C: Reallocating geographic variables

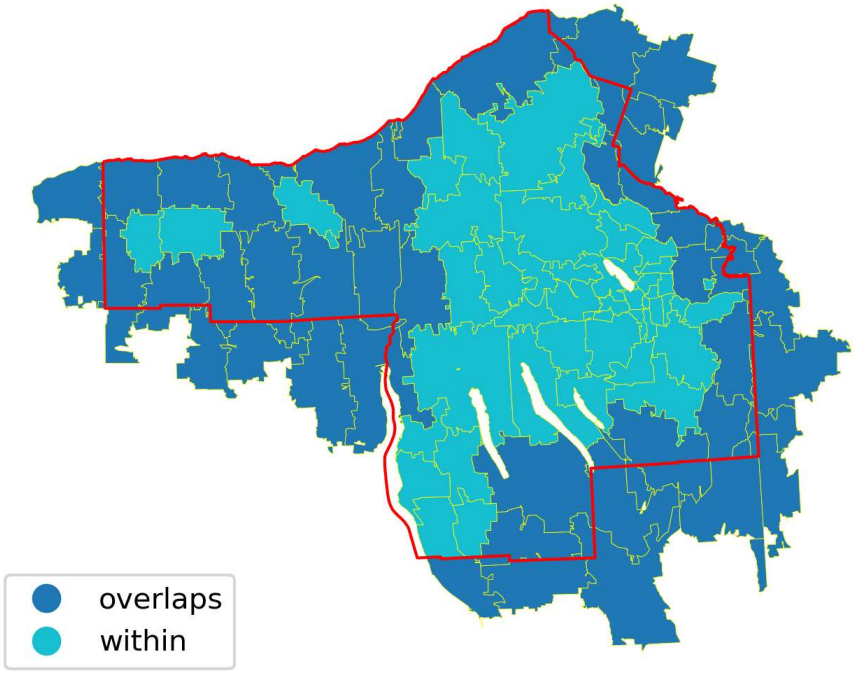
Working with datasets with incompatible geographies

Key use of **geographic intersection** (slicing polygons)

Example: election contributions by Congressional District

- Presidential election contributions data by zip code
- Demographic and other data by Congressional District
- Want: contributions by district

New York's 24th Congressional District



Basic approach: impute based on areas

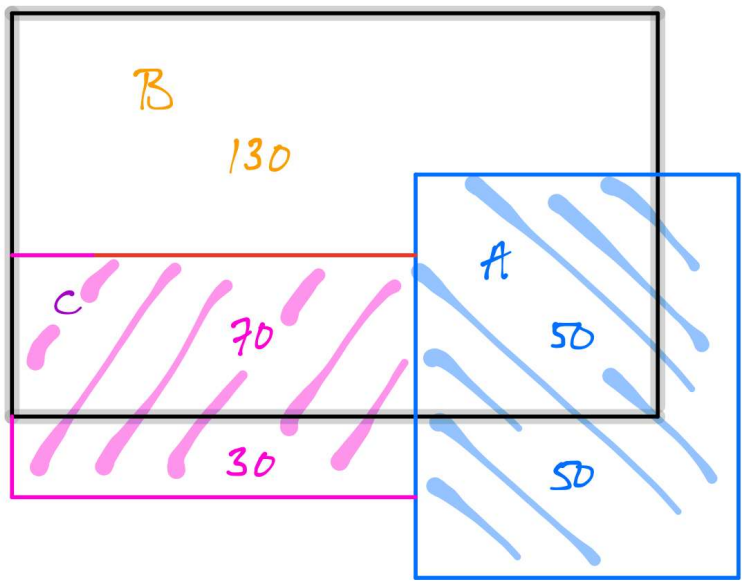
1. Use **geometric intersection** to **slice zip codes** by district boundary
2. Calculate each **slice's share** of its **zip code's area**

3. Split contributions **in proportion** to area
4. **Aggregate** slice contributions by district

Schematically:

Suppose district CDXX is the black rectangle below:

- Consists of zones that are parts of 3 zips
- Numbers shown are areas



Data on the zips:

Zone	Size	Alignment with District	Contributions
A	100	Overlaps	$2000
B	130	Within	$3000
C	100	Overlaps	$4000
Total	330		$9000

Geometric intersection creates five slices:

Slice	Zone	District	Size	Share	Contributions
0	A	CDXX	50	0.5	0.5*2000 = 1000
1	A	NaN	50	0.5	0.5*2000 = 1000
2	B	CDXX	130	1.0	1.0*3000 = 3000
3	C	CDXX	70	0.7	0.7*4000 = 2800
4	C	NaN	30	0.3	0.3*4000 = 1200
Total			330		9000

Aggregating to the district:

District	Size	Contributions
CDXX	50+130+70 = 250	1000+3000+2800 = 6800
NaN	50+30 = 80	1000+1200 = 2200
Total	330	9000

End result:

- **Reallocates** contributions from zips to districts
- Key assumption: donor distribution is **approximately uniform** within zips
- Could refine with block-level population density

Continue with g27 demo.py