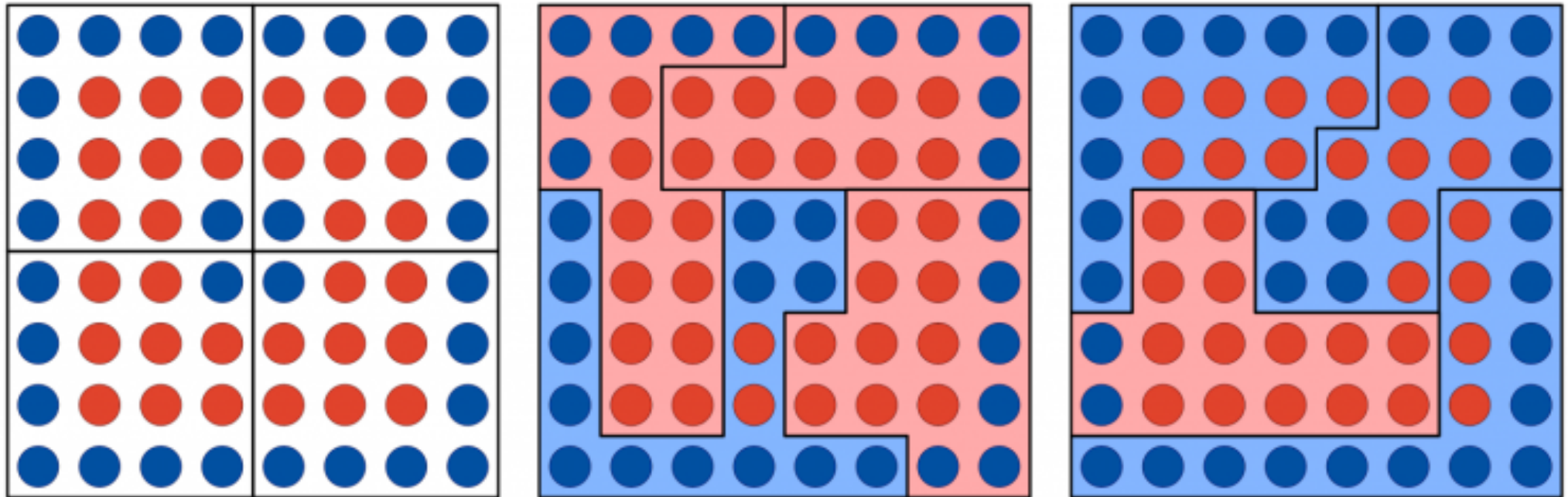


Zone effect

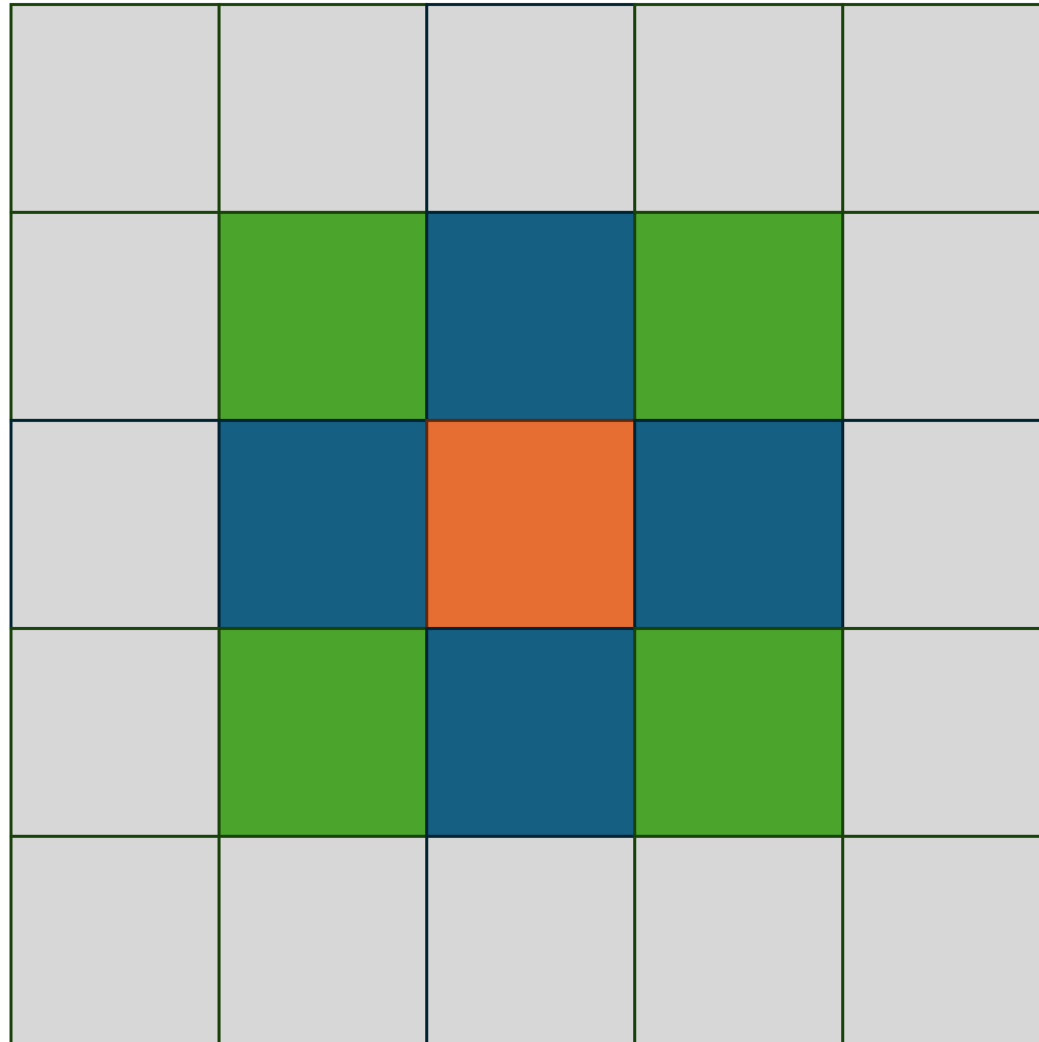


Gerrymandering

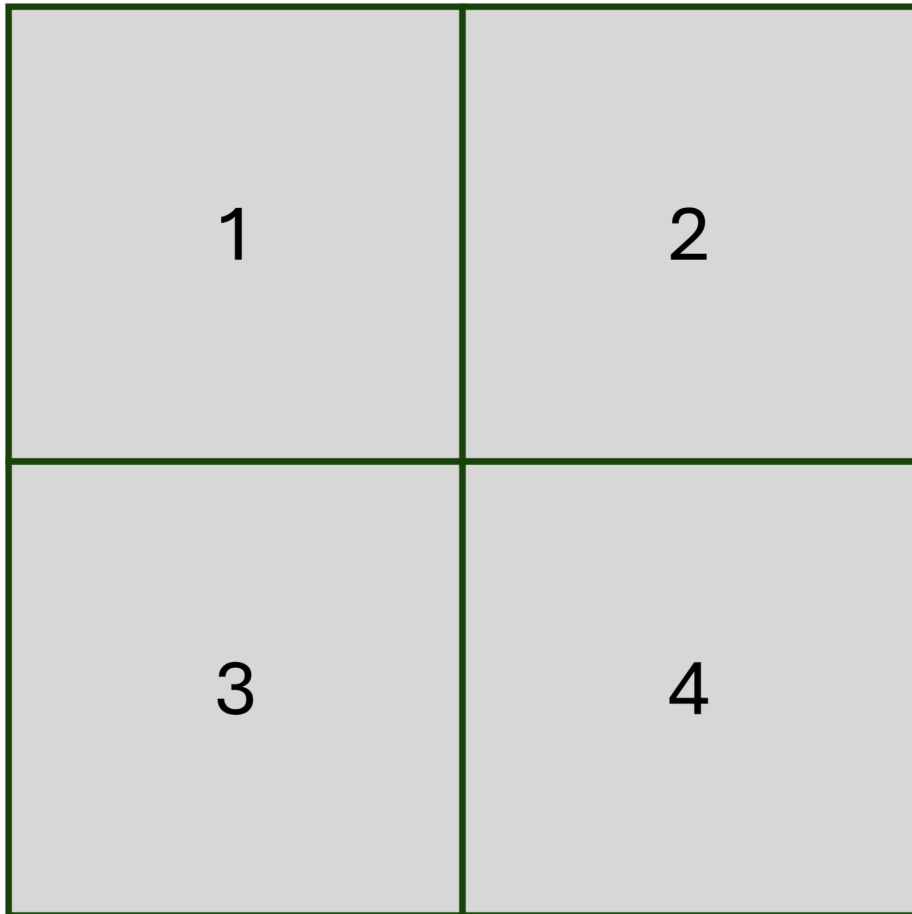
- In representative electoral systems, carefully modifying electoral district boundaries can provide advantages to a particular party.



Rock and queen contiguity



Spatial weight matrix



$$\mathbf{W} = \begin{pmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{pmatrix}$$

$$\mathbf{W}' = \begin{pmatrix} 0 & 0.5 & 0.5 & 0 \\ 0.5 & 0 & 0 & 0.5 \\ 0.5 & 0 & 0 & 0.5 \\ 0 & 0.5 & 0.5 & 0 \end{pmatrix}$$

Linear algebra recap

$$\mathbf{W} = \begin{pmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{pmatrix}$$

$$\mathbf{X} = \begin{pmatrix} b_{11} \\ b_{21} \end{pmatrix}$$

$$\mathbf{W} \cdot \mathbf{X} = \begin{pmatrix} a_{11} \cdot b_{11} + a_{12} \cdot b_{21} \\ a_{21} \cdot b_{11} + a_{22} \cdot b_{21} \end{pmatrix}$$

Colour scheme

<https://colorbrewer2.org/>

The screenshot displays the ColorBrewer 2.0 interface. At the top, it says "COLORBREWER 2.0 color advice for cartography". The "Number of data classes" is set to 3. Under "Nature of your data", "sequential" is selected. The "Pick a color scheme" section shows a "3-class BuGn" scheme with three color swatches: light blue (#e5f5f9), medium blue (#99d8c9), and dark blue (#2ca25f). The "Only show" section has "borders" checked. The "Context" section has "borders" checked. The "Background" section has "solid color" selected. A map of Pennsylvania is shown with the 3-class sequential color scheme applied to its counties. The map is titled "EXPORT" and "HEX" is selected as the color format. The bottom of the interface includes copyright information: "© Cynthia Brewer, Mark Harrower and The Pennsylvania State University", a link to "Source code and feedback", and "Back to Flash version" and "Back to ColorBrewer 1.0". The "axismaps" logo is also present.

Activities for today

- We will work on the following chapter from the textbook:
 - Chapter 20: Activity 9: Area Data I
 - Chapter 22: Activity 10: Area Data II
- The hard deadline is **Friday, February 28.**

Reference

- <https://gisgeography.com/maup-modifiable-areal-unit-problem/>