

Topic 1: Introduction to Data Mining

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Types of Data: Flat File Data

2.3	-1.5	...	-1.3
1.1	0.1	...	-0.1
...

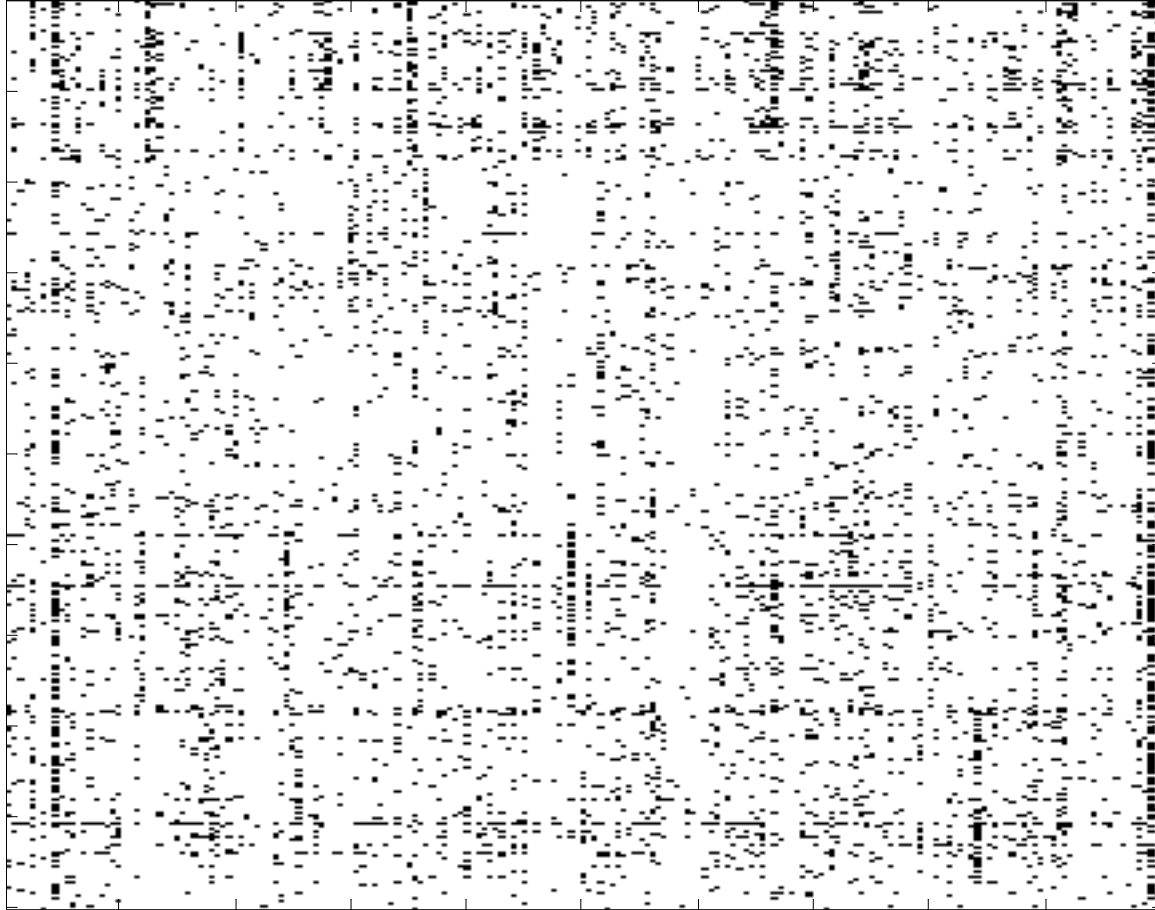
- Rows = objects
- Columns = measurements on objects
- Both n and p can be very large in data mining (also $p \gg n$)
- Matrix can be quite sparse

Types of Data: Text Data

Can be
represented as a
sparse matrix

Obama

Text
Documents



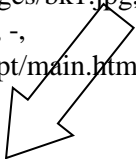
Word ID

Types of Data: Transactional Data

Date stamped events (logs, phone calls):

128.195.36.195, -, 3/22/00, 10:35:11, W3SVC, SRVR1, 128.200.39.181, 781, 363, 875, 200, 0, GET, /top.html, -,
128.195.36.195, -, 3/22/00, 10:35:16, W3SVC, SRVR1, 128.200.39.181, 5288, 524, 414, 200, 0, POST, /spt/main.html, -,
128.195.36.195, -, 3/22/00, 10:35:17, W3SVC, SRVR1, 128.200.39.181, 30, 280, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.195.36.101, -, 3/22/00, 16:18:50, W3SVC, SRVR1, 128.200.39.181, 60, 425, 72, 304, 0, GET, /top.html, -,
128.195.36.101, -, 3/22/00, 16:18:58, W3SVC, SRVR1, 128.200.39.181, 8322, 527, 414, 200, 0, POST, /spt/main.html, -,
128.195.36.101, -, 3/22/00, 16:18:59, W3SVC, SRVR1, 128.200.39.181, 0, 280, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:54:37, W3SVC, SRVR1, 128.200.39.181, 140, 199, 875, 200, 0, GET, /top.html, -,
128.200.39.17, -, 3/22/00, 20:54:55, W3SVC, SRVR1, 128.200.39.181, 17766, 365, 414, 200, 0, POST, /spt/main.html, -,
128.200.39.17, -, 3/22/00, 20:54:55, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:55:07, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:55:36, W3SVC, SRVR1, 128.200.39.181, 1061, 382, 414, 200, 0, POST, /spt/main.html, -,
128.200.39.17, -, 3/22/00, 20:55:36, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:55:39, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:56:03, W3SVC, SRVR1, 128.200.39.181, 1081, 382, 414, 200, 0, POST, /spt/main.html, -,
128.200.39.17, -, 3/22/00, 20:56:04, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:56:33, W3SVC, SRVR1, 128.200.39.181, 0, 262, 72, 304, 0, GET, /top.html, -,
128.200.39.17, -, 3/22/00, 20:56:52, W3SVC, SRVR1, 128.200.39.181, 19598, 382, 414, 200, 0, POST, /spt/main.html, -,

Can be represented as a time series:



User 1	2	3	2	2	3	3	3	1	1	1	3	1	3	3	3	3
User 2	3	3	3	1	1	1										
User 3	7	7	7	7	7	7	7	7								
User 4	1	5	1	1	1	5	1	5	1	1	1	1	1	1		
User 5	5	1	1	5												
...																

Types of Data: Relational Data

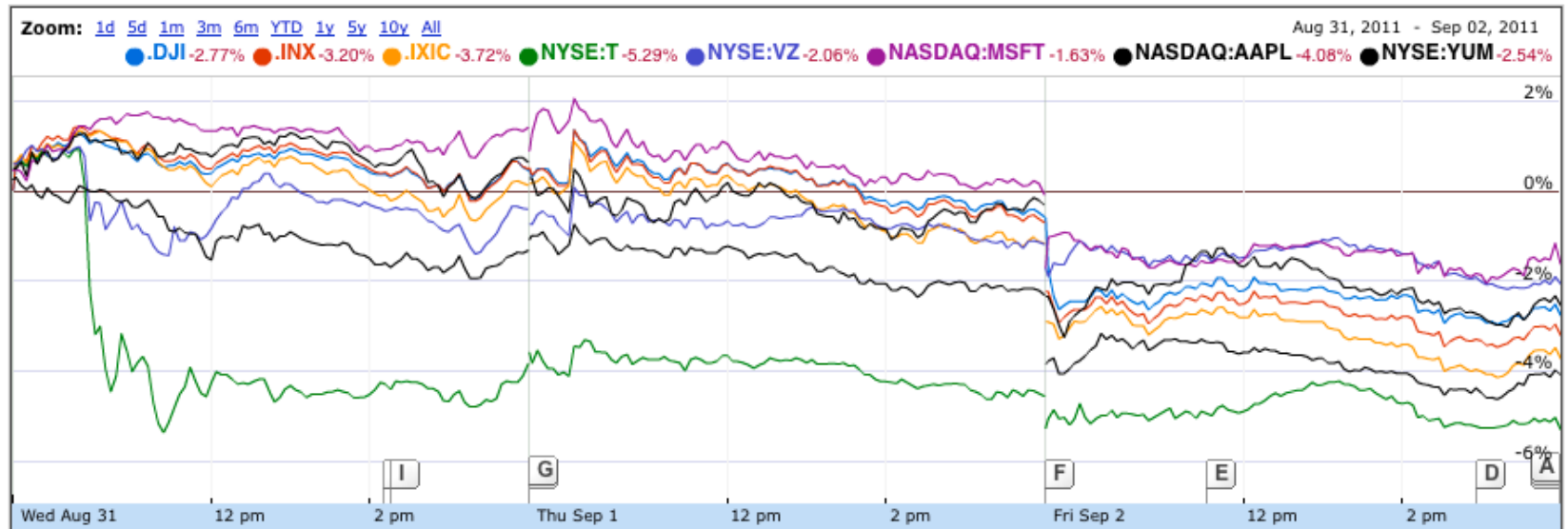
128.200.39.17, -, 3/22/00, 20:55:07, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.200.39.17, -, 3/22/00, 20:55:36, W3SVC, SRVR1, 128.200.39.181, 1061, 382, 414, 200, 0, POST, /spt/main.html, -,
128.200.39.17, -, 3/22/00, 20:55:36, W3SVC, SRVR1, 128.200.39.181, 0, 258, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
128.195.36.195, -, 3/22/00, 10:35:11, W3SVC, SRVR1, 128.200.39.181, 781, 363, 875, 200, 0, GET, /top.html, -,
128.195.36.195, -, 3/22/00, 10:35:16, W3SVC, SRVR1, 128.200.39.181, 5288, 524, 414, 200, 0, POST, /spt/main.html, -,
128.195.36.195, -, 3/22/00, 10:35:17, W3SVC, SRVR1, 128.200.39.181, 30, 280, 111, 404, 3, GET, /spt/images/bk1.jpg, -,
...

128.195.36.195, Doe, John, 12 Main St, 973-462-3421, Madison, NJ, **07932**
114.12.12.25, Trank, Jill, 11 Elm St, 998-555-5675, Chester, NJ, 07911
...

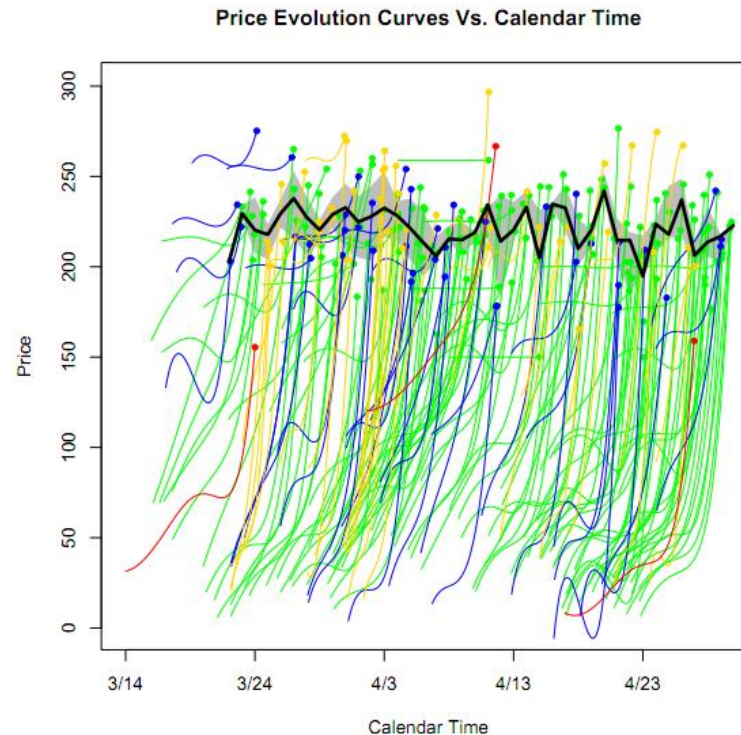
07911, Chester, NJ, 07954, 34000, , 40.65, -74.12
07932, Madison, NJ, 56000, 40.642, -74.132
...

- Most large data sets are stored in relational data sets
- Special data query language: SQL

Types of Data: Time Series Data



Types of Data: Time Series Data



Jank, Shmueli, et al (2005)

Fig. 10. Rug Plot displaying the price evolution (y-axis) of 217 online auctions over calendar time (x-axis) during a 3-month period. The colored lines show the price path of each auction with color indicating auction length (yellow = 3-day; blue=5-day; green = 7-day; red = 10-day). The dot at the end of each line indicates the final price of the auction. The black line represents the average of the daily closing price, and the gray band is the inter-quartile range.

Types of Data: Image Data



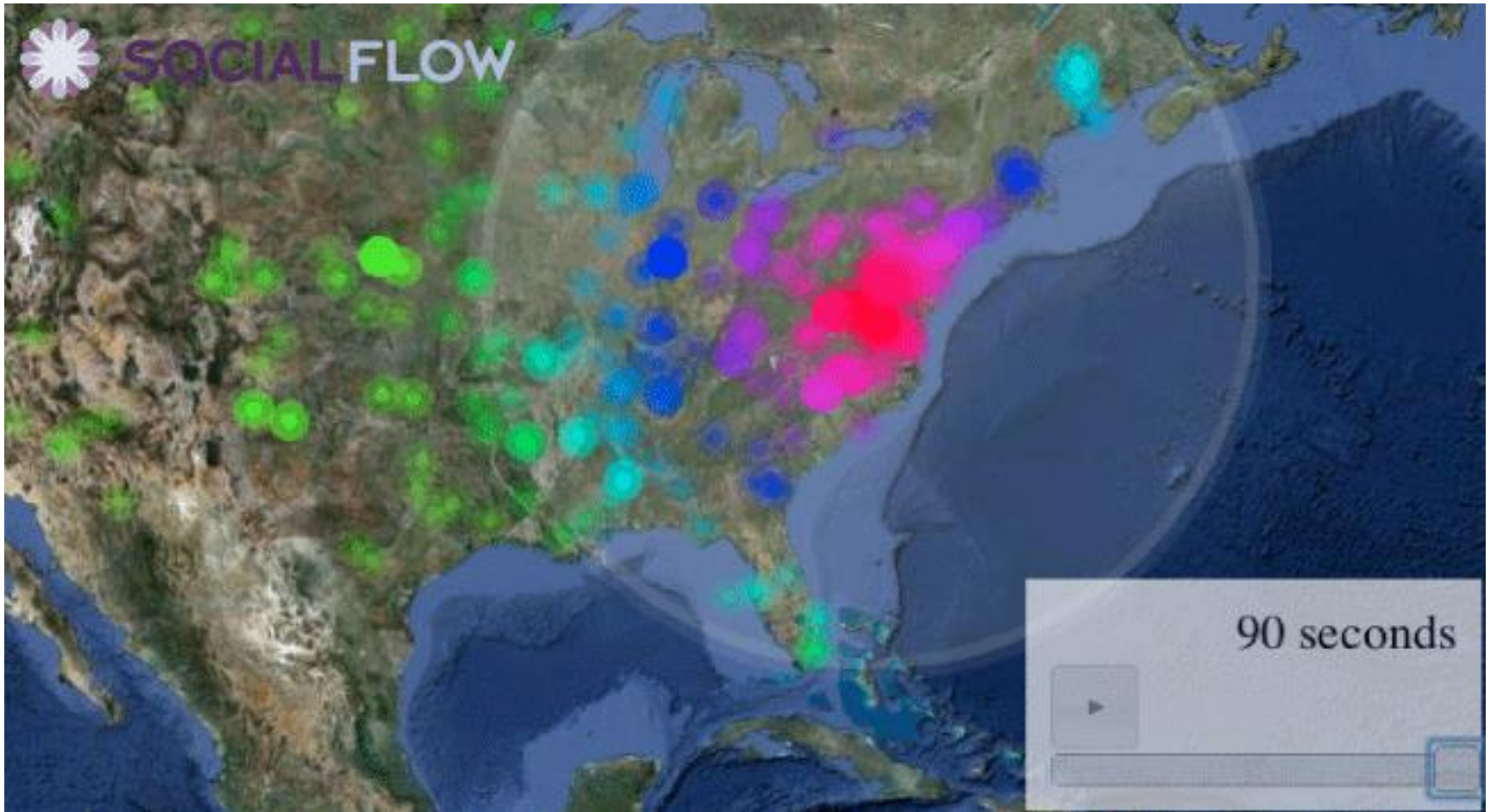
Types of Data: Spatio-Temporal Data



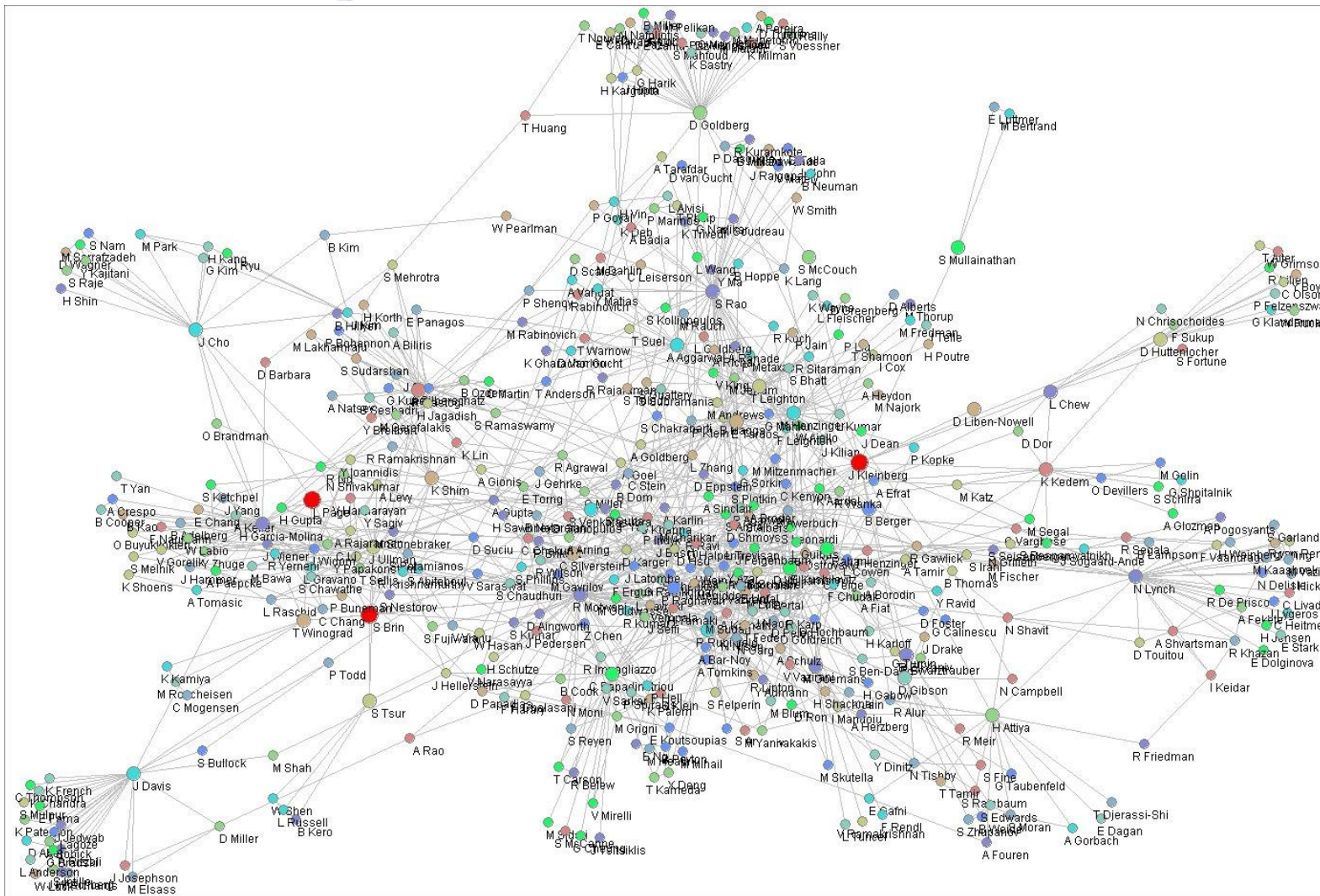
@b_mc817

Glendaaaaa

Omg earthquake!!!



Types of Data: Network Data



Algorithms for estimating relative importance in networks
S. White and P. Smyth, *ACM SIGKDD*, 2003.