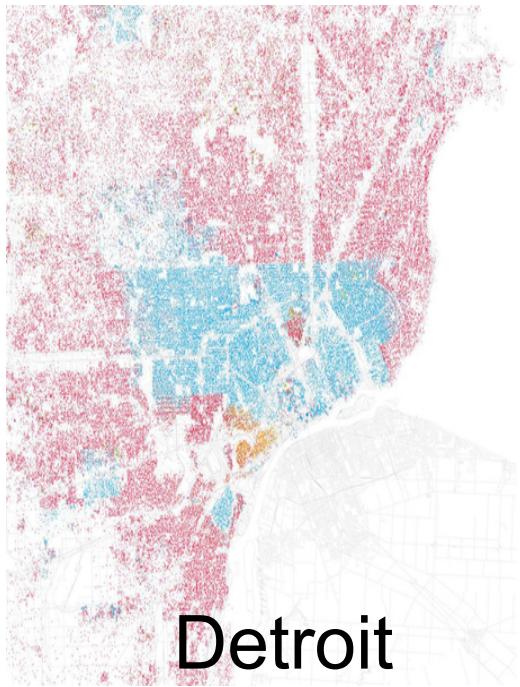


Model Thinking

Scott E Page



Detroit



Sorting vs Peer Effects

- Schelling
- Granovetter
- Standing Ovation
- Identification

Equation Based Model

Score = 50 + 5 Hours

Agent Based Model

individuals

behaviors

outcomes

Model Thinking

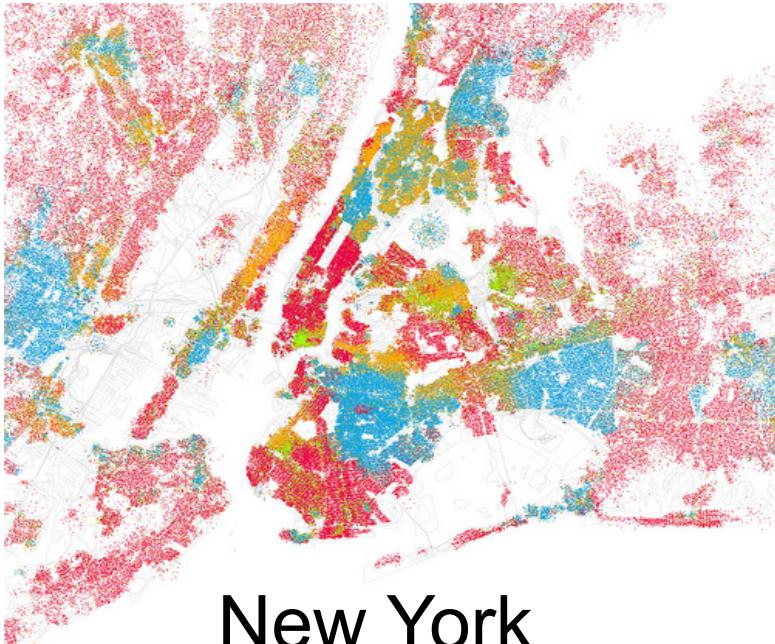
Scott E Page

Model Thinking

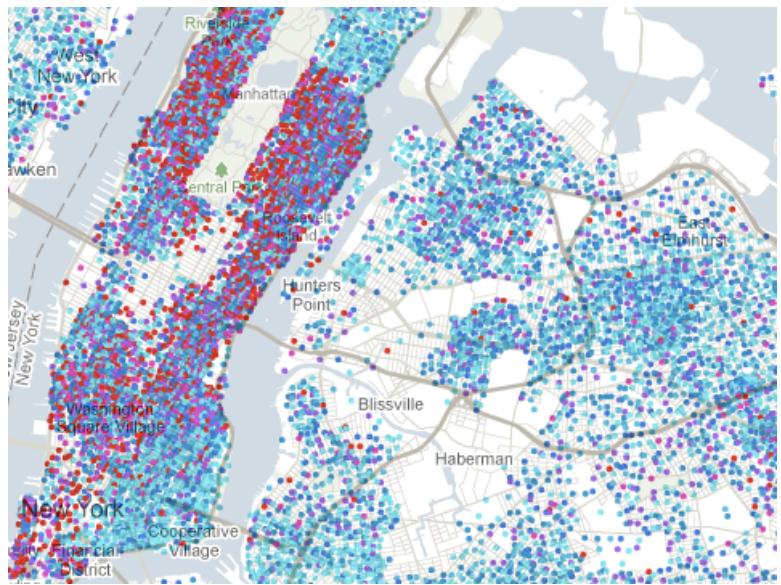
Scott E Page

Schelling's Segregation Model





New York



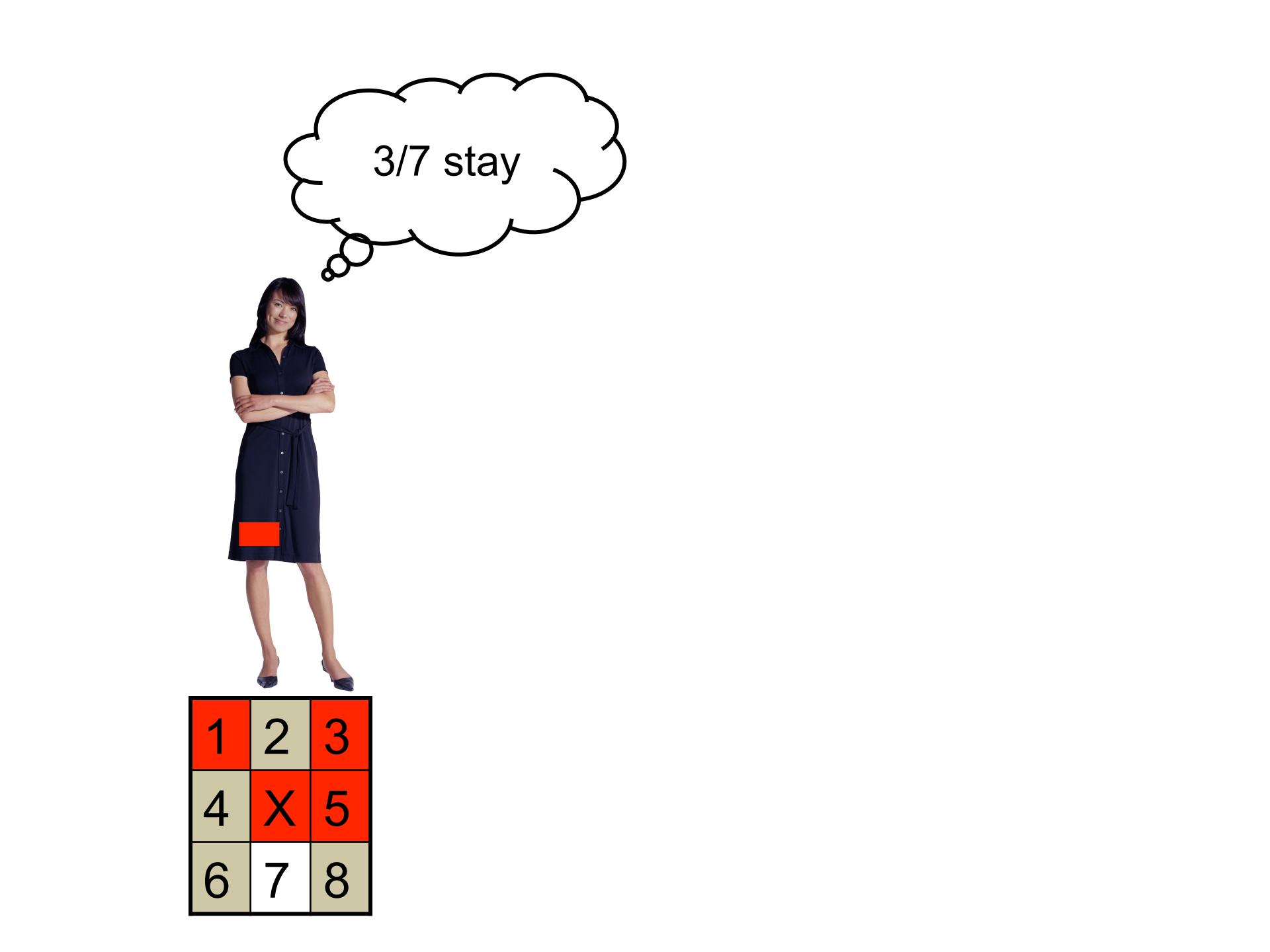
agent based model



$3/x$

1	2	3
4	x_3	5
6	7	8

Neighborhood



3/7 stay

1	2	3
4	X	5
6	7	8



1	2	3
4	X	5
6	7	8

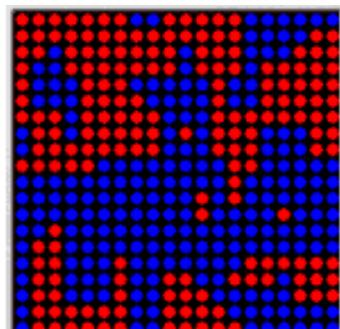
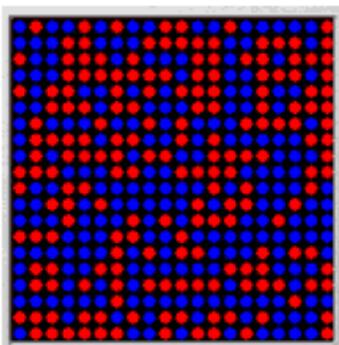
Netlogo Model

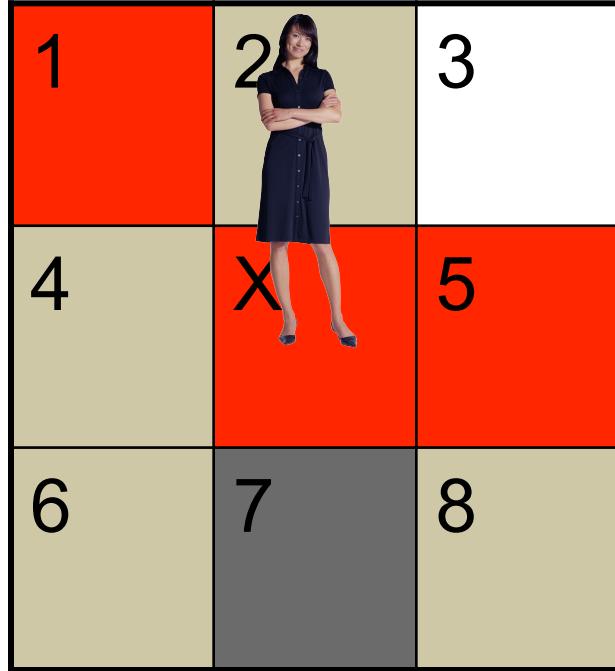
Micromotives

≠

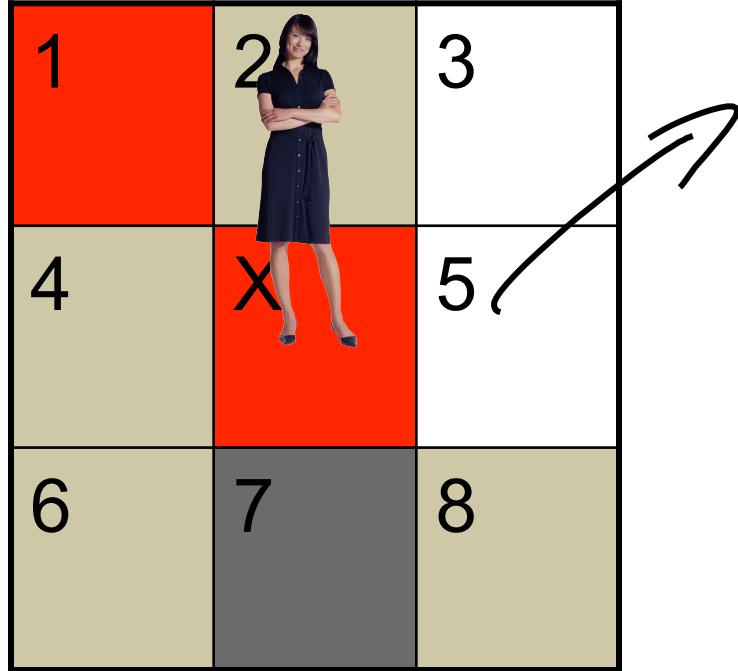
Macrobbehavior

Tipping





Exodus Tip

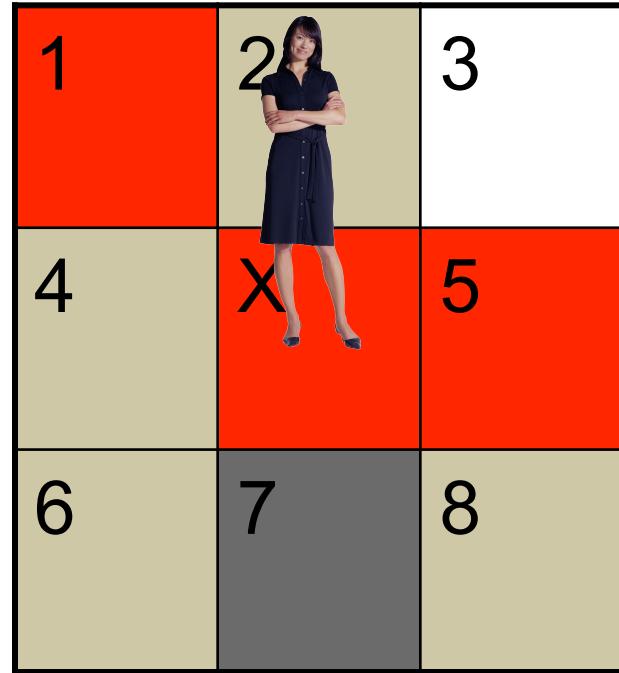


Exodus Tip

1	2	3
4	X	5
6	7	8

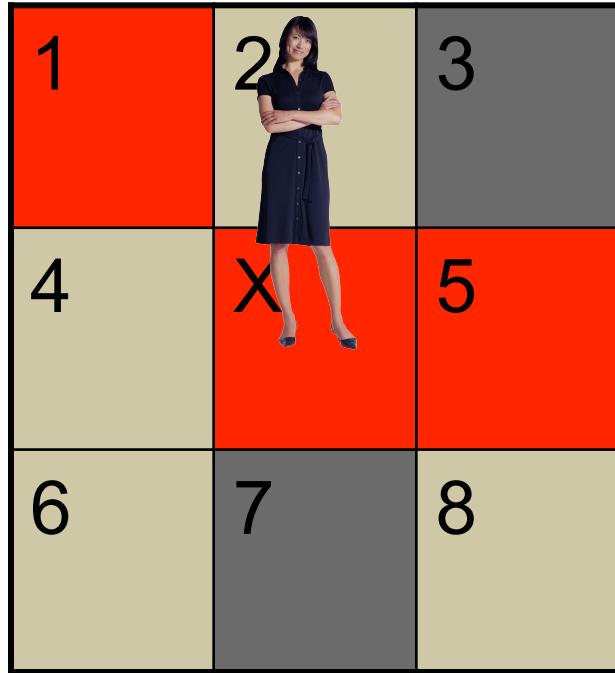
Exodus Tip

2 IX



Genesis Tip

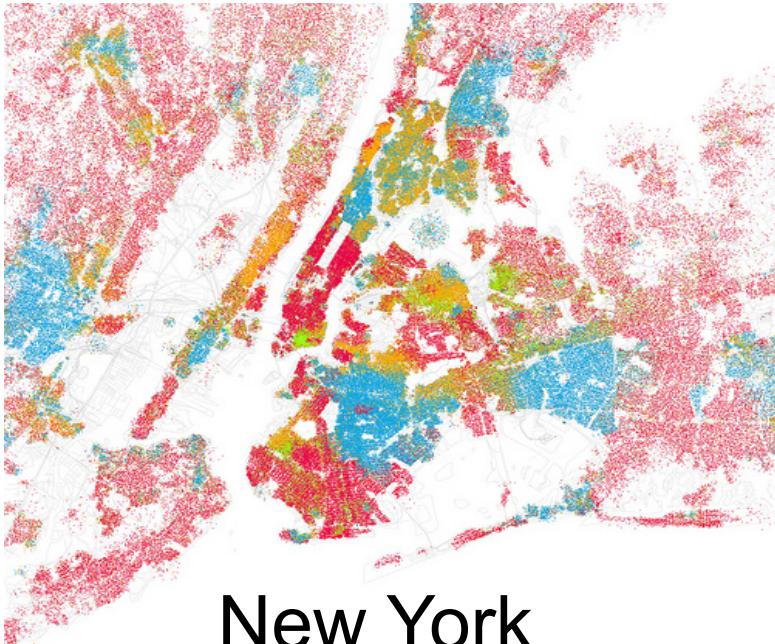
2/8



Genesis Tip

1	2	3
4	X	5
6	7	8

Genesis Tip



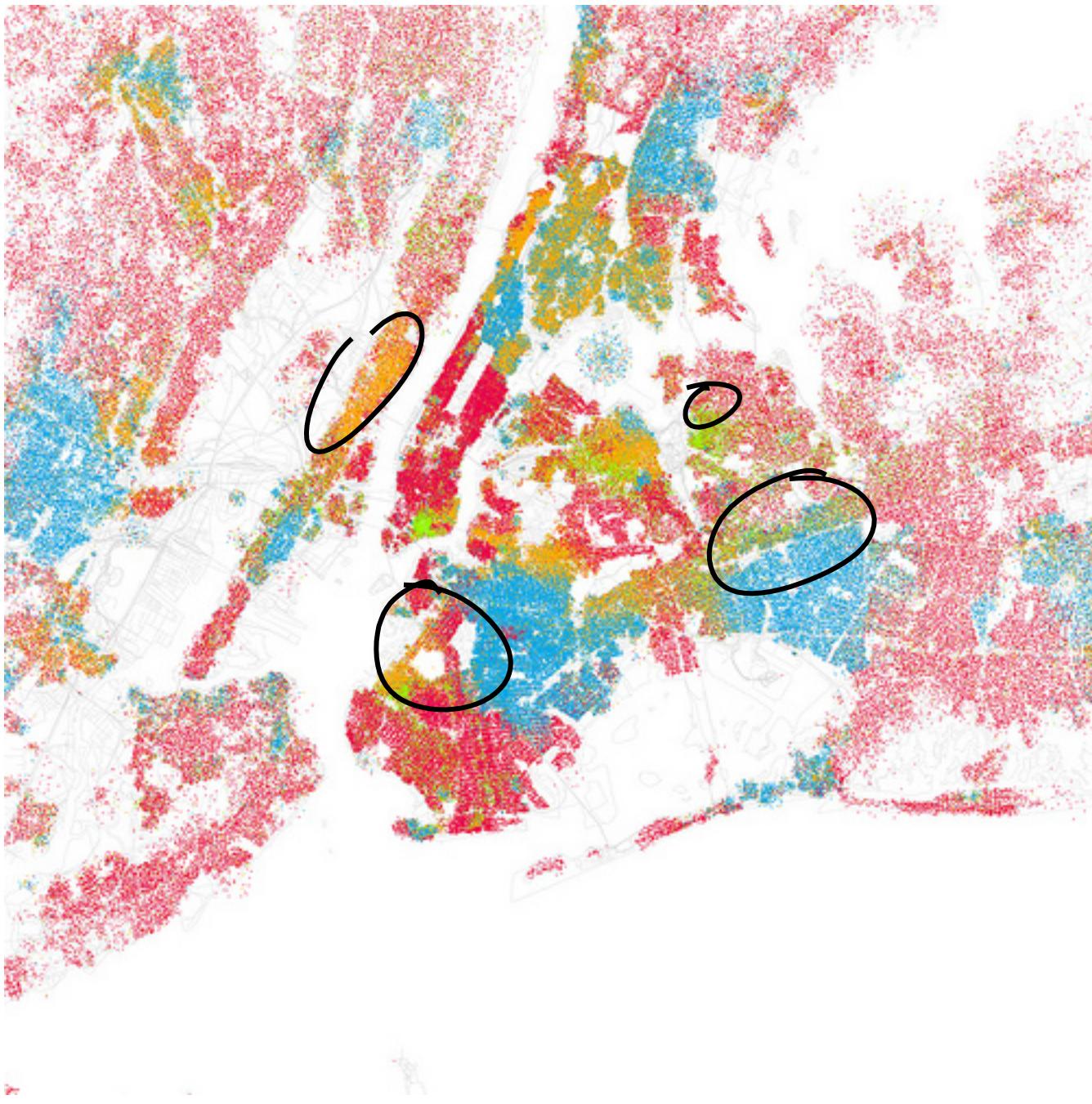
New York

Model Thinking

Scott E Page

Model Thinking

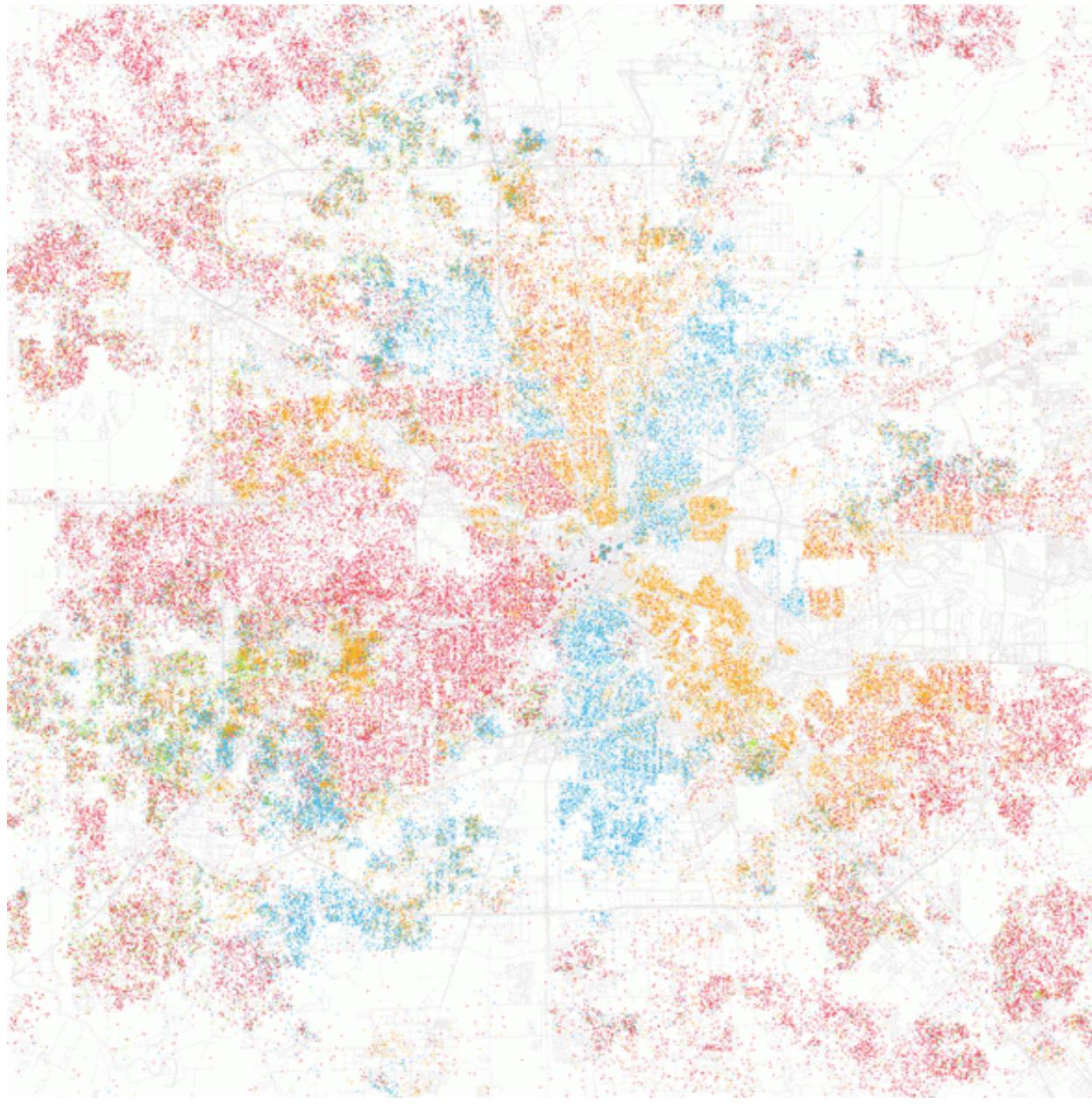
Scott E Page



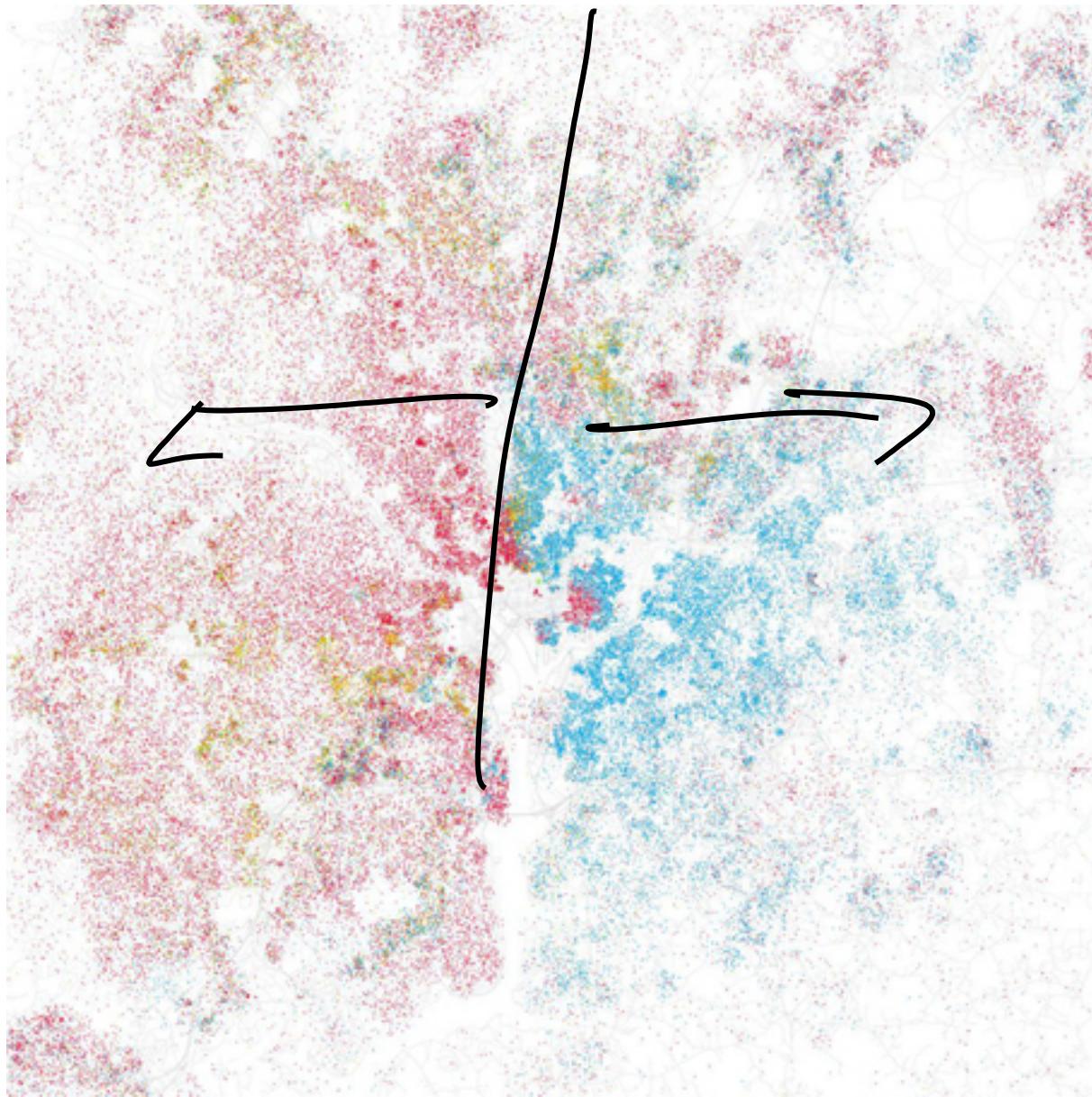
New York



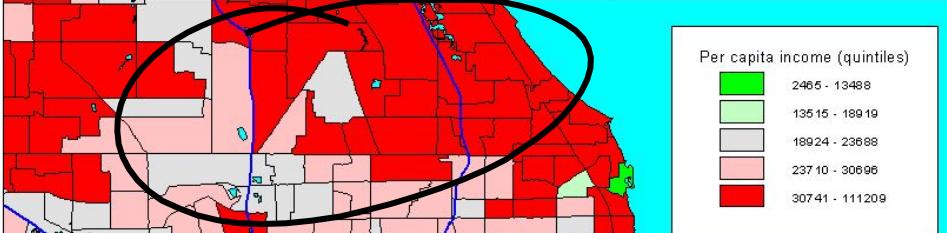
LA



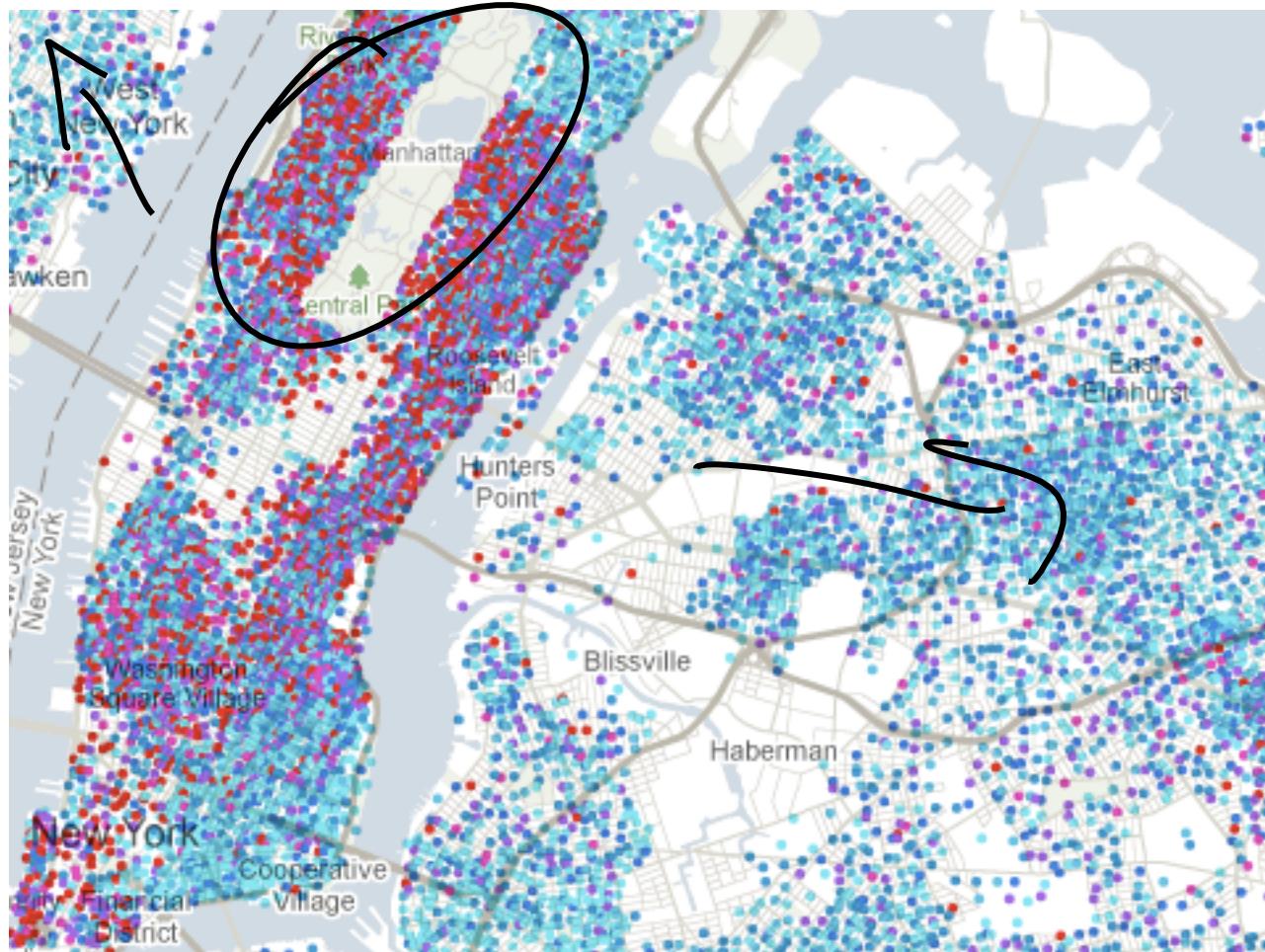
Houston



DC

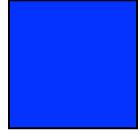


Chicago

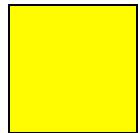


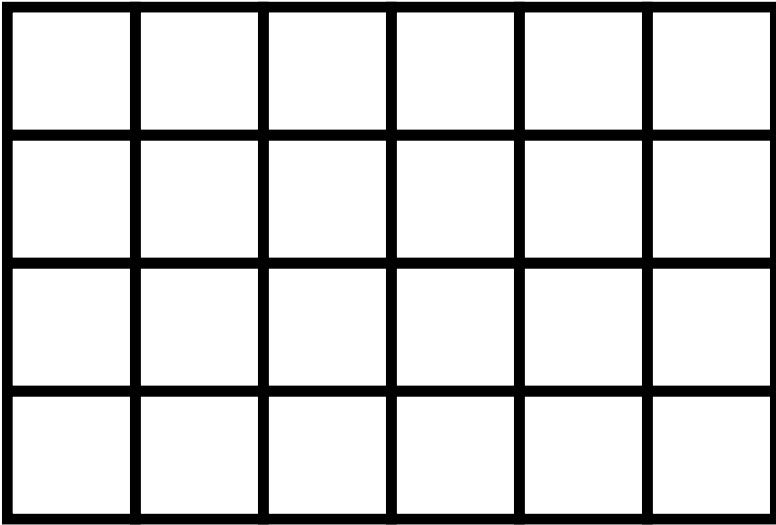
NY
Red > 200K
Light blue < 30K

Rich

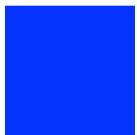
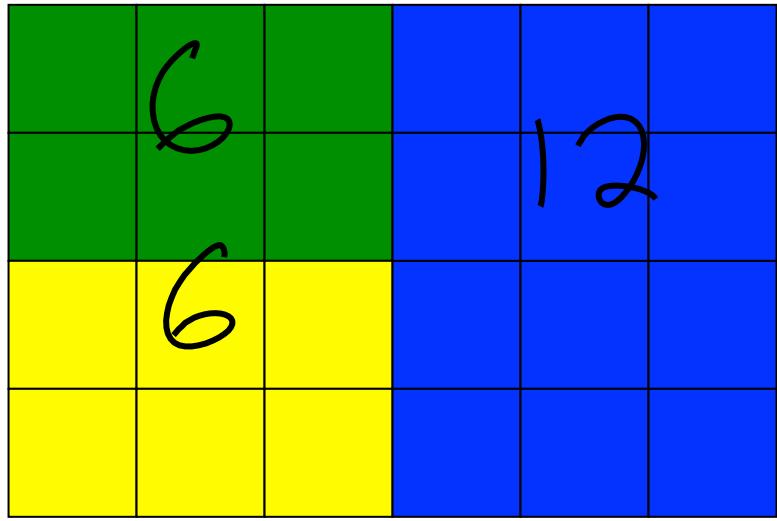


Poor

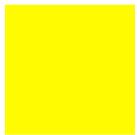




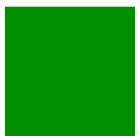
24 Blocks
**10 People
Per Block**



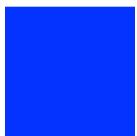
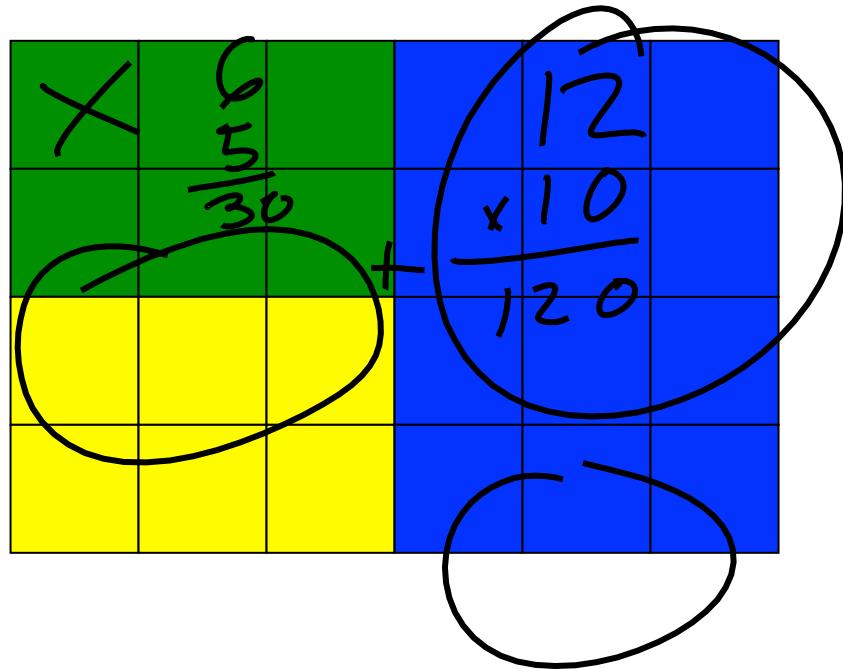
Rich



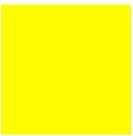
Poor



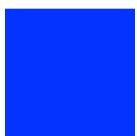
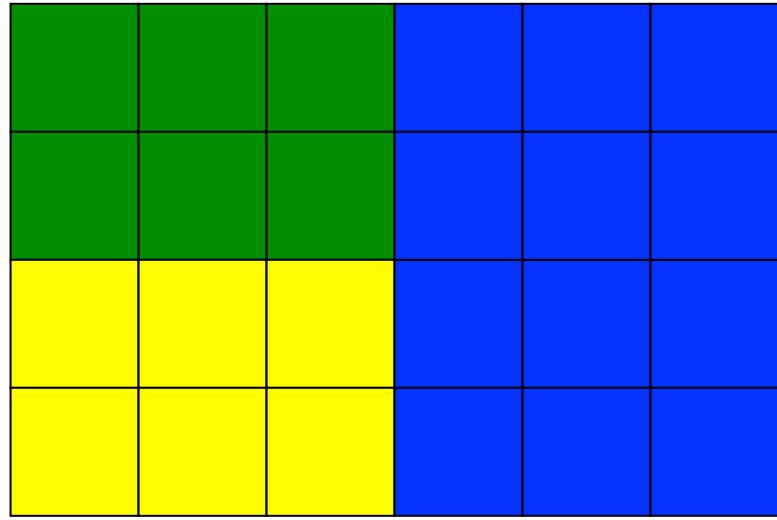
50/50



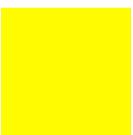
Rich: 150



Poor: 90



Rich: 150



Poor: 90

b = # blue in block

B = # blue total (150)

y = # yellow in block

Y = # yellow total (90)

$$\frac{b}{B} = ? \text{ blue}$$

$b = \# \text{ blue in block}$

$B = \# \text{ blue total (150)}$

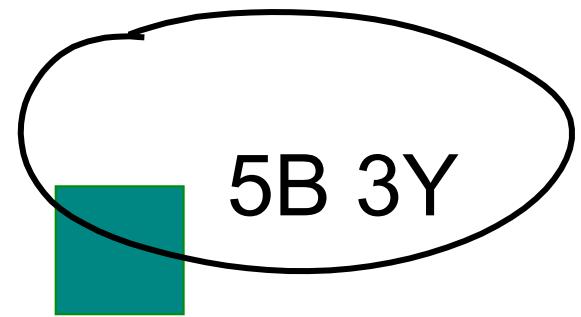
$y = \# \text{ yellow in block}$

$Y = \# \text{ yellow total (90)}$

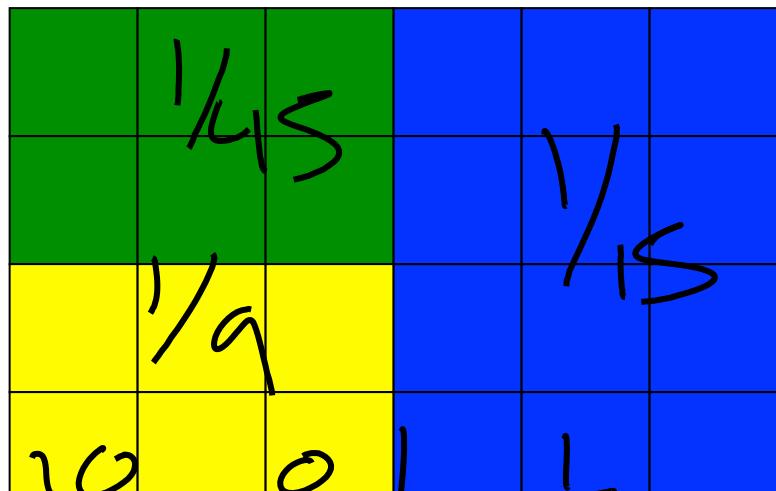
$$|b/B - y/Y|$$



$$| b/B - y/Y |$$



$$\left| \frac{5}{150} - \frac{3}{90} \right| = 0$$
$$\left| \frac{1}{30} - \frac{1}{30} \right| = 0$$

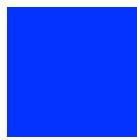


$$\left| \frac{10}{150} - \frac{0}{90} \right| = \frac{1}{15}$$

$$\left| \frac{0}{150} - \frac{10}{90} \right| = \frac{1}{9}$$

$$\left| \frac{5}{150} - \frac{5}{90} \right| = \frac{1}{45}$$

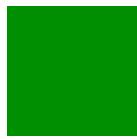
$$| b/B - y/Y |$$



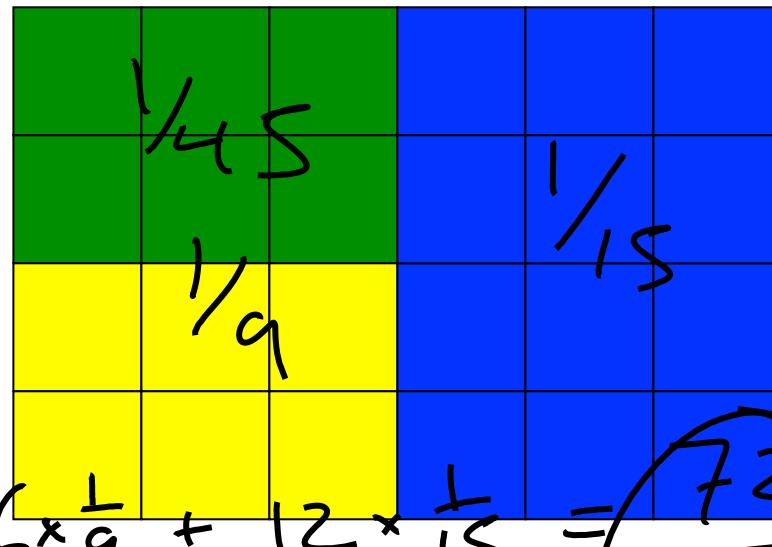
10 Blue $| 10/150 - 0/90 | = \underline{\underline{1/15}}$



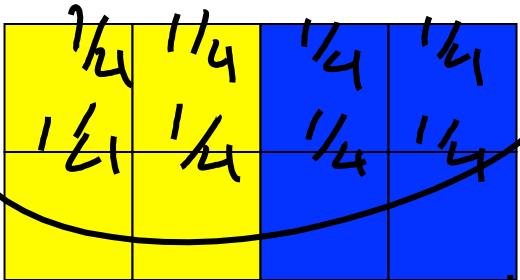
10 Yellow $| 0/150 - 10/90 | = \underline{1/9}$



5 B 5 Y $| 5/150 - 5/90 | = \underline{\underline{1/45}}$



$$6 \times \frac{1}{45} + 6 \times \frac{1}{9} + 12 \times \frac{1}{15} = \frac{72}{45}$$



40 Y
40 B

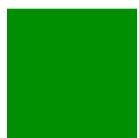
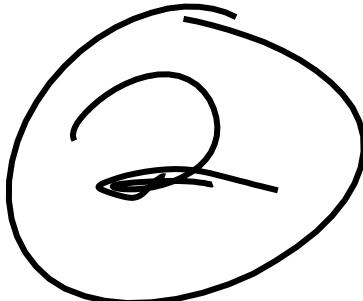
$$\left| \frac{0}{40} - \frac{50}{40} \right| = \frac{1}{4}$$



Rich



Poor

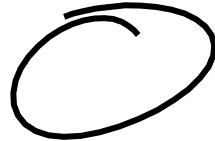
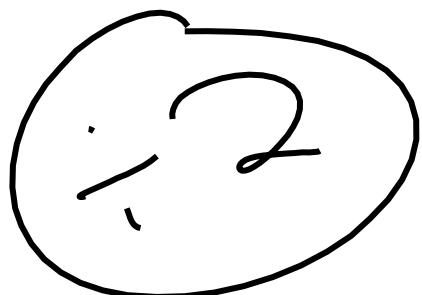


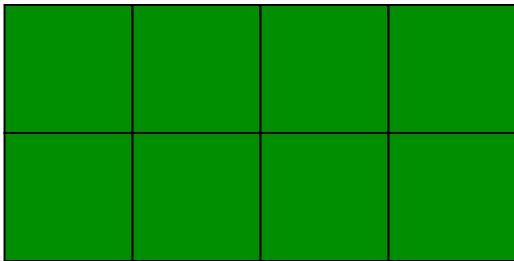
50/50

0	0	0	0
0	0	0	0

80
40B 40Y

5B S₅₀/50
 $|S_{40} - S_{40}| = 0$





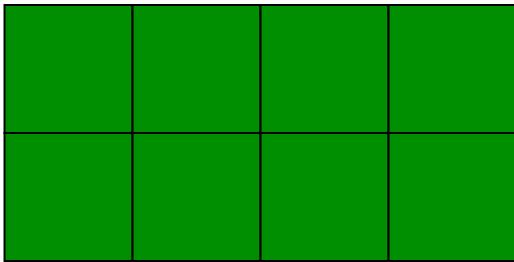
50/50



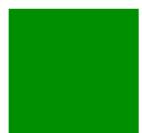
Rich: 40

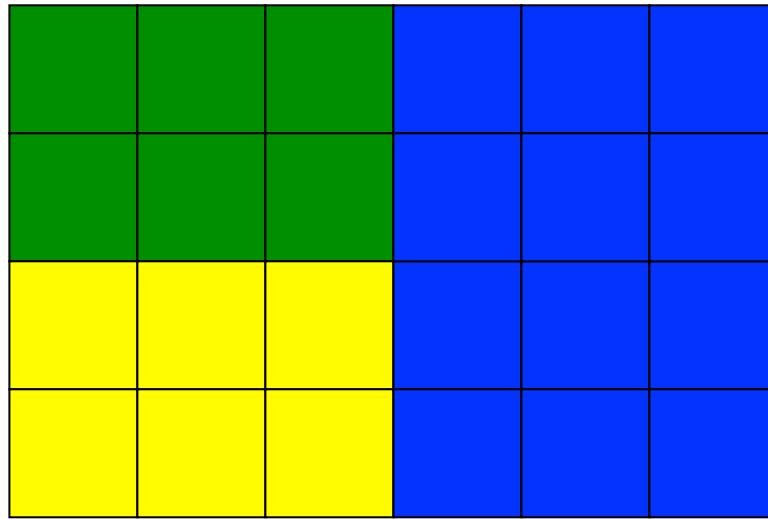


Poor: 40

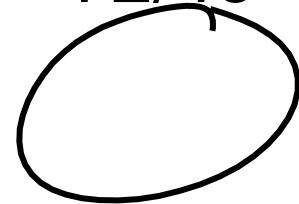


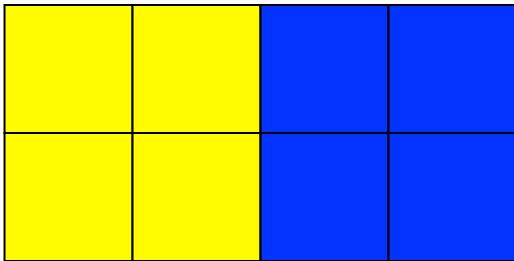
$$| b/B - y/Y |$$


$$5 B 5 Y | \cancel{5}/40 - 5/40 | = 0$$

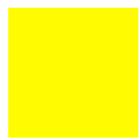


$$12 \times (1/15) + 6 \times (1/9) + 6 \times (1/45) = 72/45$$

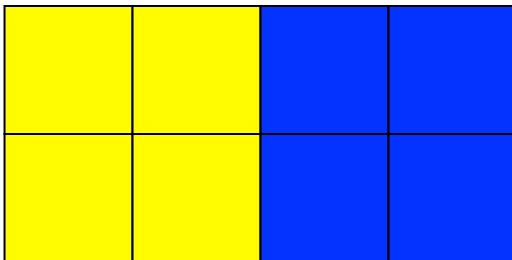




Rich



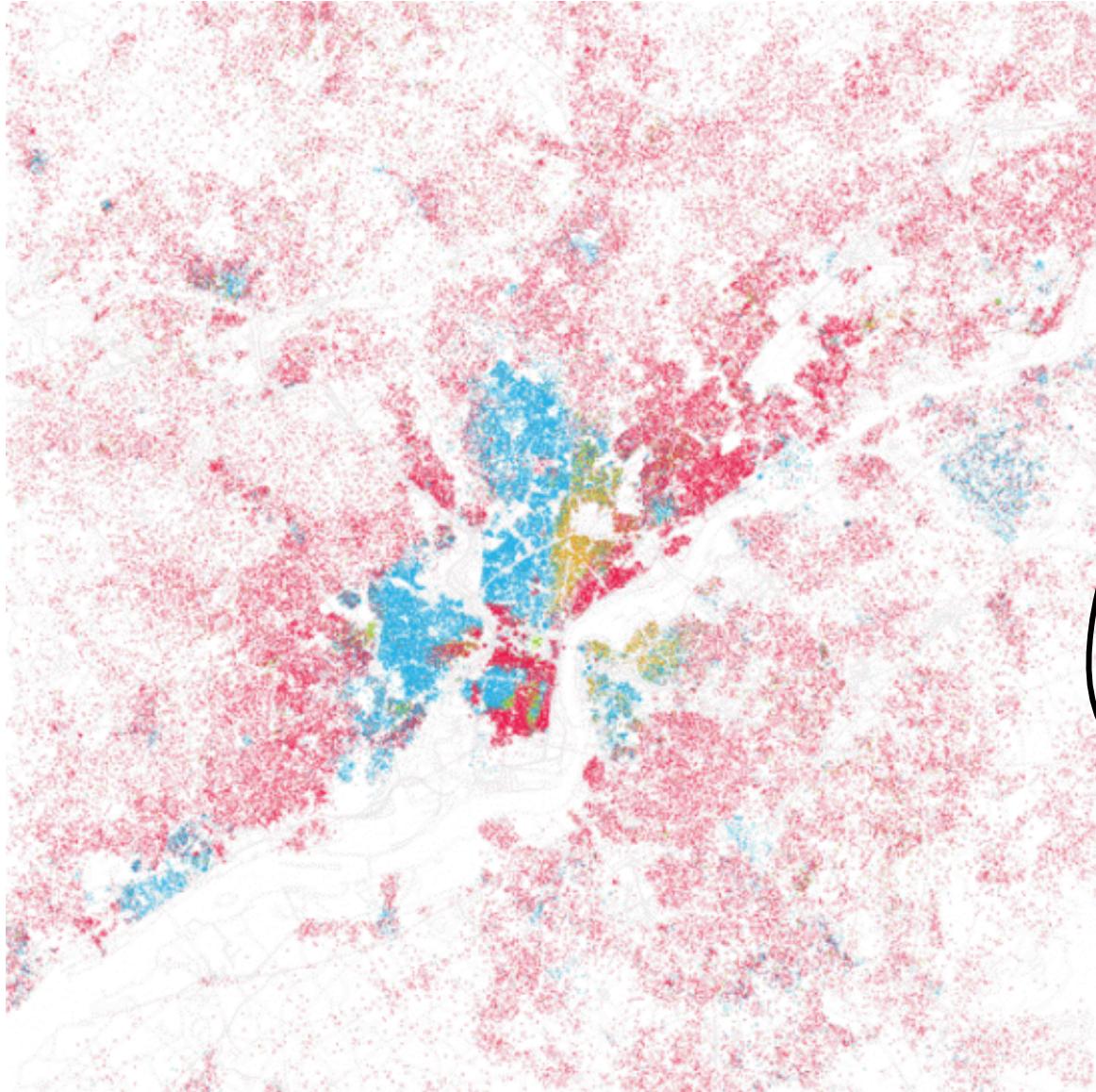
Poor



| b/B - y/Y |

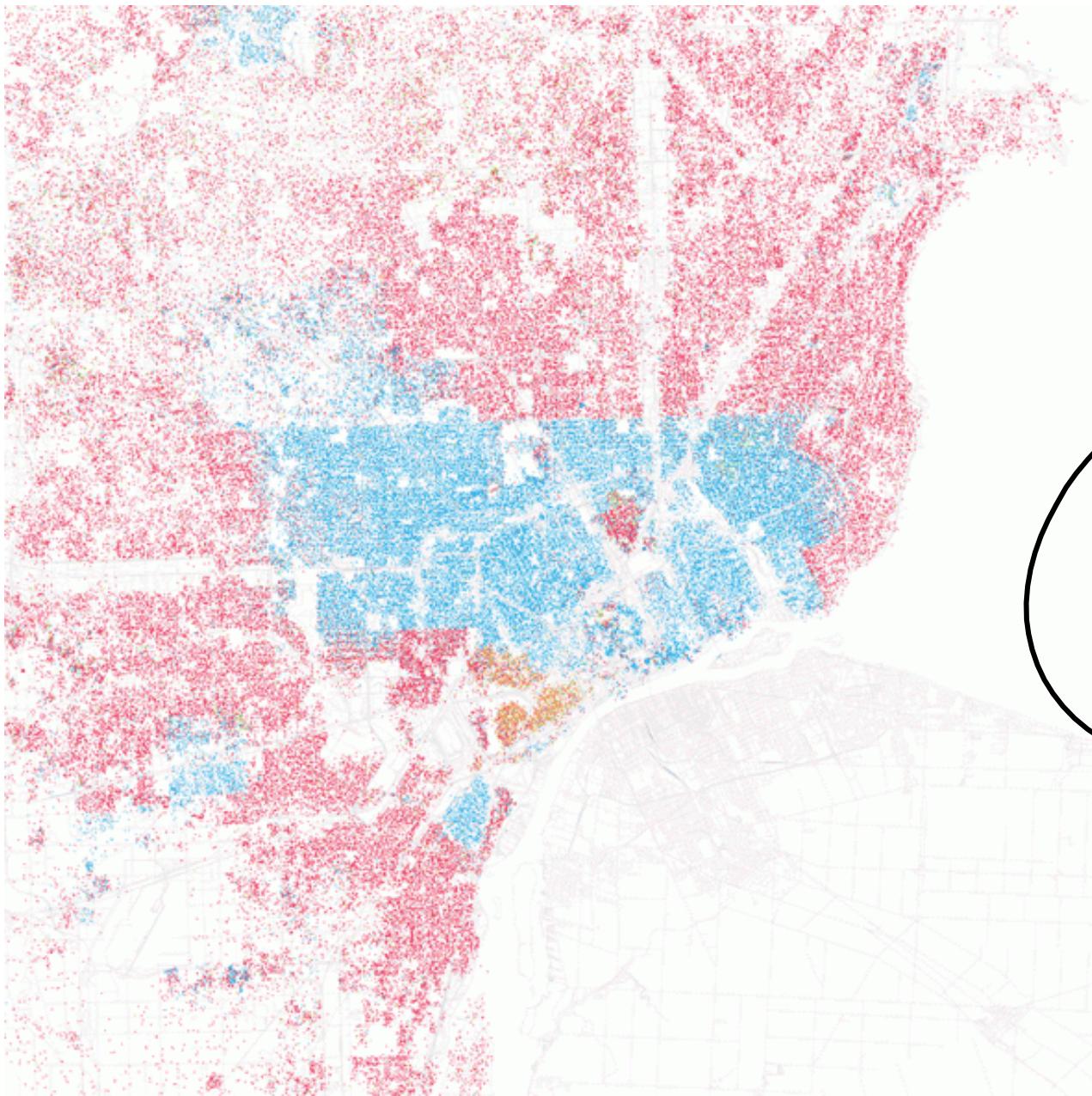
 | 10/40 – 0/40 | = 1/4

 | 10/40 – 0/40 | = 1/4



Phili

0.8



Detroit

0.6

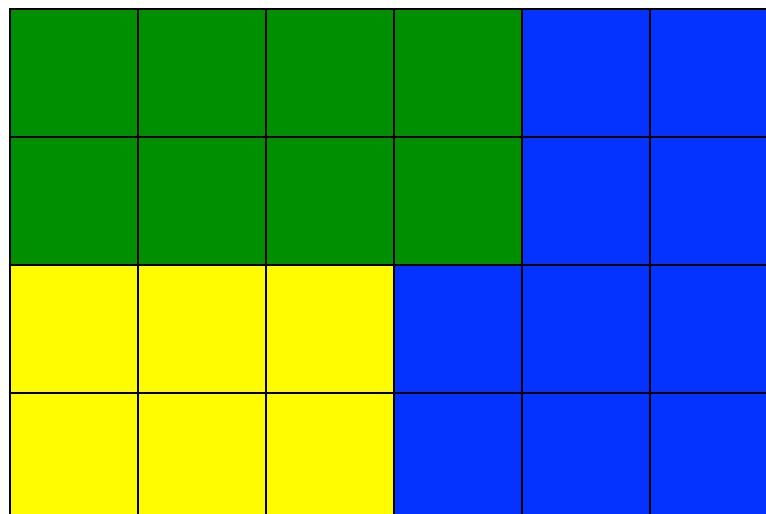
The D

Model Thinking

Scott E Page

Homework #1

Compute the Index of Dissimilarity for the following



Model Thinking

Scott E Page

Granovetter's Model





Model

- N Individuals
- Each has a Threshold
 - T_j for person j
 - Join if T_j others join



Thresholds:

0
1

2
2
2



Thresholds:

0

1

2

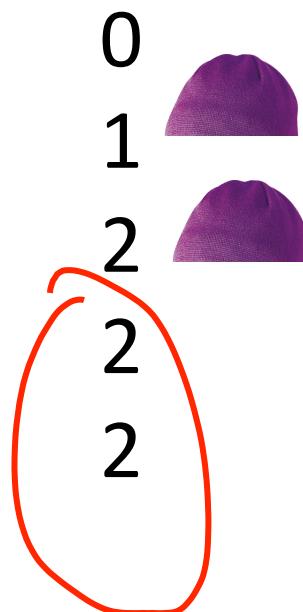
2

2





Thresholds:





Thresholds:

0



1



2

2



2





Thresholds:

1
1
1

2
2



Thresholds:

0

1

2

3

4



Thresholds:

0

1

2

3

4





Thresholds:

0

1

2

3

4





Thresholds:

0



1



2



3



4



Thresholds:

0



1



2



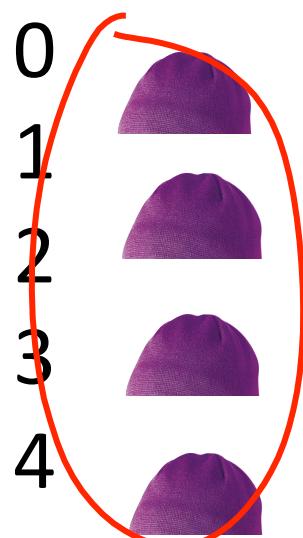
3



4



Thresholds:





Thresholds:

1

1

1

2

2

Ave 1.4

Thresholds:

0

1

2

3

4

Ave = 2.5

Collective Action

More Likely If:

- Lower Thresholds
- More Variation in thresholds



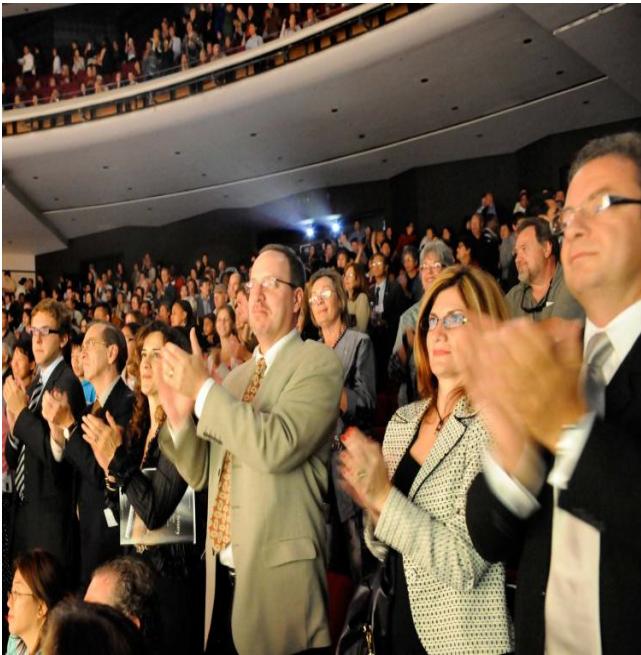
Model Thinking

Scott E Page

Model Thinking

Scott E Page

Standing Ovations



Peer Effect

Information

- Threshold to Stand: T
- Quality: Q
- Signal: $S = Q + E$
- Initial Rule
 - If $S > T$, Stand
- Subsequent Rule
 - Stand if more X% stand

Claim 1: Higher Q,
more people stand.

Claim 1: Higher Q,
more people stand.

Stand if $Q + \text{error} > T$



Claim 2: Lower T ,
more people stand.

Claim 2: Lower T ,
more people stand.

Stand if $Q + \text{error} > T$



Claim 3: Lower \bar{X} ,
more ovations.

Claim 3: Lower X,
more ovations.

Stand if more than X%

~~60%~~
 (0°)

Big X?

Small X?

Signal: ~~$S = Q + F$~~

Signal: $S = Q + E$

E = Error

Signal: $S = Q + \underline{E}$

E = Error

E = Diversity

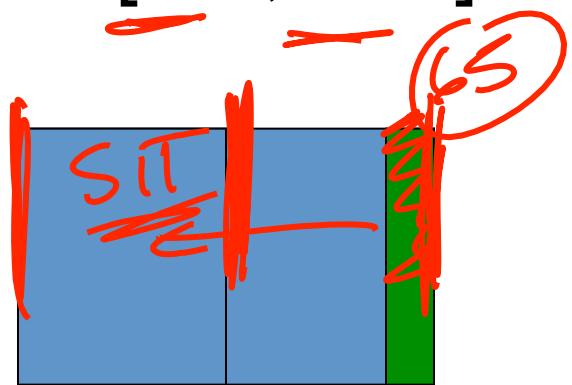
1000 people

$T = 60$

$Q = 50$

50260

E in $[-15, +15]$



35 50 60

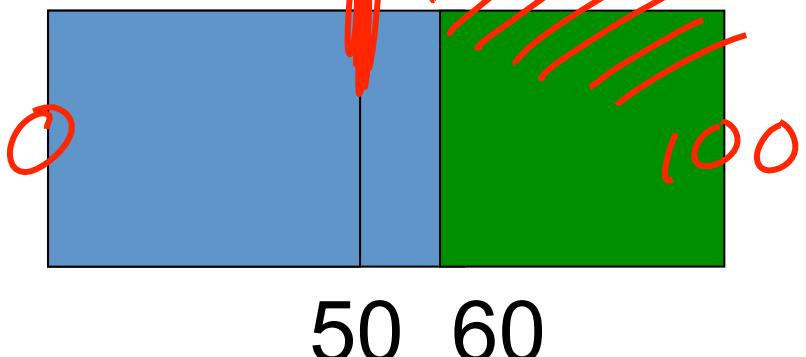


sit



stand

E in $[-50, +50]$



sit

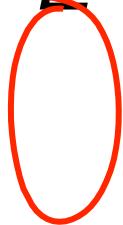


stand

Claim 4: If $Q < T$, more
variation in E , more
stand

Claim 4: If $Q < T$, more variation in E , more stand

Stand if $Q+E>T$



- Audience
 - Diverse
 - Unsophisticated
- Performance
 - Multidimensional
 - Complex

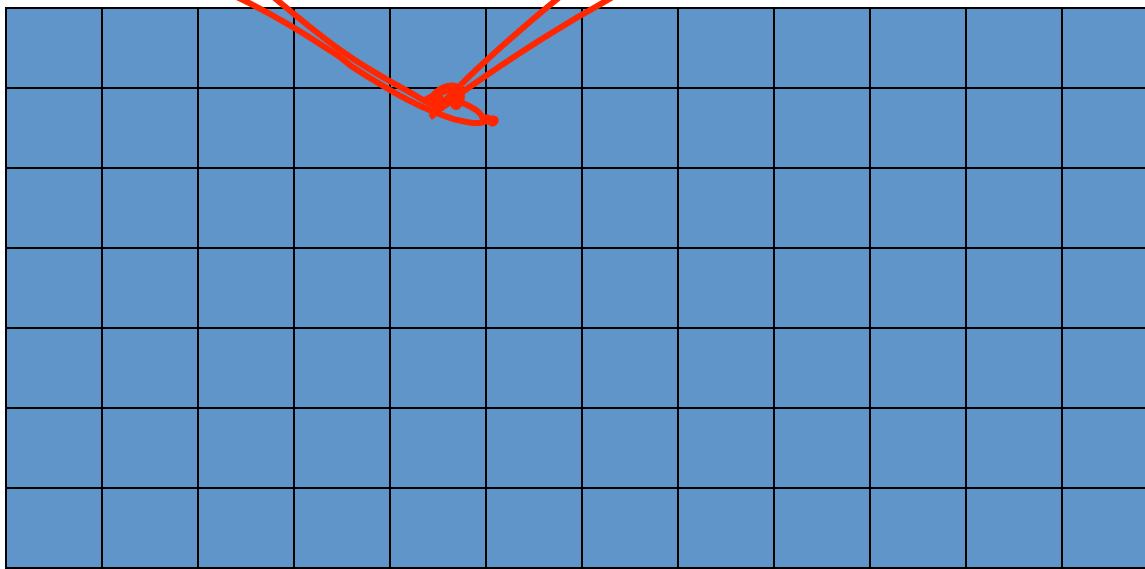
- Higher Quality
- Lower Threshold
- Larger Peer Effects
- More Variation

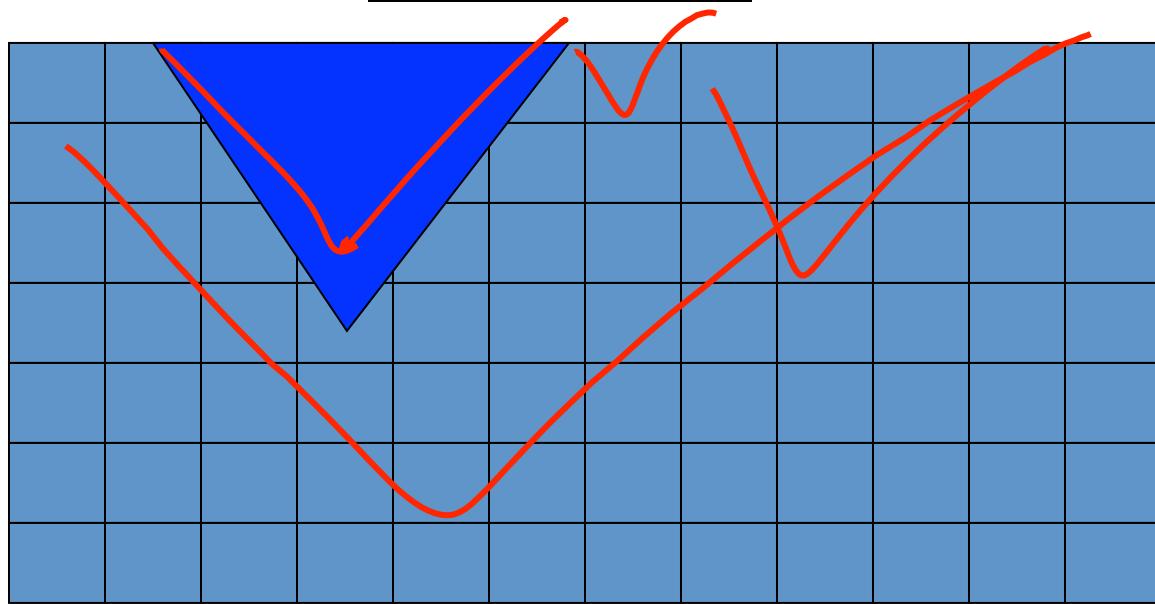


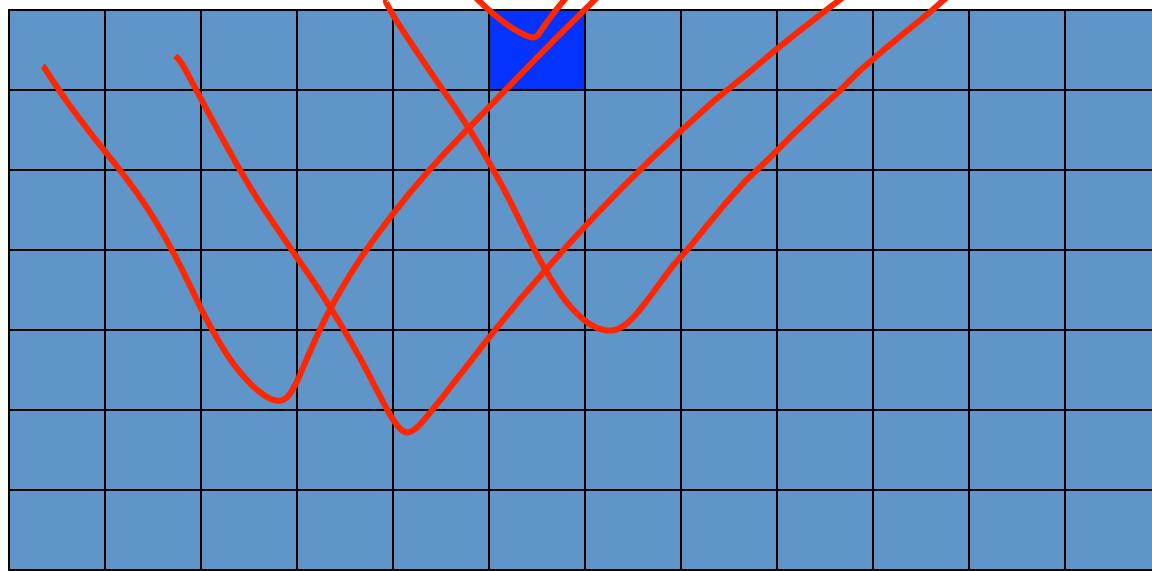
Ovations Advanced



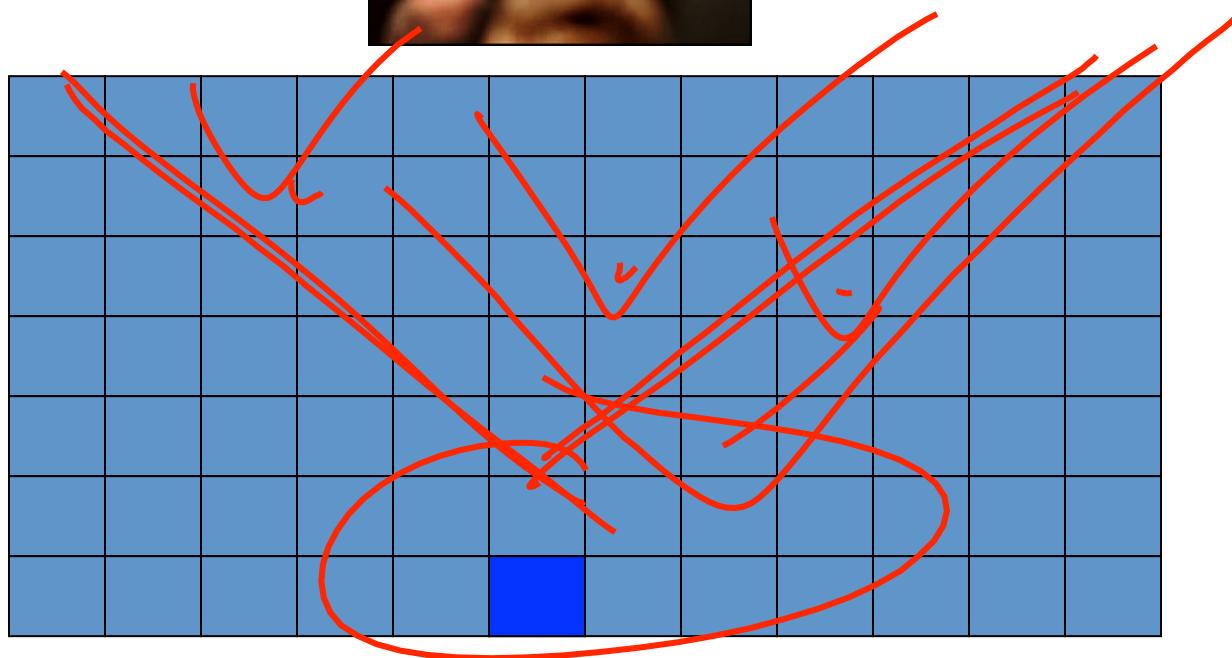




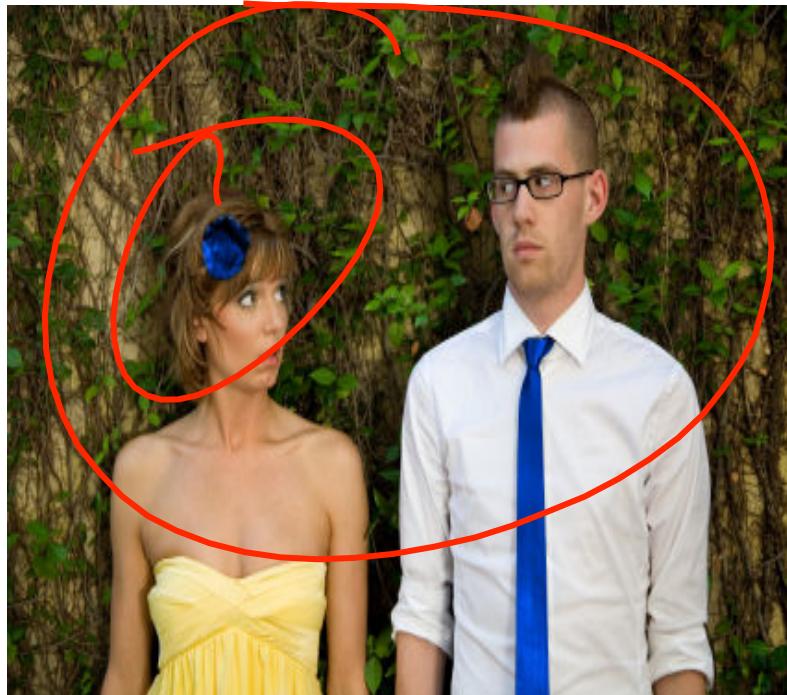




Celebrity



Academic



How do you increase
the probability
of an ovation?

- Higher Quality
- Lower Threshold
- Larger Peer Effects
- More Variation
- **Use Celebrities**
- **Big Groups**

Fertility

- Collective Action
- Academic Performance
- Urban Renewal
- Fitness/Health
- Online course

Model Thinking

Scott E Page

Model Thinking

Scott E Page

Identification

Schelling

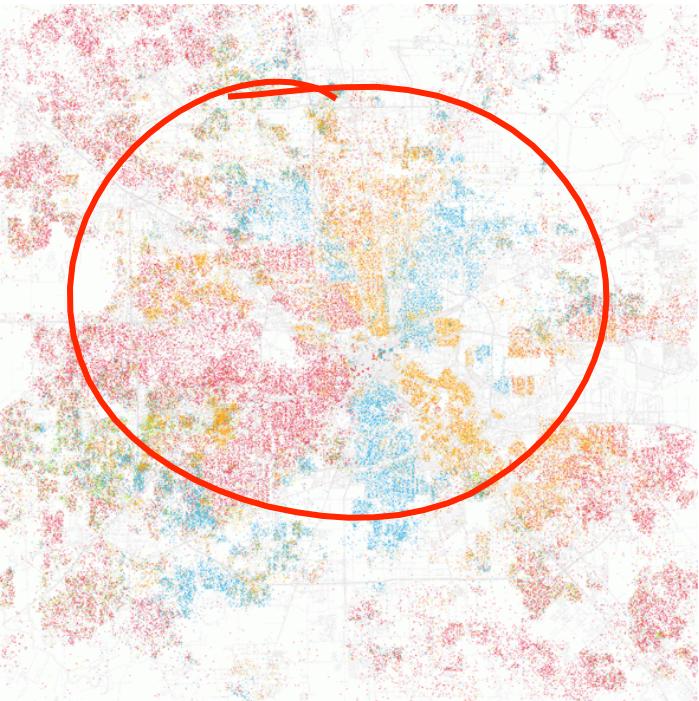
or

Standing Ovation

Homophily

or

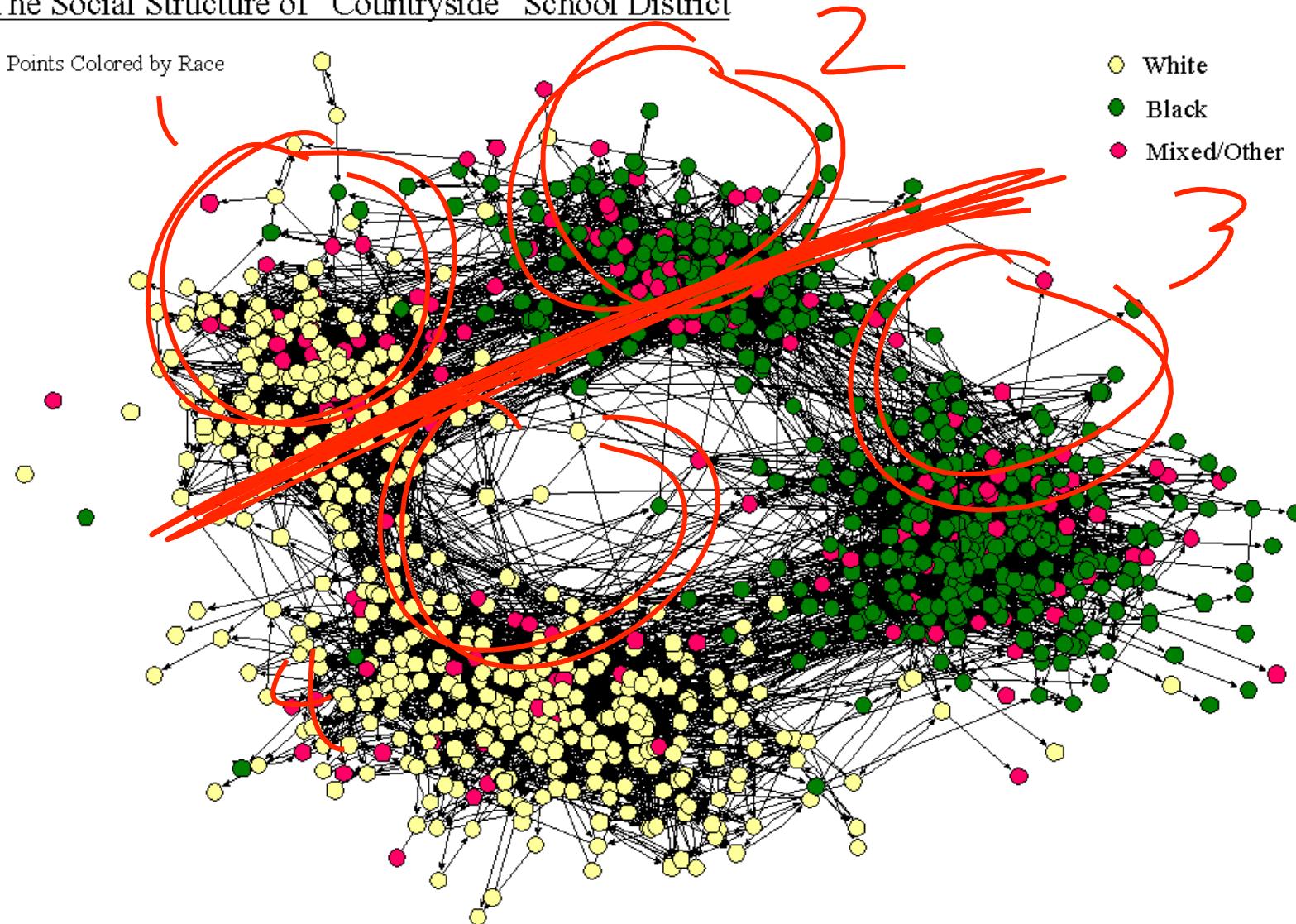
Peer Effect?



Houston

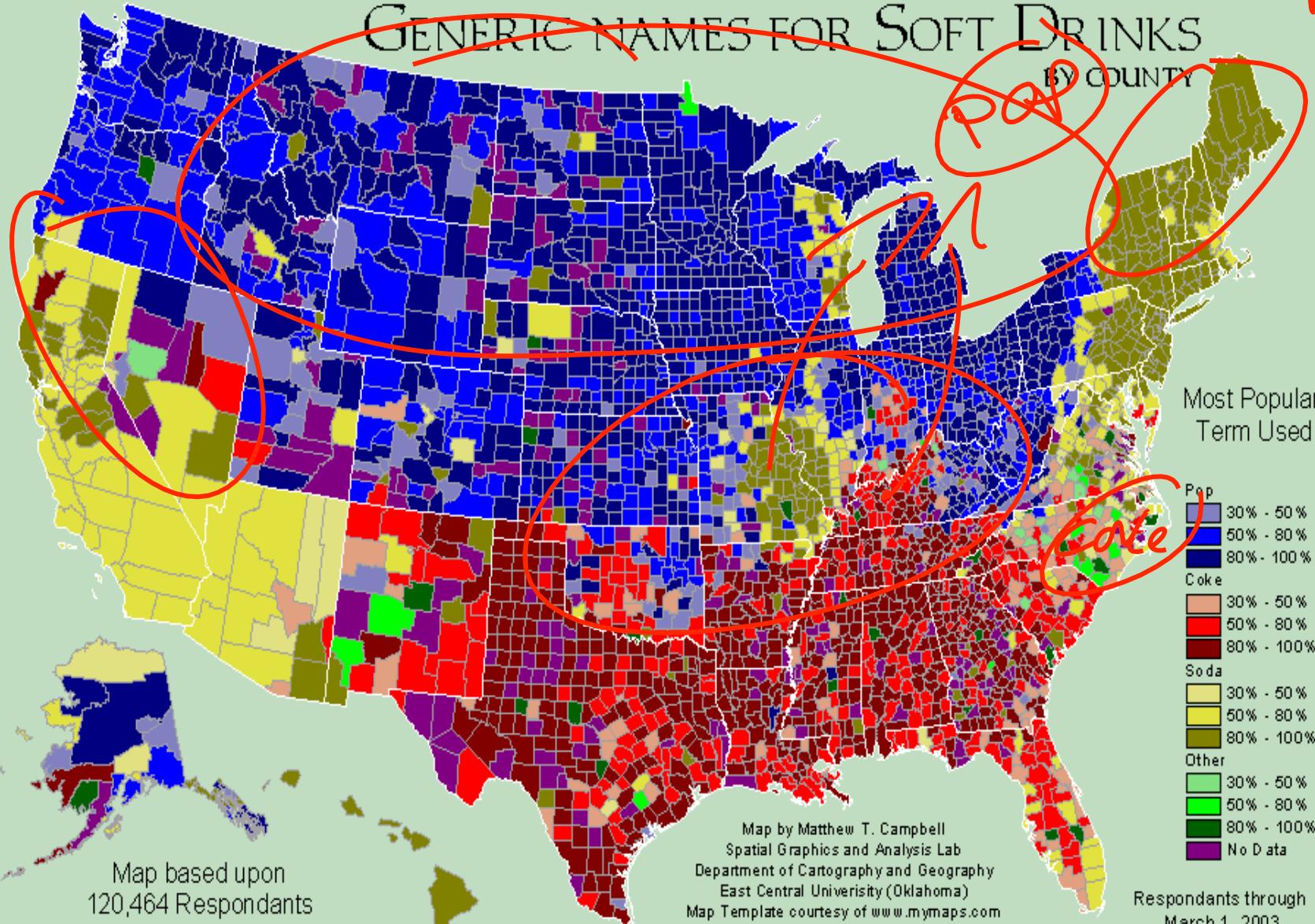
The Social Structure of “Countryside” School District

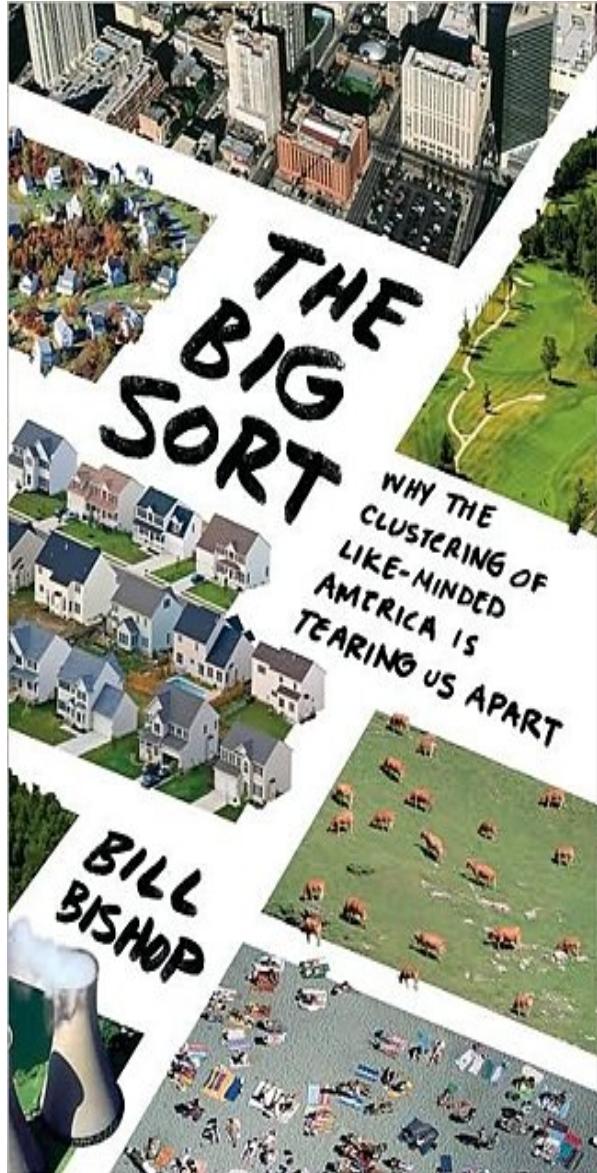
Points Colored by Race



SCDA

GENERIC NAMES FOR SOFT DRINKS BY COUNTY





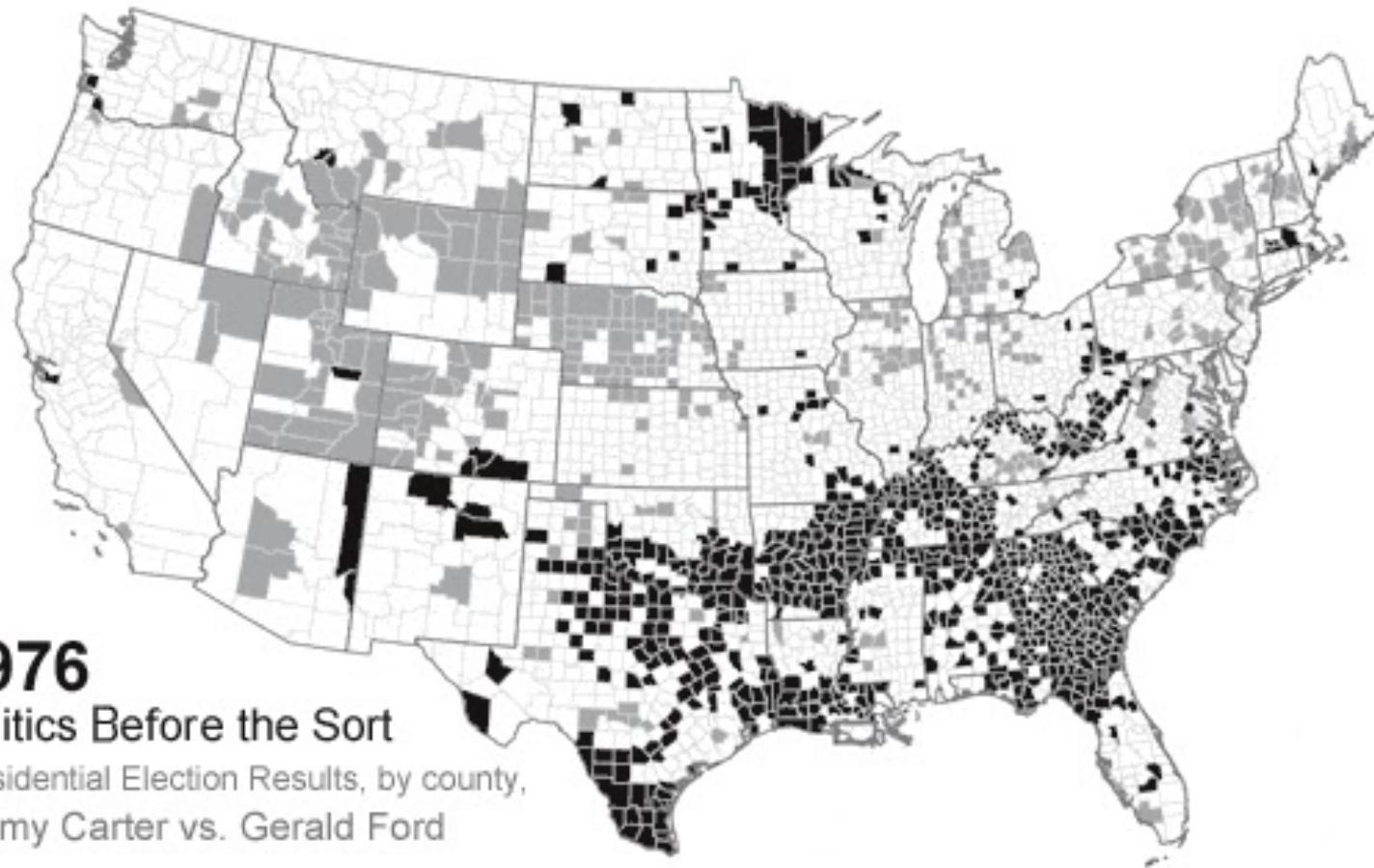
"Connected could change your life forever."
— DANIEL GILBERT, author of *Stumbling on Happiness*

NICHOLAS A. CHRISTAKIS, MD, PhD
AND JAMES H. FOWLER, PhD



Connected

The Surprising Power of Our Social Networks
and How They Shape Our Lives

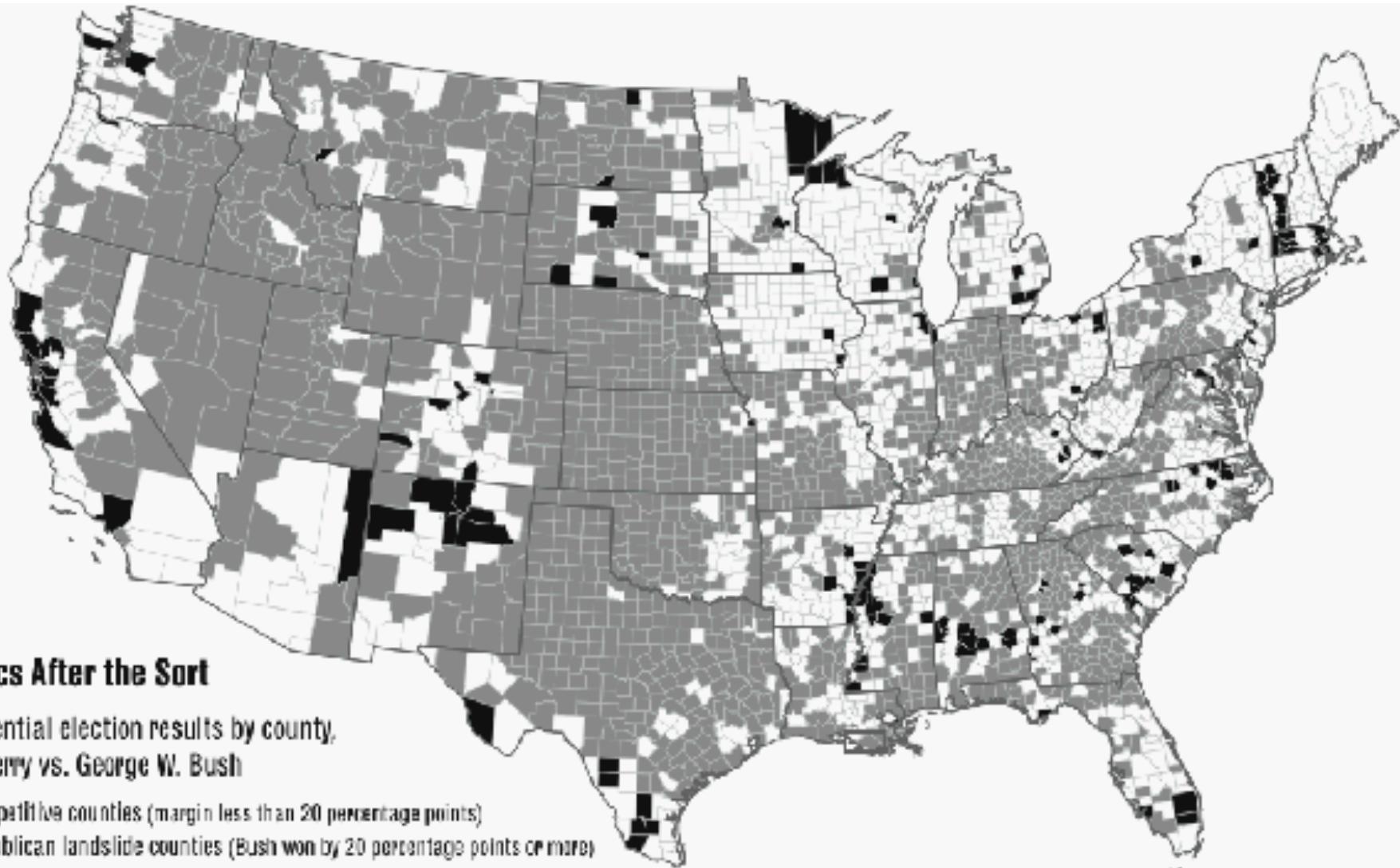


1976

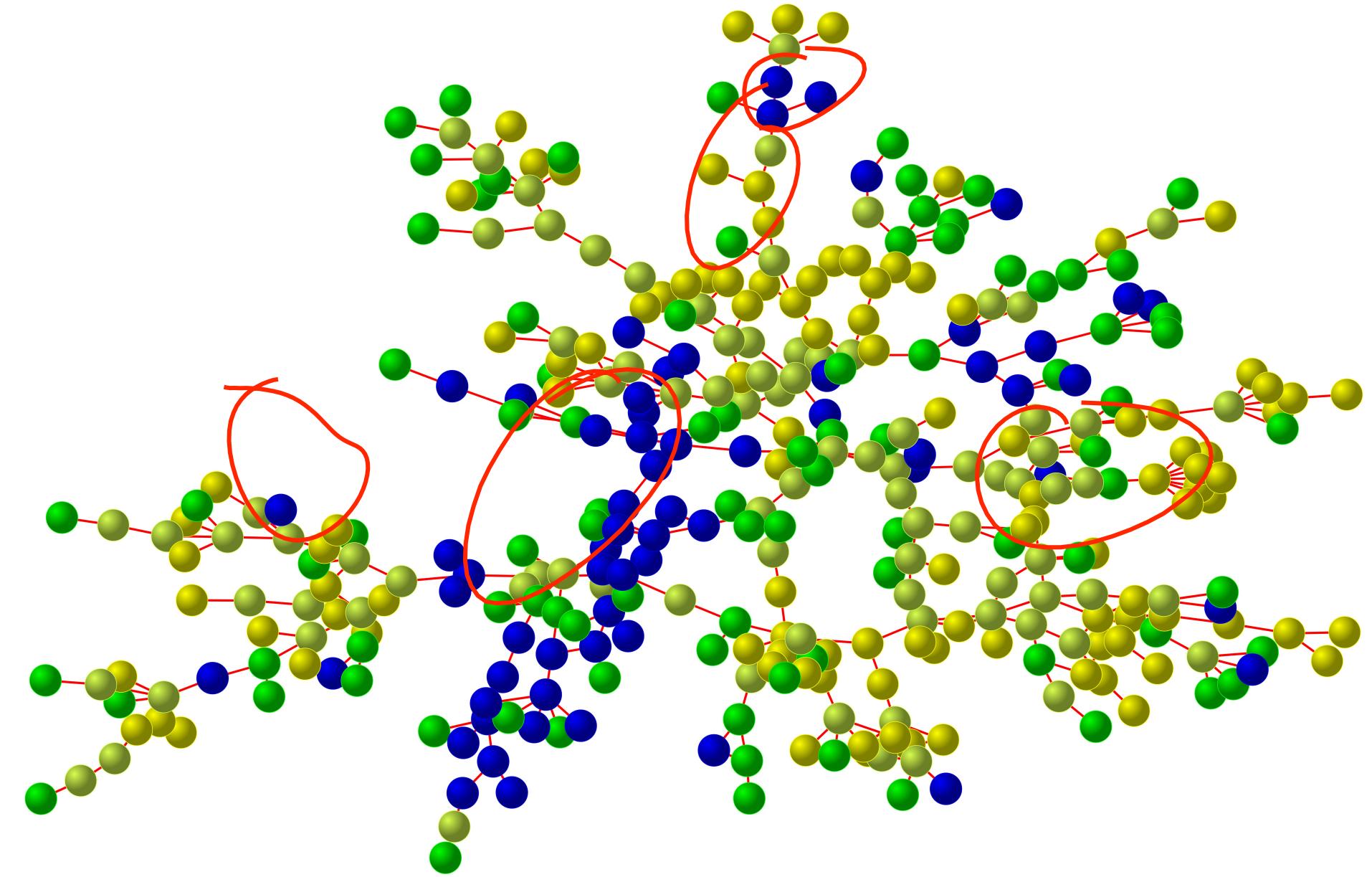
Politics Before the Sort

Presidential Election Results, by county,
Jimmy Carter vs. Gerald Ford

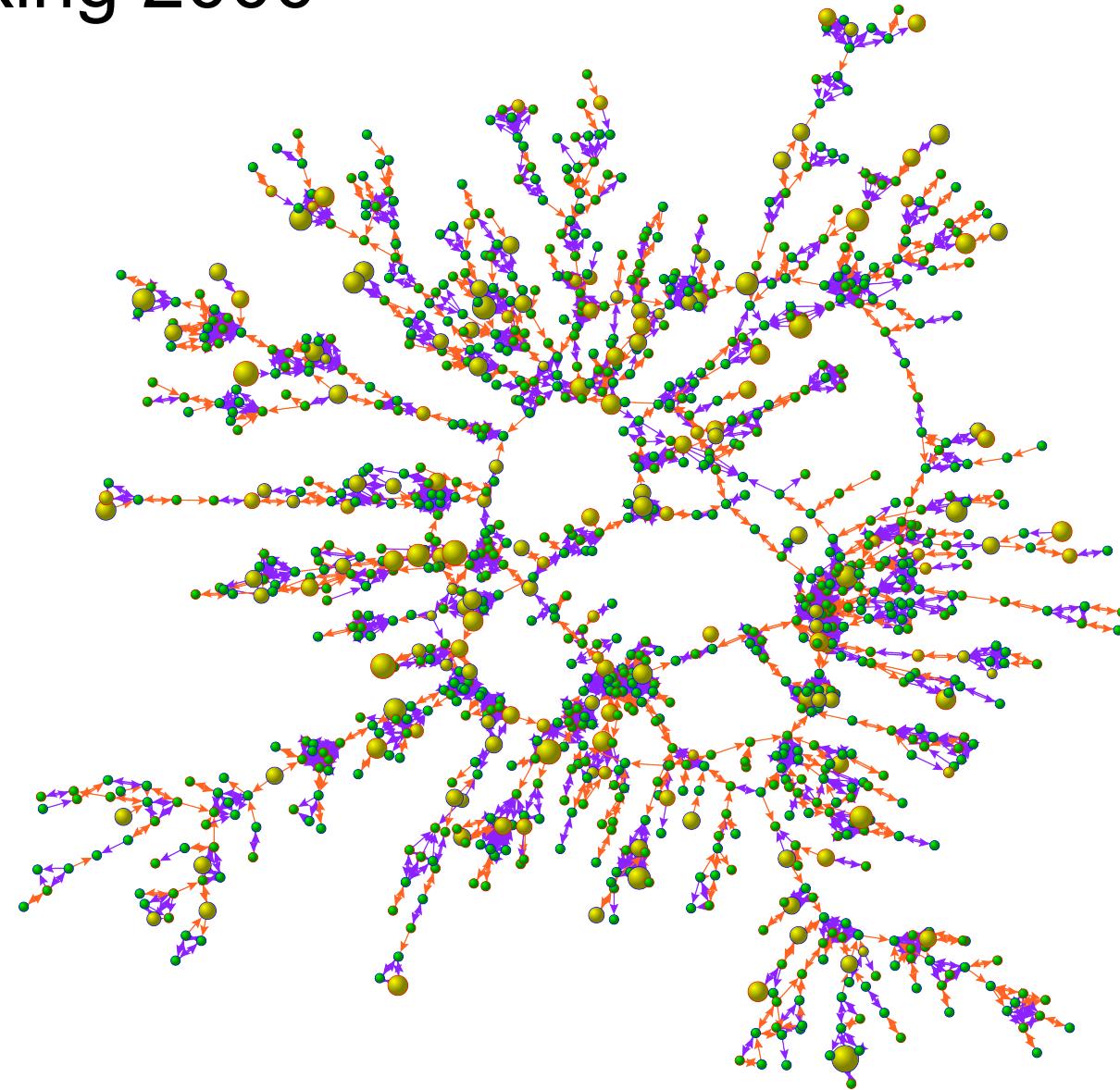
- Competitive counties (margin less than 20 percentage points)
- Republican landslide counties (Ford won by 20 percentage points or more)
- Democratic landslide counties (Carter won by 20 percentage points or more)
(Democratic and Republican votes only)

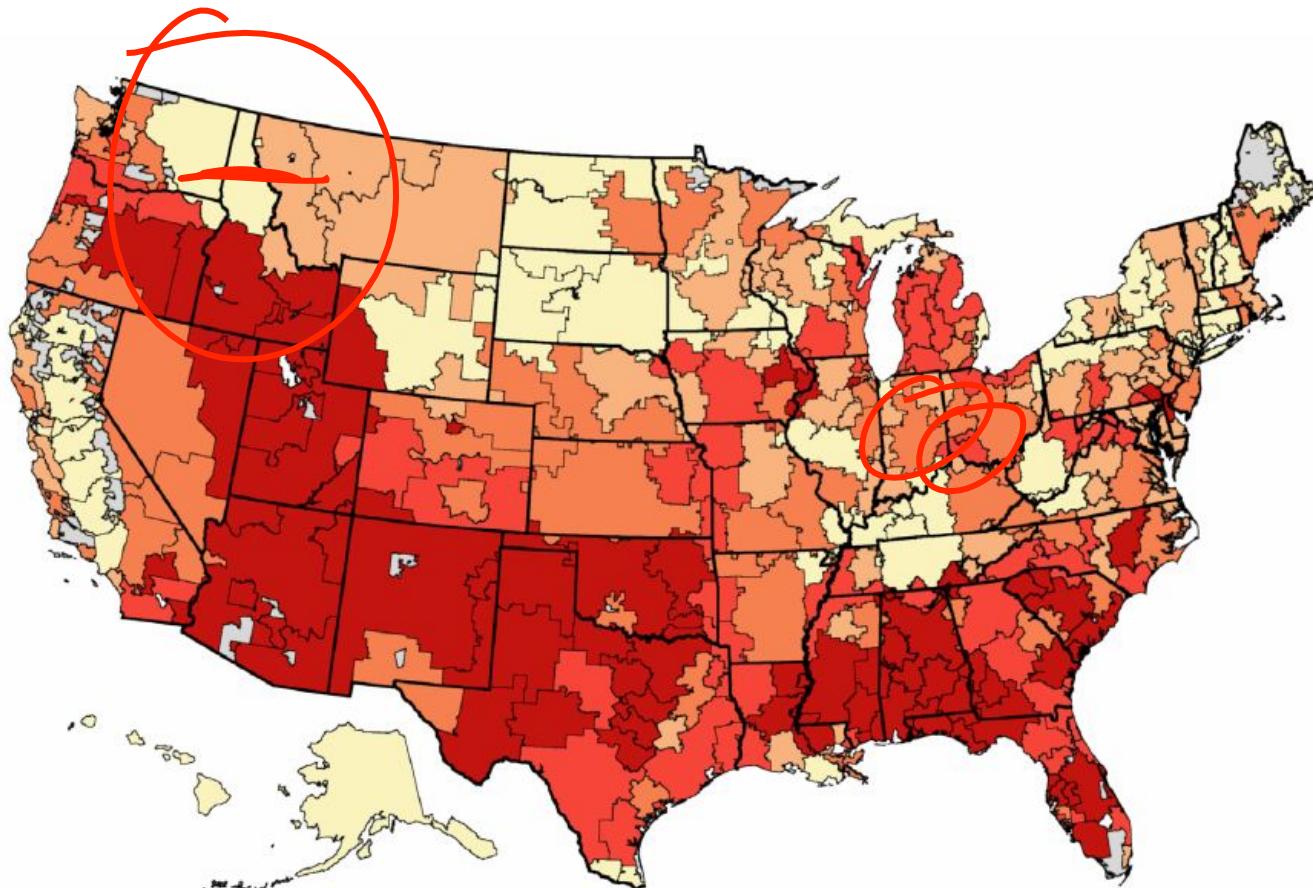


Happiness



Smoking 2000



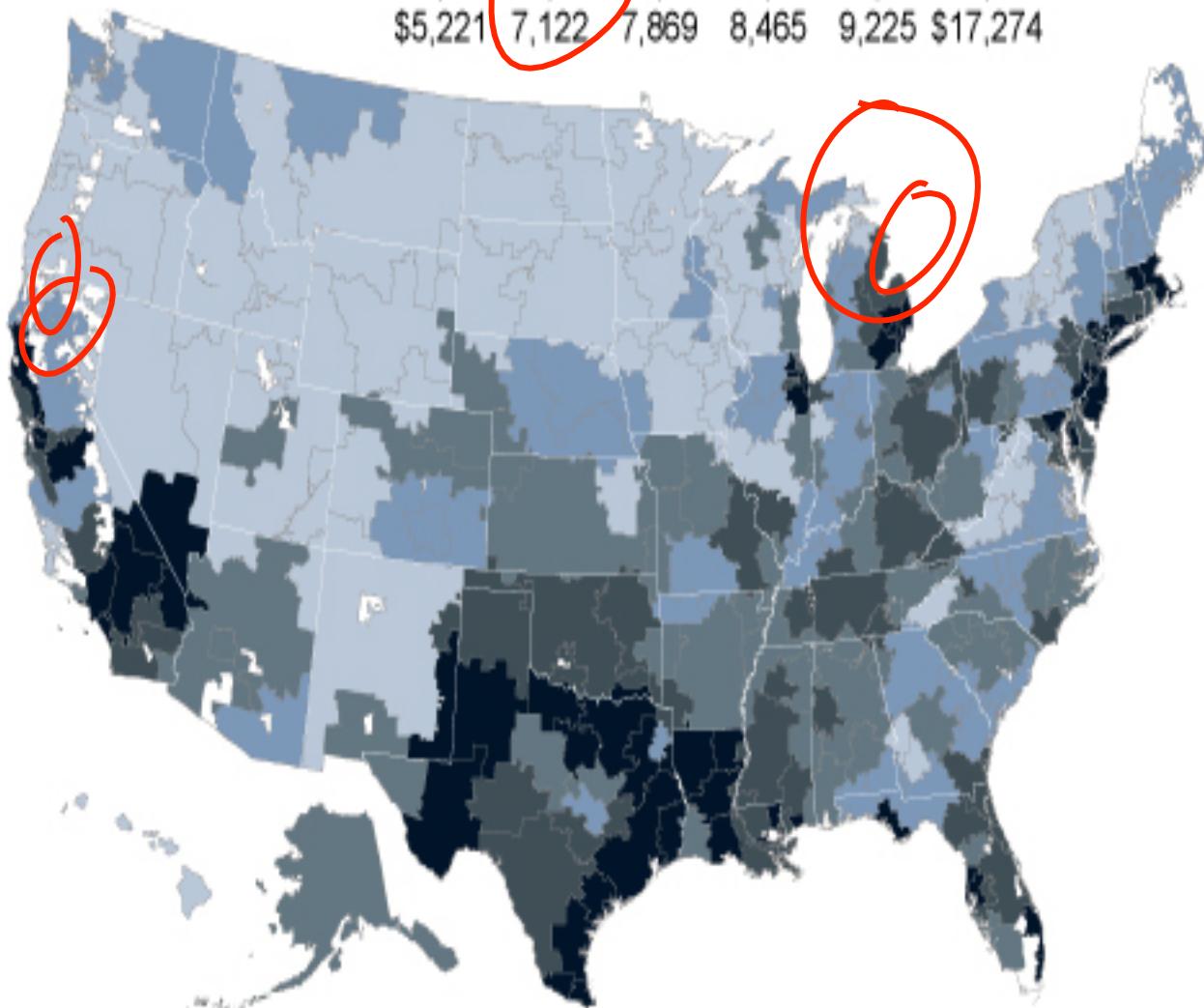


**Average Number of Hospice Days
per Chronically Ill Patient during
the Last Six Months of Life**

by HRR (deaths occurring in 2007)

- 22.9 to 39.5 (61)
- 19.6 to < 22.9 (60)
- 16.6 to < 19.6 (62)
- 13.3 to < 16.6 (62)
- 6.0 to < 13.3 (61)
- Not populated

Medicare reimbursements per enrollee



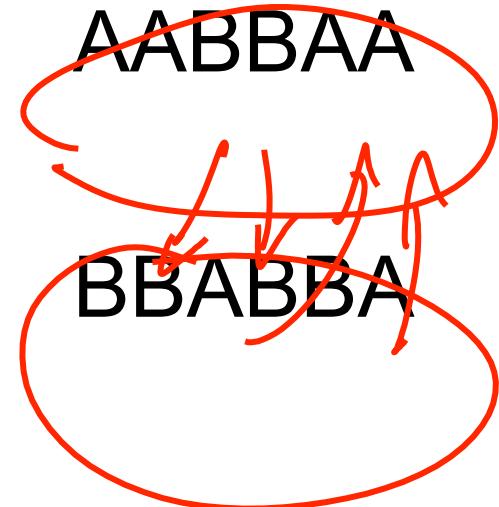
A's

B's

Sorting:

AABBAA

BBABBA



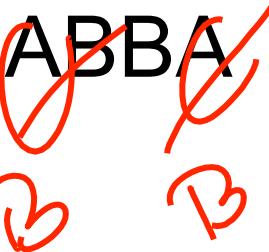
Peer Effects:

AABBAA



The sequence "AABBAA" is written in black. Above it, several red lines and loops are drawn, obscuring parts of the letters and creating a messy, scribbled appearance.

BBABBA

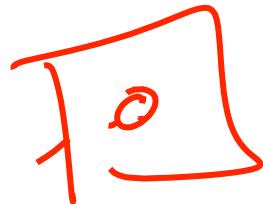


The sequence "BBABBA" is written in black. Above it, several red lines and loops are drawn, obscuring parts of the letters. Below the sequence, two red circles are drawn around the second and fourth letters, which are both "B".

Result:

AAAAAAA

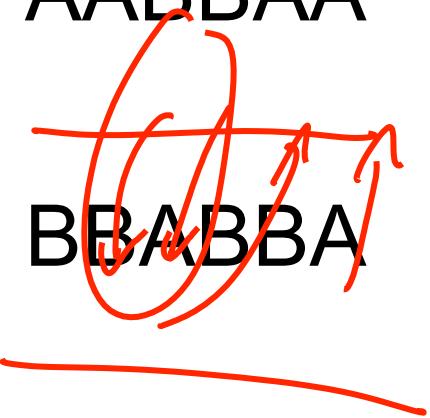
BBBBBBB



Sorting:

AABBA

BAABB



Peer Effects:



BBABBA

Model Thinking

Scott E Page