Facebook Friend Wheel

By: Mollie Breen and Audrey Vernick

Mollie Breen

Audrey Vernick

Corresponding Communication Matrix

Degree Centrality

- Katie Breen: 12 (row 9)
- Patrick Rollo: 12 (row 10)
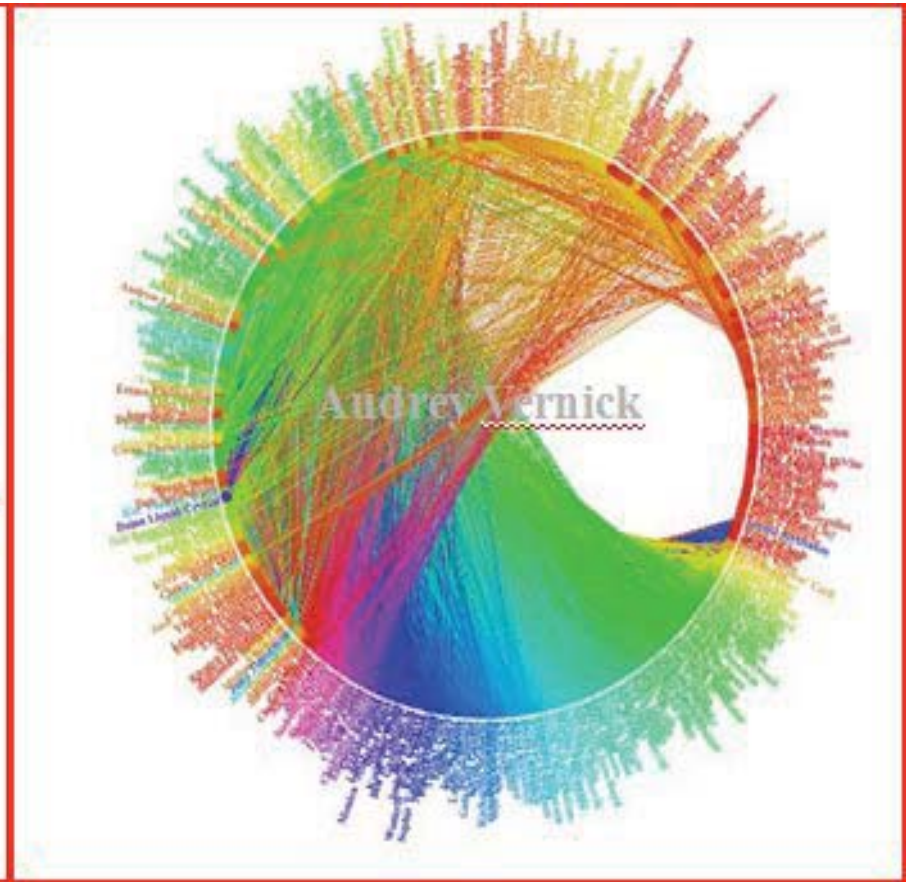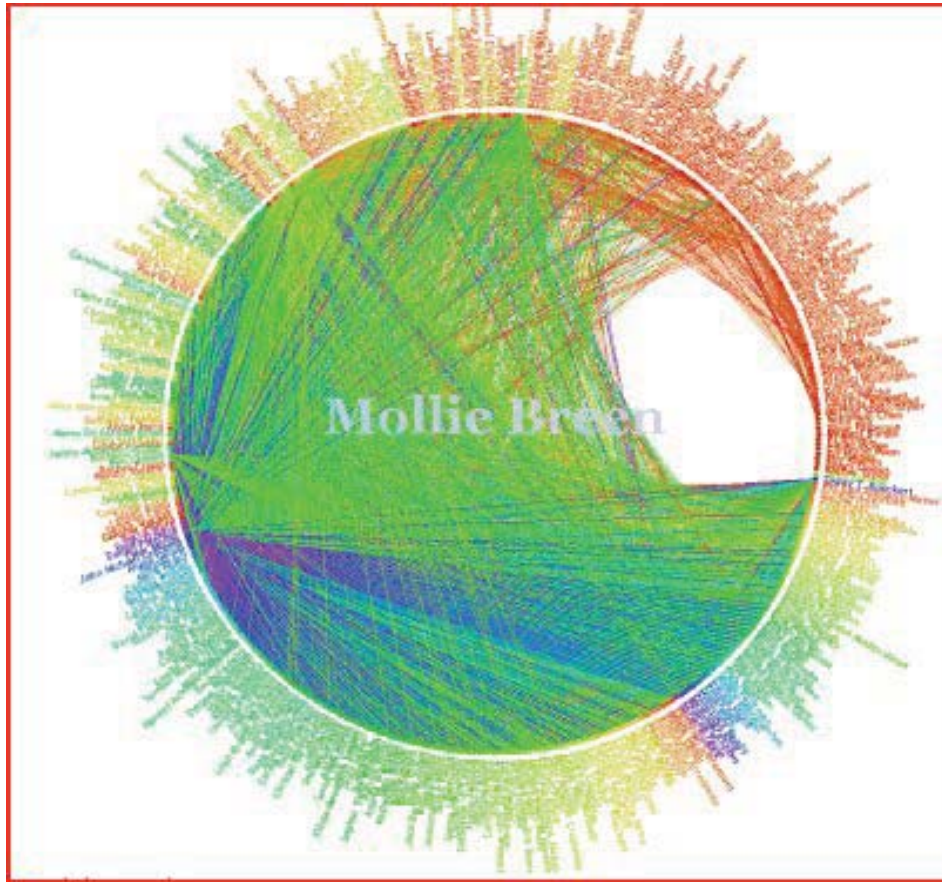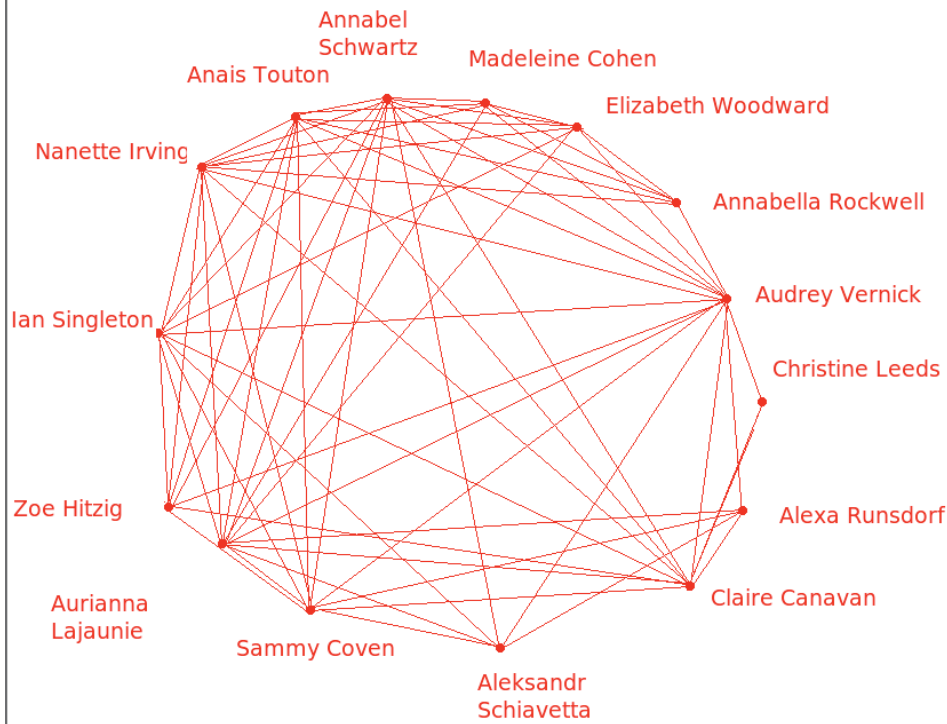
Corresponding Communication Matrix

0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1	0	0	1	1	1	1	1	0	0	0	0	0	0	0
1	0	1	0	1	1	1	1	1	0	1	0	0	0	0
1	0	1	1	0	1	1	1	0	0	1	0	0	0	0
1	0	1	1	1	0	1	1	1	1	1	1	1	1	0
1	0	1	1	1	1	0	1	1	1	1	1	0	1	0
1	0	1	1	1	1	1	0	1	1	1	1	0	1	0
1	0	0	1	0	1	1	1	0	1	1	1	1	1	0
1	0	0	0	0	1	1	1	1	0	1	1	0	1	0
1	0	0	1	1	1	1	1	1	1	0	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	0	1	1	1
1	0	0	0	0	1	0	0	1	0	1	1	0	0	1
1	1	0	0	0	1	1	1	1	1	1	1	0	0	1
1	0	0	0	0	0	0	0	0	0	1	1	1	1	0

Degree Centrality

- Annabel Schwartz: 12 (row 6)
- Aurianna Lajaunie: 12 (row 11)

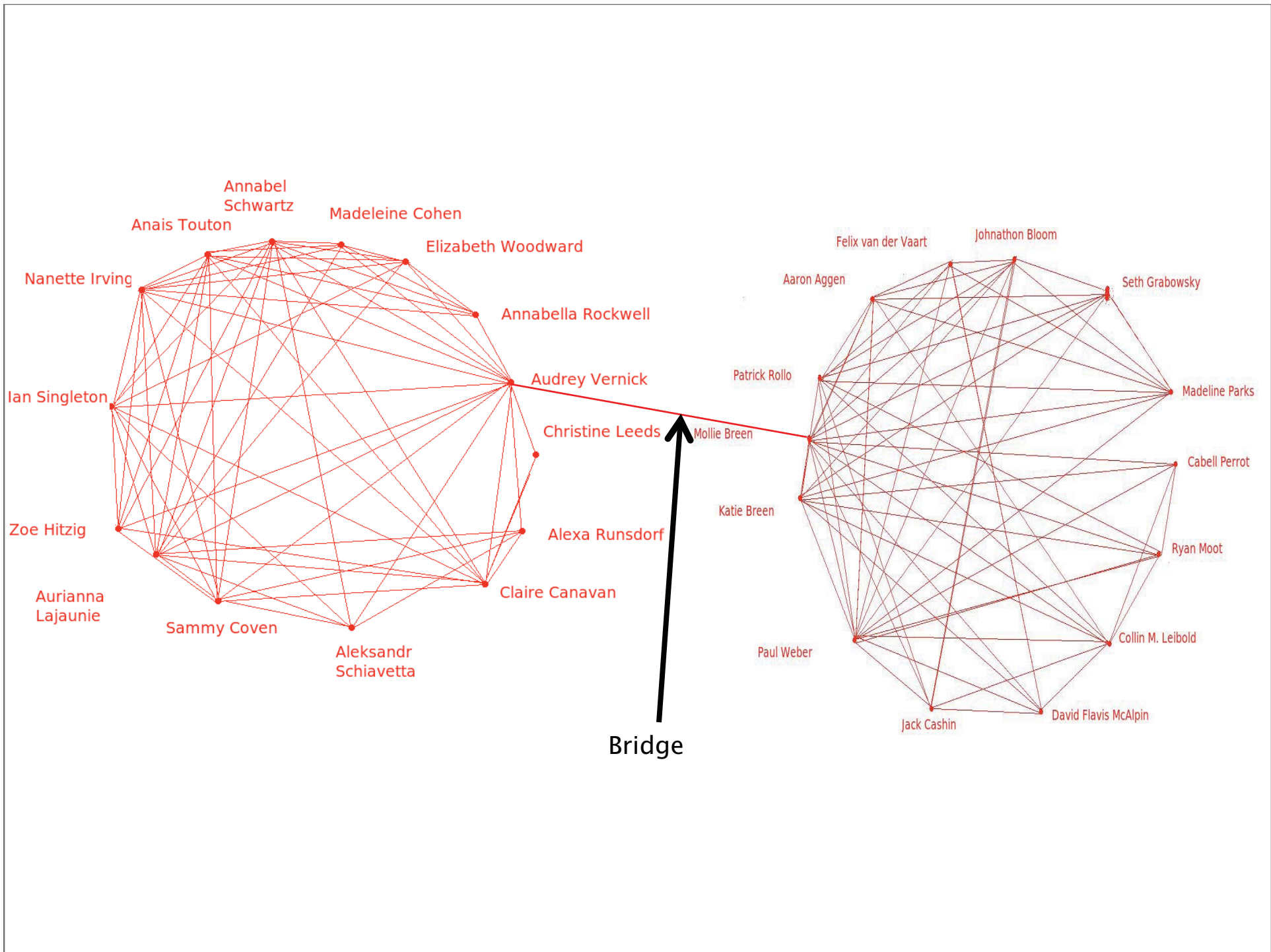|														
0	1	1	1	1	1	1	1	1	1	1	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	1	0
1	0	0	1	1	1	1	1	0	0	0	0	0	0	0
1	0	1	0	1	1	1	1	1	0	1	0	0	0	0
1	0	1	1	0	1	1	1	0	0	1	0	0	0	0
1	0	1	1	1	0	1	1	1	1	1	1	1	1	0
1	0	1	1	1	1	0	1	1	1	1	1	0	1	0
1	0	1	1	1	1	1	0	1	1	1	1	0	1	0
1	0	0	1	0	1	1	1	0	1	1	1	1	1	0
1	0	0	0	0	1	1	1	1	0	1	1	0	1	0
1	0	0	1	1	1	1	1	1	1	0	1	1	1	1
1	0	0	0	0	1	1	1	1	1	1	0	1	1	1
1	0	0	0	0	1	0	0	1	0	1	1	0	0	1
1	1	0	0	0	1	1	1	1	1	1	1	0	0	1
1	0	0	0	0	0	0	0	0	0	1	1	1	1	0

Closeness Centrality

- A Matrix^n tells you if there is a path between two vertices and if there is the matrix tells you how many paths between those two vertices that are 'n' length

14	1	5	7	6	11	10	10	9	7	11	9	5	9	4
1	2	1	1	1	2	2	2	2	2	2	2	1	1	2
5	1	6	5	5	5	5	5	5	4	6	4	2	4	1
7	1	5	8	6	7	7	7	5	6	6	6	4	6	2
6	1	5	6	7	6	6	6	6	5	5	5	3	5	2
11	2	5	7	6	12	10	10	9	7	10	8	4	7	5
10	2	5	7	6	10	11	10	8	7	9	7	5	7	4
10	2	5	7	6	10	10	11	8	7	9	7	5	7	4
9	2	5	5	6	9	8	8	10	7	9	8	4	7	5
7	2	4	6	5	7	7	7	7	8	7	7	5	7	4
11	2	6	6	5	10	9	9	9	7	12	9	5	8	4
9	2	4	6	5	8	7	7	8	7	9	10	5	8	4
5	1	2	4	3	4	5	5	4	5	5	5	6	6	3
9	1	4	6	5	7	7	7	7	7	8	8	6	10	3
4	2	1	2	2	5	4	4	5	4	4	4	3	3	5

Canonical Form

```
[0 1 0 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 0 0 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 1 0 0 0 1 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 1 0 1 1 0 1 1 1 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 1 1 0 1 1 1 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 1 1 0 1 0 1 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 0 1 0 1 1 0 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 1 1 1 1 0 1 0 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 0 1 1 1 1 1 0 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 0 0 1 1 0 1 1 1 0 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 0 0 0 1 0 1 1 1 1 0 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 0 0 0 0 1 1 1 1 1 0 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 1 1 1 1 1 1 1 1 1 1 1 1 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 1 1 1 1 1 1 1 1 1 1 1 1
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 0 0 1 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 1 0 0 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 0 1 1 1 1 1 0 1 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 0 1 1 1 0 0 1 0 0 0 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 1 0 1 1 1 1 1 1 1 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 1 1 0 1 1 1 1 1 0 1 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 1 1 1 1 1 0 1 1 1 1 0 1 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 0 1 1 1 0 1 1 1 1 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 1 1 1 0 1 1 0 1 0
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 1 1 0 1 1 1 1
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 1 1 1 1 1 1 1 0 1 1 1 1
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 1 0 0 1 0 1 1 0 0 1
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 1 0 0 0 1 1 1 1 1 1 0 0 1
 0 0 0 0 0 0 0 0 0 0 0 0 0 1 0 0 0 0 0 0 0 0 0 1 1 1 1 0]
```

Annabel
Schwartz
Anais Touton
Madeleine Cohen
Elizabeth Woodward
Nanette Irving
Annabella Rockwell
Audrey Vernick
Ian Singleton
Christine Leeds
Mollie Breen
Zoe Hitzig
Alexa Runsdorf
Aurianna
Lajaunie
Claire Canavan
Sammy Coven
Aleksandr
Schiavetta

Felix van der Vaart
Johnathon Bloom
Aaron Aggen
Seth Grabowsky
Patrick Rollo
Madeline Parks
Cabell Perrot
Katie Breen
Ryan Moot
Collin M. Leibold
Paul Weber
David Flavis McAlpin
Jack Cashin

Bridge

Equivalence Classes Diagram

Equivalence Classes

Eigenvalues and Eigenvectors

D =

Columns 1 through 11

```
 -3.3778        0        0        0        0        0        0        0        0        0        0
        0  -2.6765        0        0        0        0        0        0        0        0        0
        0        0  -2.2618        0        0        0        0        0        0        0        0
        0        0        0  -1.9474        0        0        0        0        0        0        0
        0        0        0        0  -1.7202        0        0        0        0        0        0
        0        0        0        0        0  -1.4358        0        0        0        0        0
        0        0        0        0        0        0  -1.2125        0        0        0        0
        0        0        0        0        0        0        0  -1.0000        0        0        0
        0        0        0        0        0        0        0        0  -1.0000        0        0
        0        0        0        0        0        0        0        0        0  -1.0000        0
        0        0        0        0        0        0        0        0        0        0  -1.0000
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0        0        0
```

Columns 12 through 20

```
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
        0        0        0        0        0        0        0        0        0
 -0.7596        0        0        0        0        0        0        0        0
        0  -0.5519        0        0        0        0        0        0        0
        0        0  -0.2026        0        0        0        0        0        0
        0        0        0   0.1020        0        0        0        0        0
        0        0        0        0   1.0429        0        0        0        0
        0        0        0        0        0   1.6377        0        0        0
        0        0        0        0        0        0   2.9882        0        0
        0        0        0        0        0        0        0   3.0000        0
        0        0        0        0        0        0        0        0  11.3752
```

V =

Columns 1 through 11

```
 -0.2795  -0.1312  -0.2700  -0.1397   0.1632  -0.4701  -0.0795        0        0        0   0.0000
 -0.2629   0.1161   0.1957  -0.0560  -0.2756  -0.0990   0.4964        0        0        0   0.0000
  0.2328  -0.1758  -0.3171   0.3700  -0.2934  -0.2295  -0.0747        0        0        0   0.0000
 -0.2222   0.5213   0.0543   0.1851   0.0078   0.1470  -0.1823        0        0        0  -0.0000
  0.2888   0.0917  -0.0030  -0.2847   0.1493   0.2618   0.1255        0        0        0  -0.7071
 -0.1386  -0.1775  -0.3411  -0.3382  -0.1784  -0.0088   0.2814        0        0        0  -0.0000
 -0.3277  -0.1455   0.1842   0.1106   0.2444   0.3403  -0.2214        0        0        0   0.0000
 -0.2210  -0.3272  -0.0908  -0.0968  -0.4266   0.2869  -0.1245        0        0        0   0.0000
 -0.1391   0.3286  -0.2262  -0.0406   0.4248  -0.3299   0.0096        0        0        0   0.0000
  0.0763   0.3020  -0.2635   0.4974  -0.2093   0.2221   0.0324        0        0        0  -0.0000
 -0.0734  -0.0291   0.6230   0.0822  -0.0778  -0.1863   0.2280        0        0        0   0.0000
  0.2888   0.0917  -0.0030  -0.2847   0.1493   0.2618   0.1255        0        0        0   0.7071
 -0.0460   0.1118   0.2478  -0.2522  -0.3135  -0.2488  -0.6196        0        0        0   0.0000
 -0.1540  -0.4385  -0.0144   0.1579   0.3745   0.1915  -0.1525        0        0        0  -0.0000
  0.5157  -0.0071   0.0658  -0.1858  -0.0273  -0.0652  -0.2372        0        0        0   0.0000
  0.2910  -0.2921   0.2280   0.3594   0.1538  -0.2530   0.1291        0        0        0  -0.0000
        0        0        0        0        0        0        0   0.7887  -0.2113   0.2887        0
        0        0        0        0        0        0        0  -0.2113   0.7887   0.2887        0
        0        0        0        0        0        0        0  -0.5774  -0.5774   0.2887        0
        0        0        0        0        0        0        0        0        0        0  -0.8660
```

Columns 12 through 20

```
 -0.1600   0.4526   0.2121   0.0627  -0.0835  -0.2029   0.4471        0   0.1761
 -0.5487  -0.0420   0.1800   0.1399   0.1641  -0.0720  -0.3051        0   0.2525
 -0.2127   0.1927  -0.3412   0.0295  -0.2909   0.3893  -0.2111        0   0.2295
 -0.0215  -0.2329   0.0763   0.4673  -0.2967   0.2578   0.3270        0   0.2154
 -0.0925   0.1261   0.0131  -0.1414  -0.2865  -0.0449   0.0194        0   0.3025
  0.6051  -0.0876   0.0621   0.3133   0.0514   0.1530  -0.1476        0   0.2894
  0.0408   0.3921  -0.3955   0.2962   0.1101  -0.2324  -0.2850        0   0.2322
 -0.1673  -0.3560  -0.2967  -0.2145   0.0168  -0.2125   0.4156        0   0.1994
 -0.0018  -0.3623  -0.4057  -0.3054   0.2049  -0.0253  -0.1254        0   0.2882
  0.2175   0.2178   0.2881  -0.2753   0.3064  -0.2498   0.0396        0   0.2838
  0.2988   0.2125  -0.1703  -0.2763   0.0664   0.3355   0.3013        0   0.2419
 -0.0925   0.1261   0.0131  -0.1414  -0.2865  -0.0449   0.0194        0   0.3025
  0.1155  -0.0438   0.2371  -0.1770  -0.1411  -0.1124  -0.3544        0   0.2352
 -0.1417  -0.1945   0.4589  -0.1722   0.1103   0.4231  -0.0804        0   0.2510
 -0.1596   0.0008  -0.0456   0.3492   0.6235   0.1066   0.1965        0   0.2136
  0.1387  -0.3441   0.0791   0.2388  -0.2305  -0.4801   0.0170        0   0.2442
        0        0        0        0        0        0        0   0.5000        0
        0        0        0        0        0        0        0   0.5000        0
        0        0        0        0        0        0        0   0.5000        0
        0        0        0        0        0        0        0   0.5000        0
```

Real World Applications

- Examples:
  - Trends
  - Things spread by word of mc
  - Finding a job
  - Disease Modeling