MIT esd

Simple Network Analysis with UCINET

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Agenda

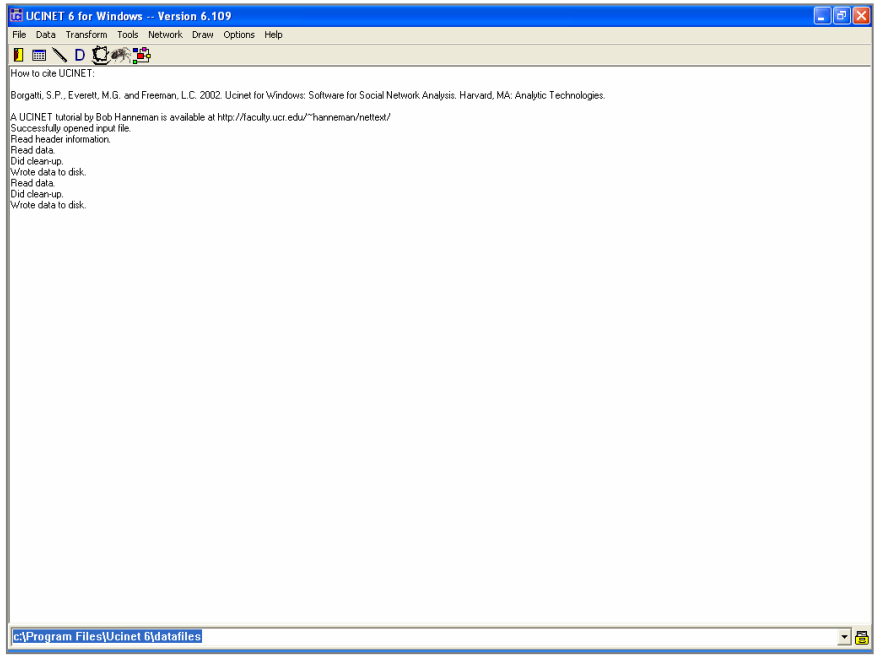
- UCINET Basics
- The UCINET Environment
- A Quick Demo
- Import Data
- Export Data
- Data Processing
- Tips of Using UCINET

UCINET Basics

- Official User's Guide of UCINET
  - http://www.analytictech.com/Ucinet_Guide.doc
- Official UCINET Tutorial
  - http://faculty.ucr.edu/~hanneman/nettext/
- Help in UCINET
  - Help > Help Topics
    - Contents: Introduction Section, DL, and Standard Datasets.
    - Index: search by keywords.

The UCINET Environment (I)

- Main window
  - **File, Data, Transform, Tools, Network, Options, and Help**.

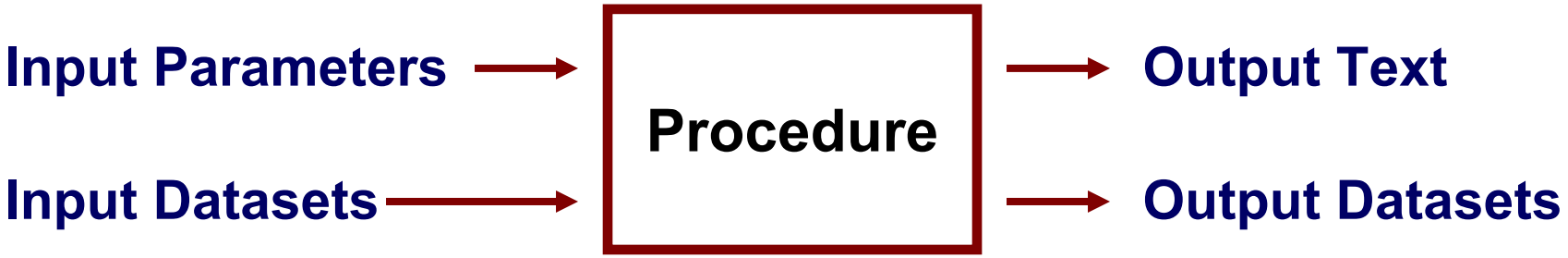


The UCINET Environment (II)

- The UCINET dataset
  - One dataset consists of Two files.
  - File with extension ##D: actual data.
  - File with ext. ##H: information about the data.
  - In referring to a dataset, refer to the .##H file.

The UCINET Environment (III)

- A typical UCINET procedure

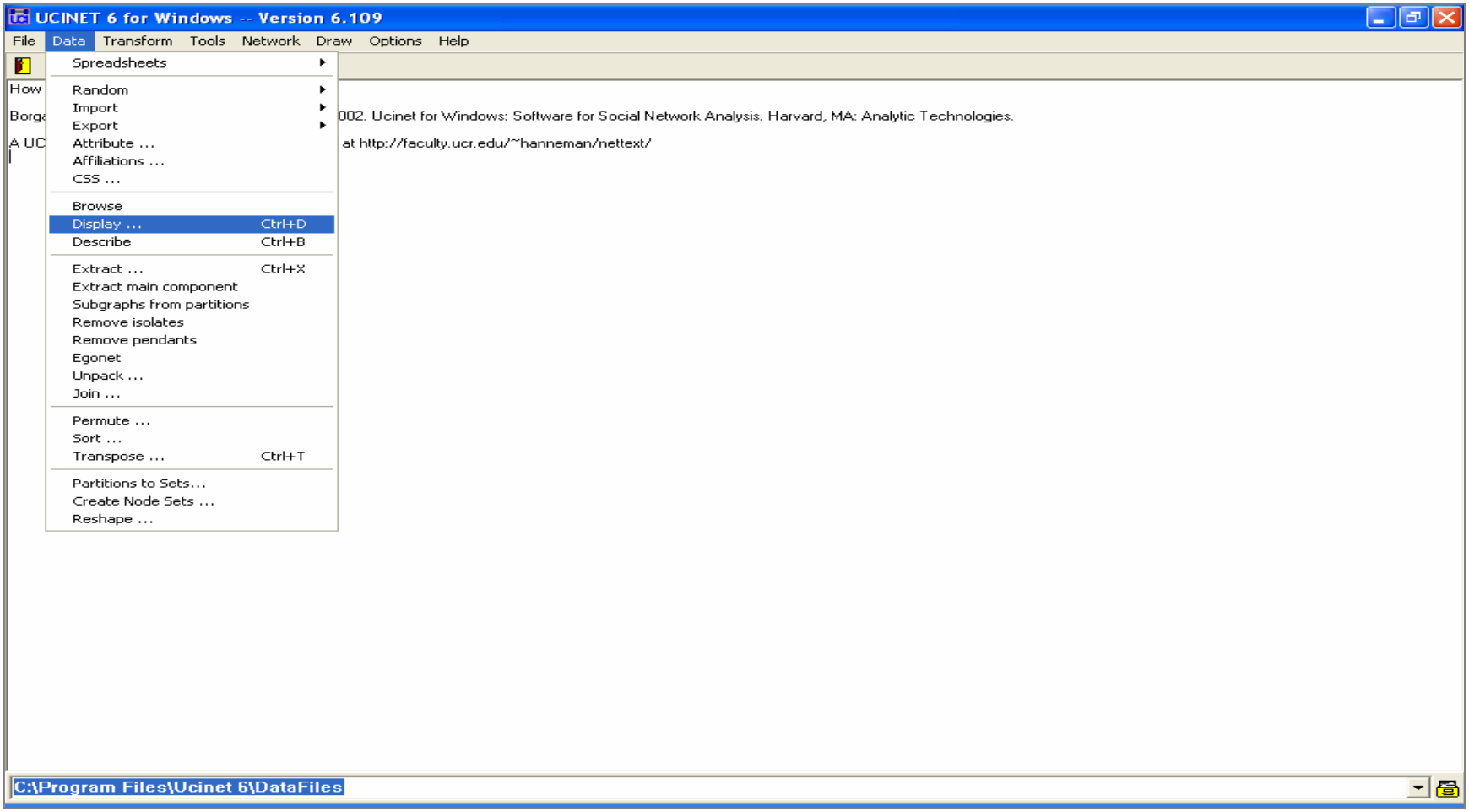


- Output text in Log Files
  - **File>View Previous Output…**

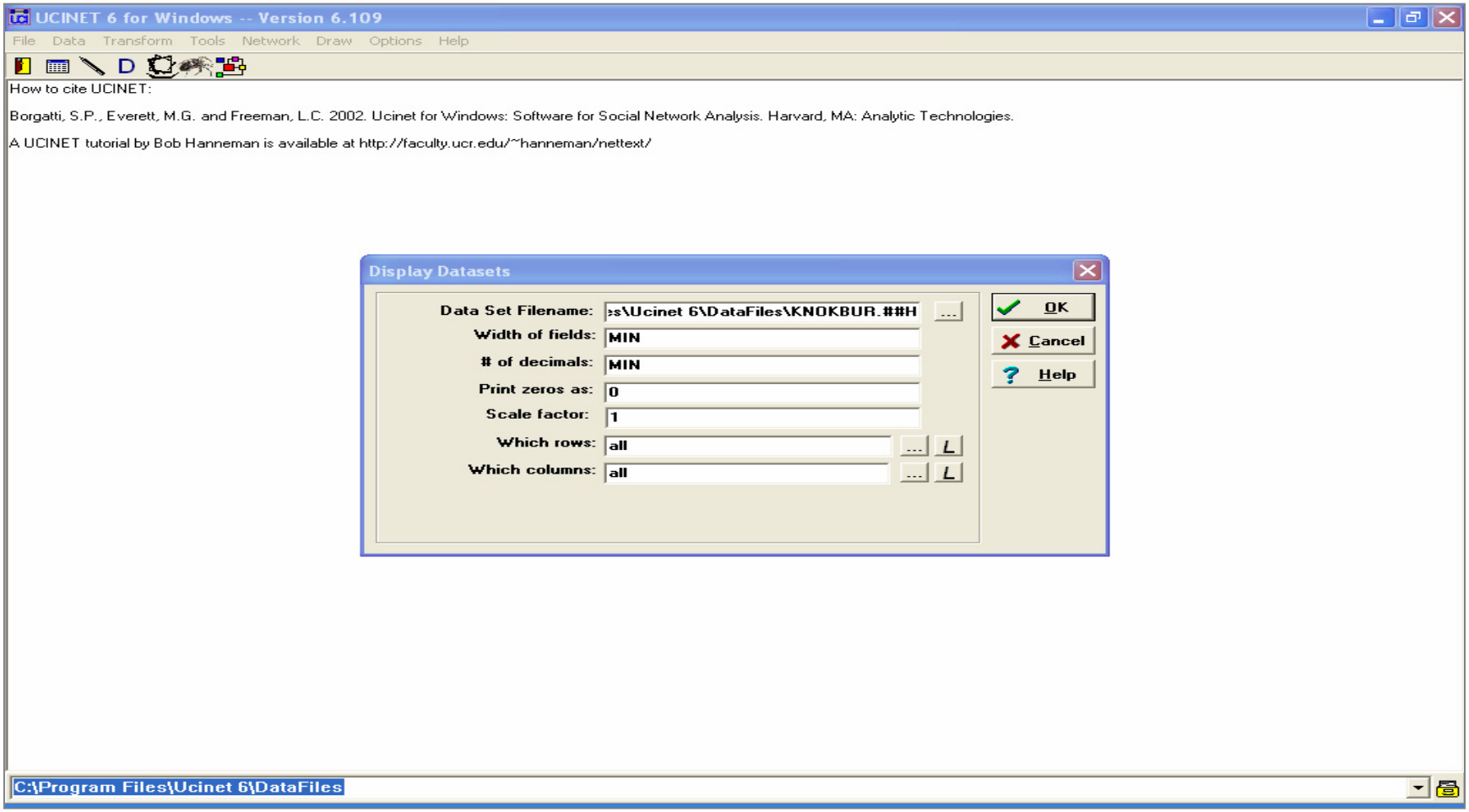
A Quick Demo

- Dataset: KNOKBUR (.##H & .##D)
- 10 organizations and two relationships.
  - Directed graph.
  - Money exchange in one matrix, and information exchange in the other.
  - See Knoke & Kuklinski (1982) for details.

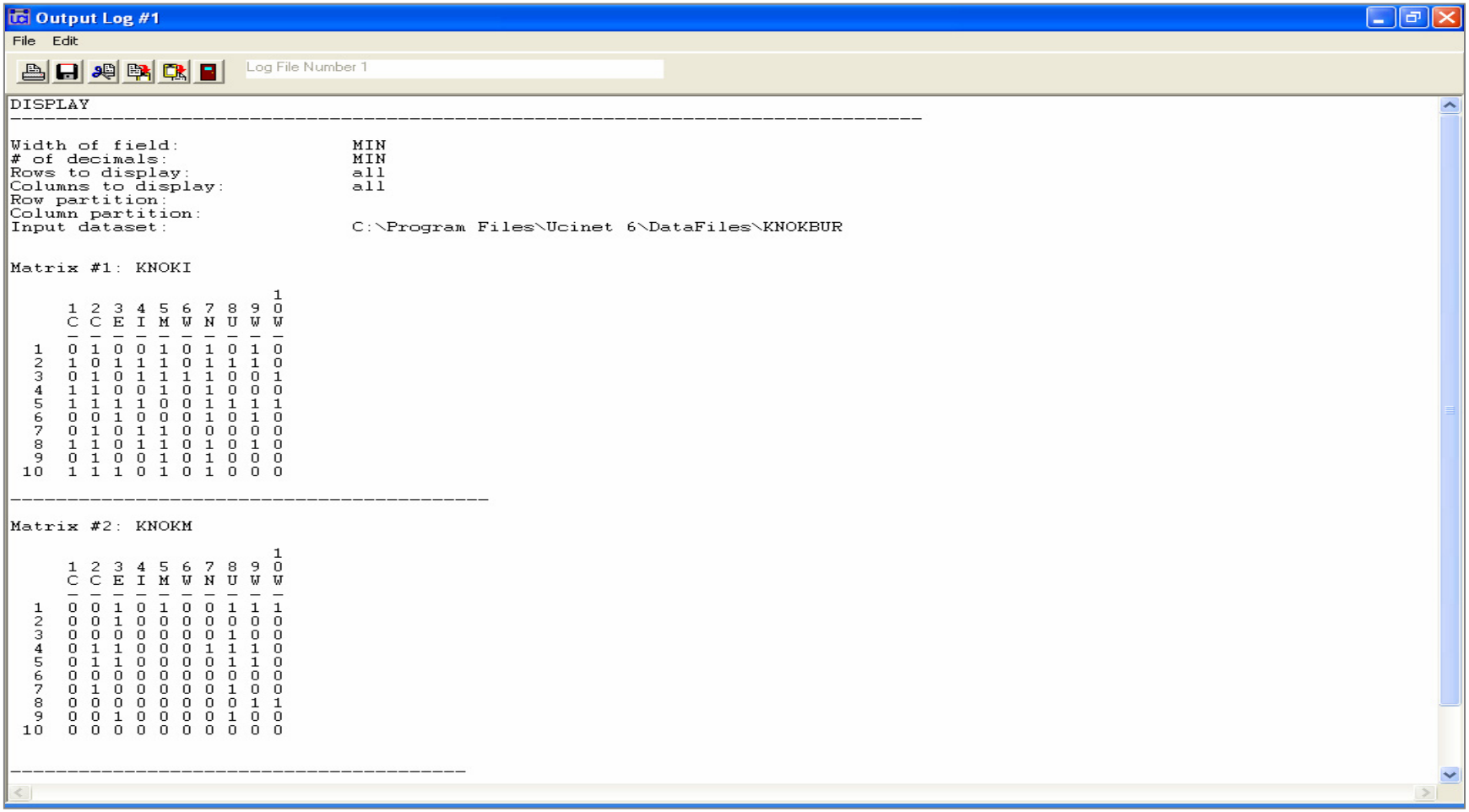
Main window: Data>Display…



Data Set Filename: KNOKBUR.##H



Output log #1

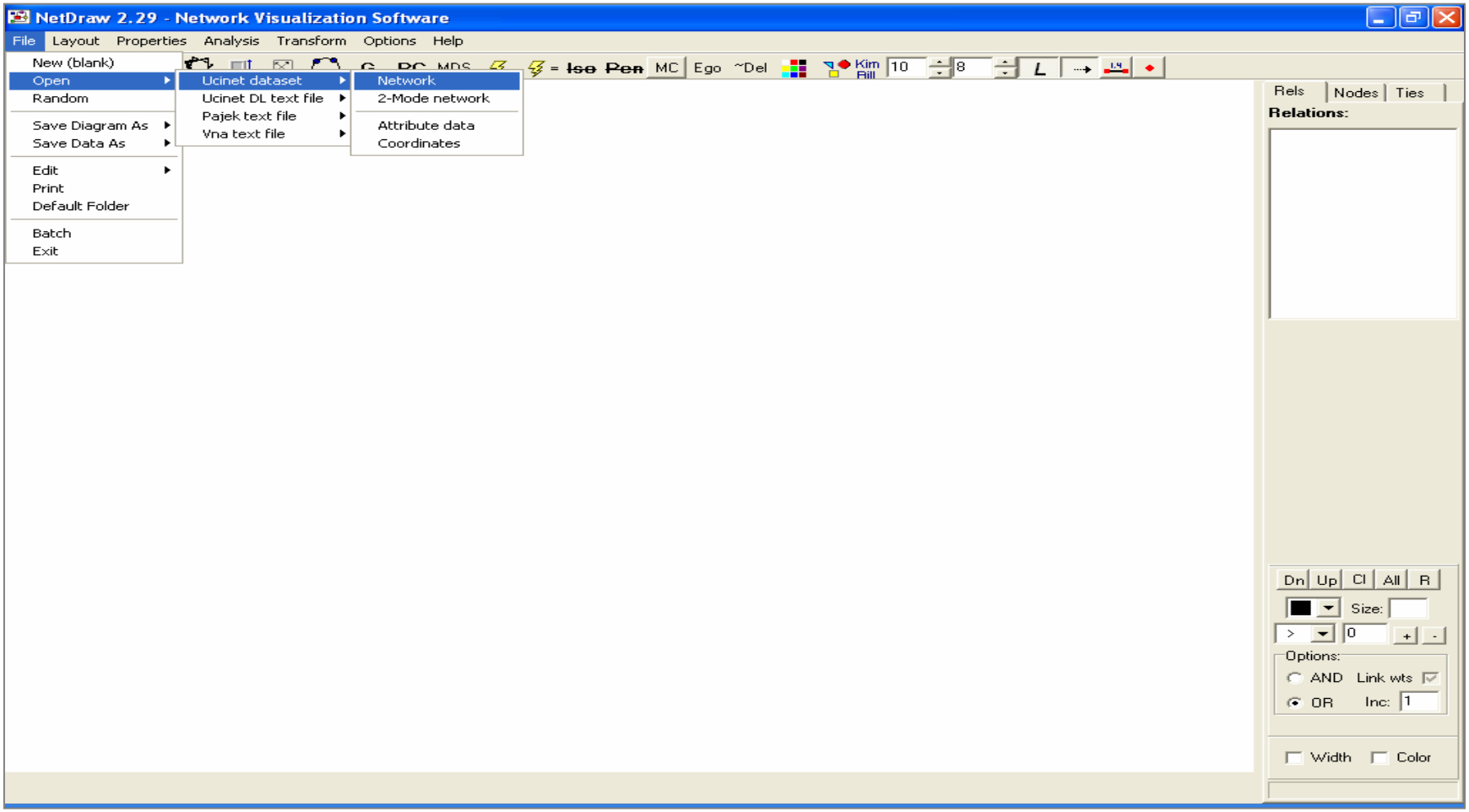

Output Log #1

File Edit

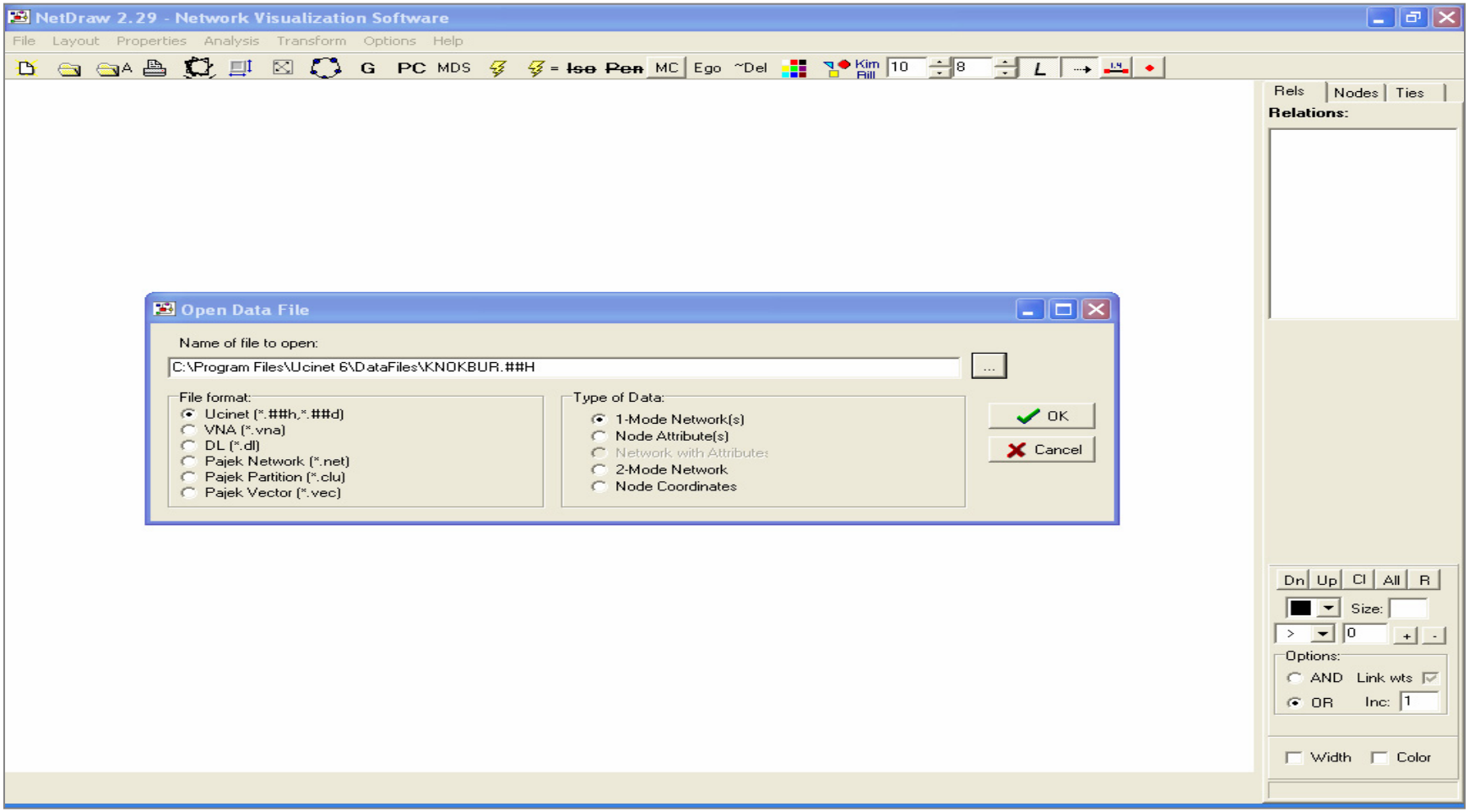
Log File Number 1

```
DISPLAY
------------------------------------------------------------------------------

Width of field:                 MIN
# of decimals:                  MIN
Rows to display:                all
Columns to display:             all
Row partition:
Column partition:
Input dataset:                  C:\Program Files\Ucinet 6\DataFiles\KNOKBUR


Matrix #1: KNOKI

                                1
     1  2  3  4  5  6  7  8  9  0
     C  C  E  I  M  W  N  U  W  W
     -  -  -  -  -  -  -  -  -  -
  1  0  1  0  0  1  0  1  0  1  0
  2  1  0  1  1  1  0  1  1  1  0
  3  0  1  0  1  1  1  1  0  0  1
  4  1  1  0  0  1  0  1  0  0  0
  5  1  1  1  1  1  0  0  1  1  1
  6  0  0  1  0  0  0  1  0  1  0
  7  0  1  0  1  1  0  0  0  0  0
  8  1  1  0  1  1  0  1  0  1  0
  9  0  1  0  0  1  0  1  0  0  0
 10  1  1  1  0  1  0  1  0  0  0

-----------------------------------------------

Matrix #2: KNOKM

                                1
     1  2  3  4  5  6  7  8  9  0
     C  C  E  I  M  W  N  U  W  W
     -  -  -  -  -  -  -  -  -  -
  1  0  0  1  0  1  0  0  1  1  1
  2  0  0  1  0  0  0  0  0  0  0
  3  0  0  0  0  0  0  0  1  0  0
  4  0  1  1  0  0  0  1  1  1  0
  5  0  1  1  0  0  0  0  1  1  0
  6  0  0  0  0  0  0  0  0  0  0
  7  0  1  0  0  0  0  0  1  0  0
  8  0  0  0  0  0  0  0  0  1  1
  9  0  0  1  0  0  0  0  1  0  0
 10  0  0  0  0  0  0  0  0  0  0


-------------------------------------------
```

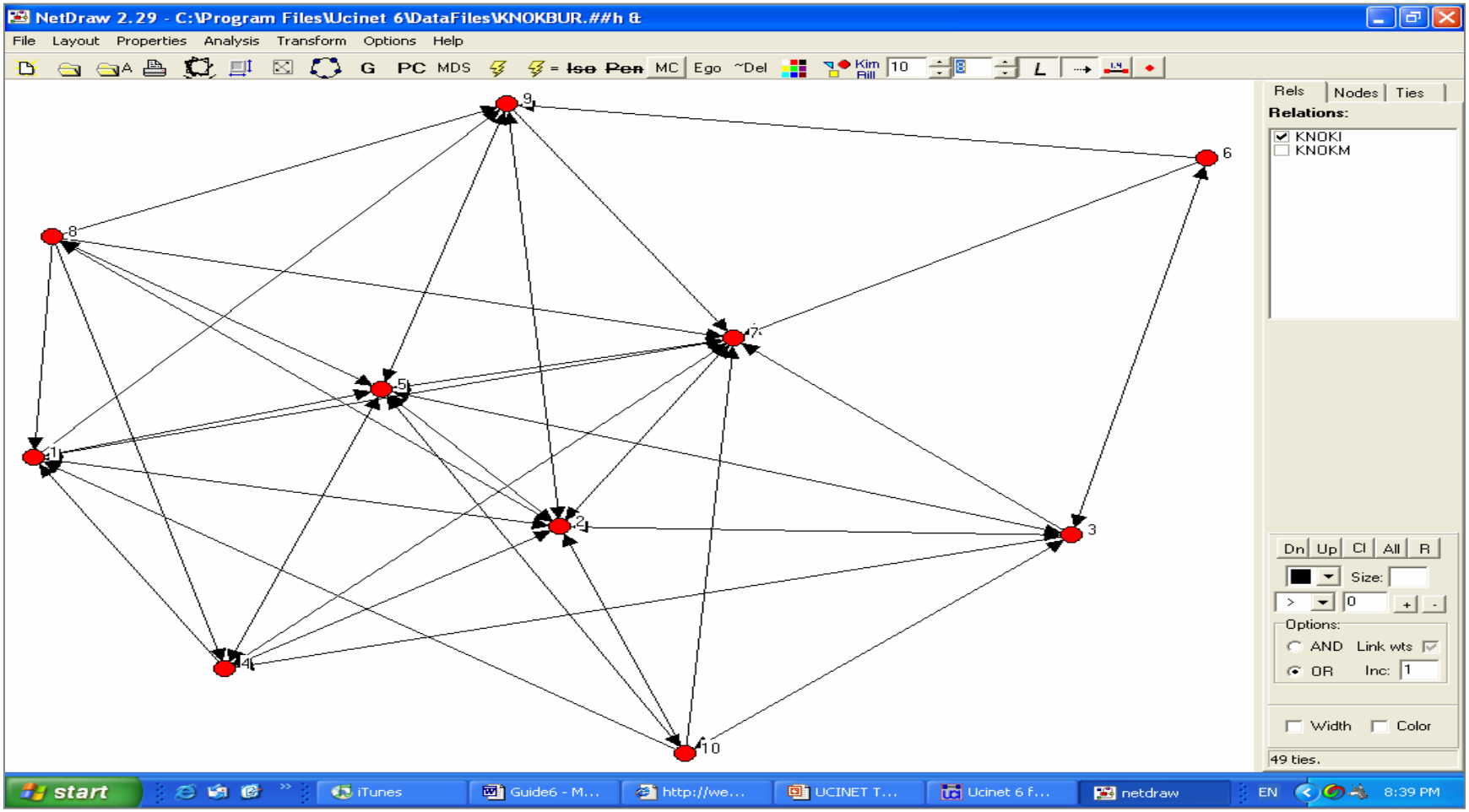
Main window: Draw
File>Open>Ucinet dataset>Network



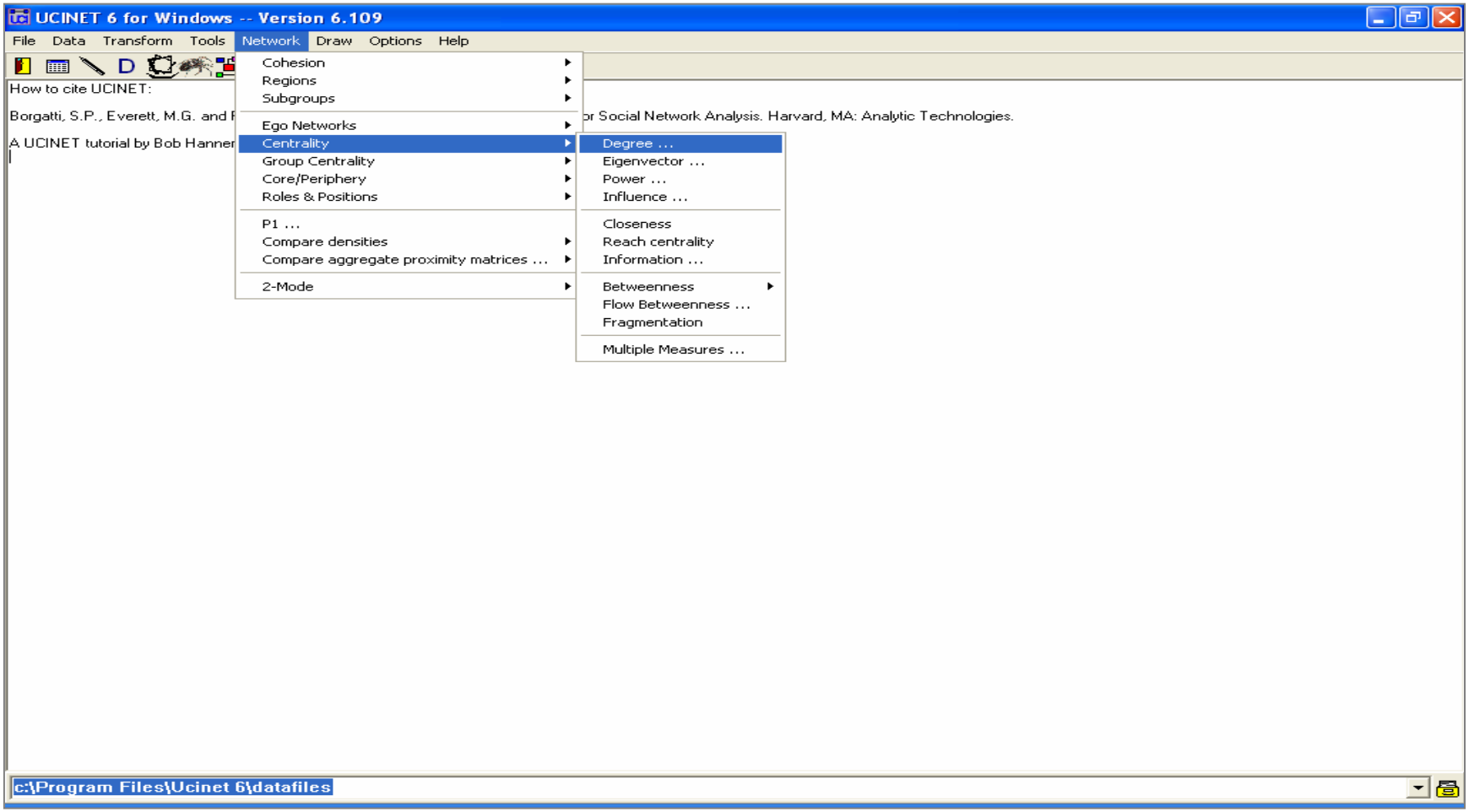
Name of file to open: KNOKBUR.##H



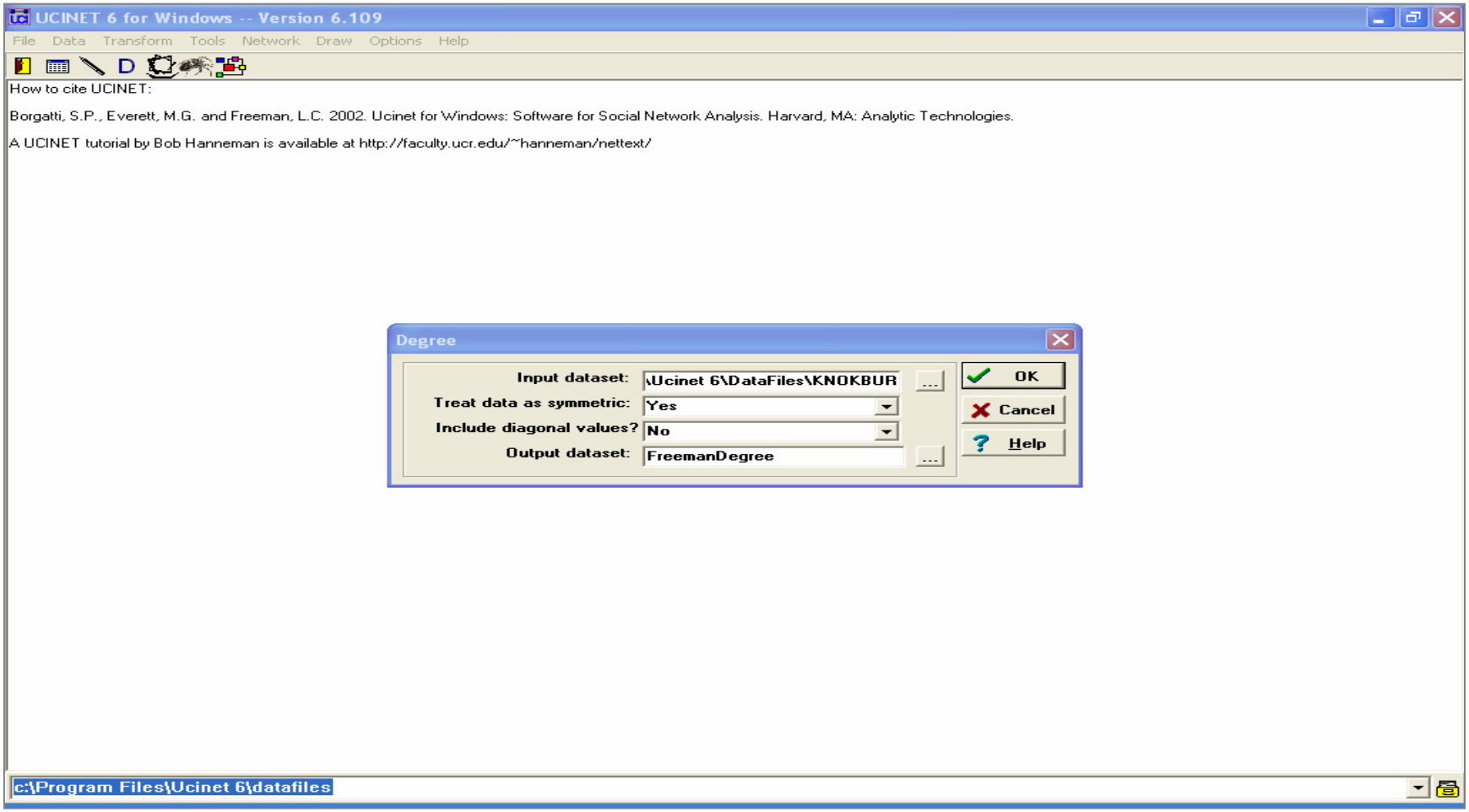
Graph representation of the network



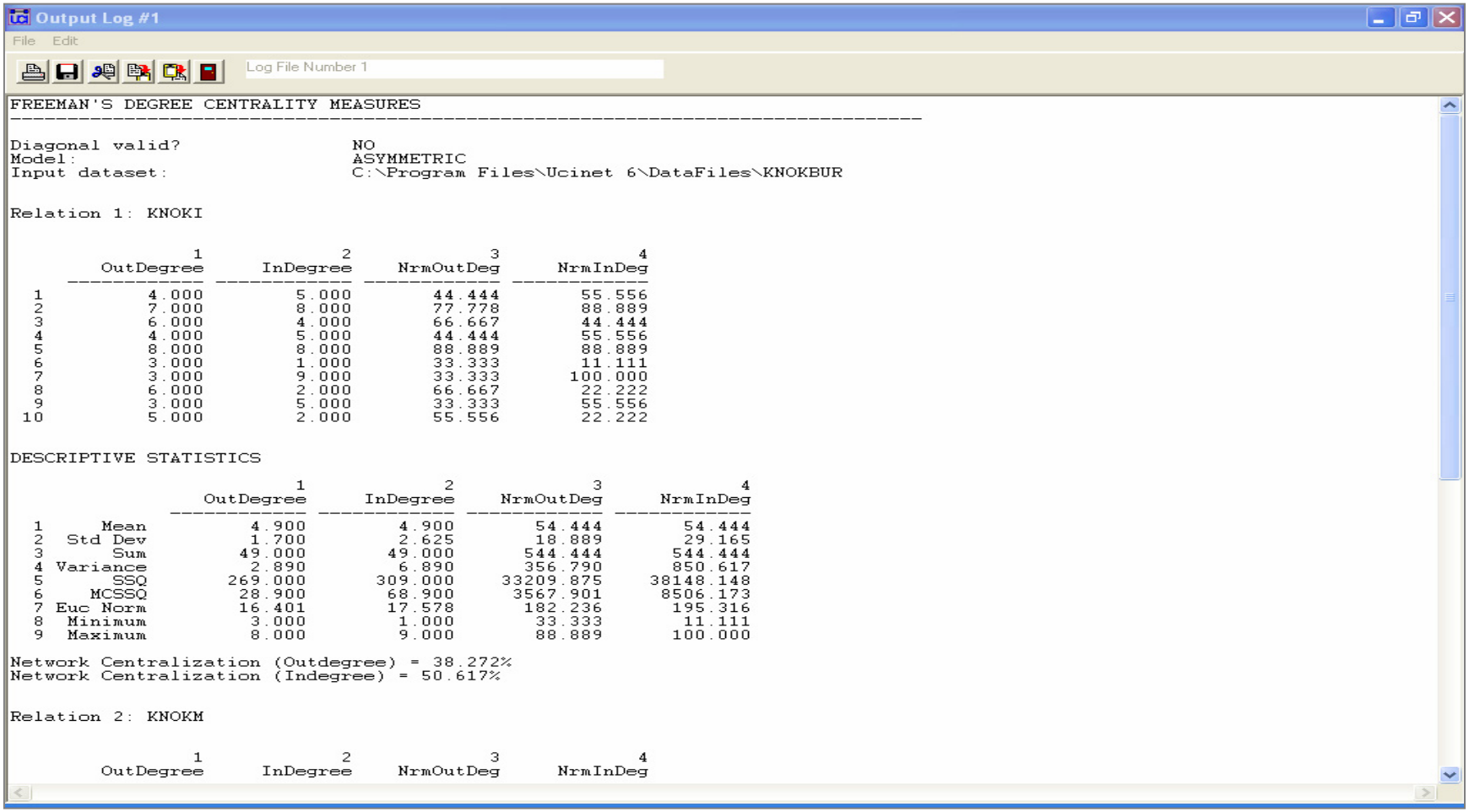
Main window: Network>Centrality>Degree…



Input dataset: KNOKBUR.##H



Output log #2



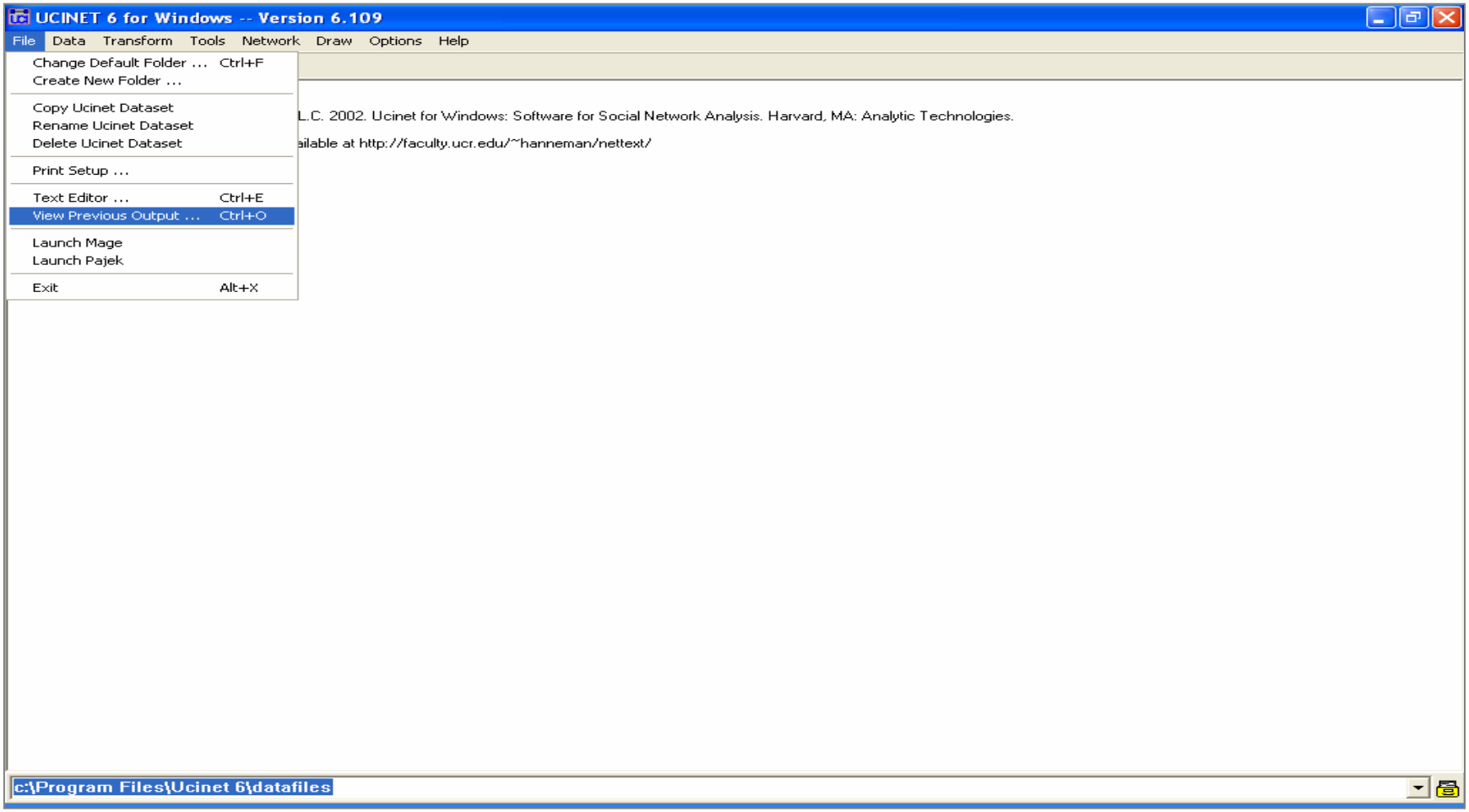
Output Log #1

File Edit

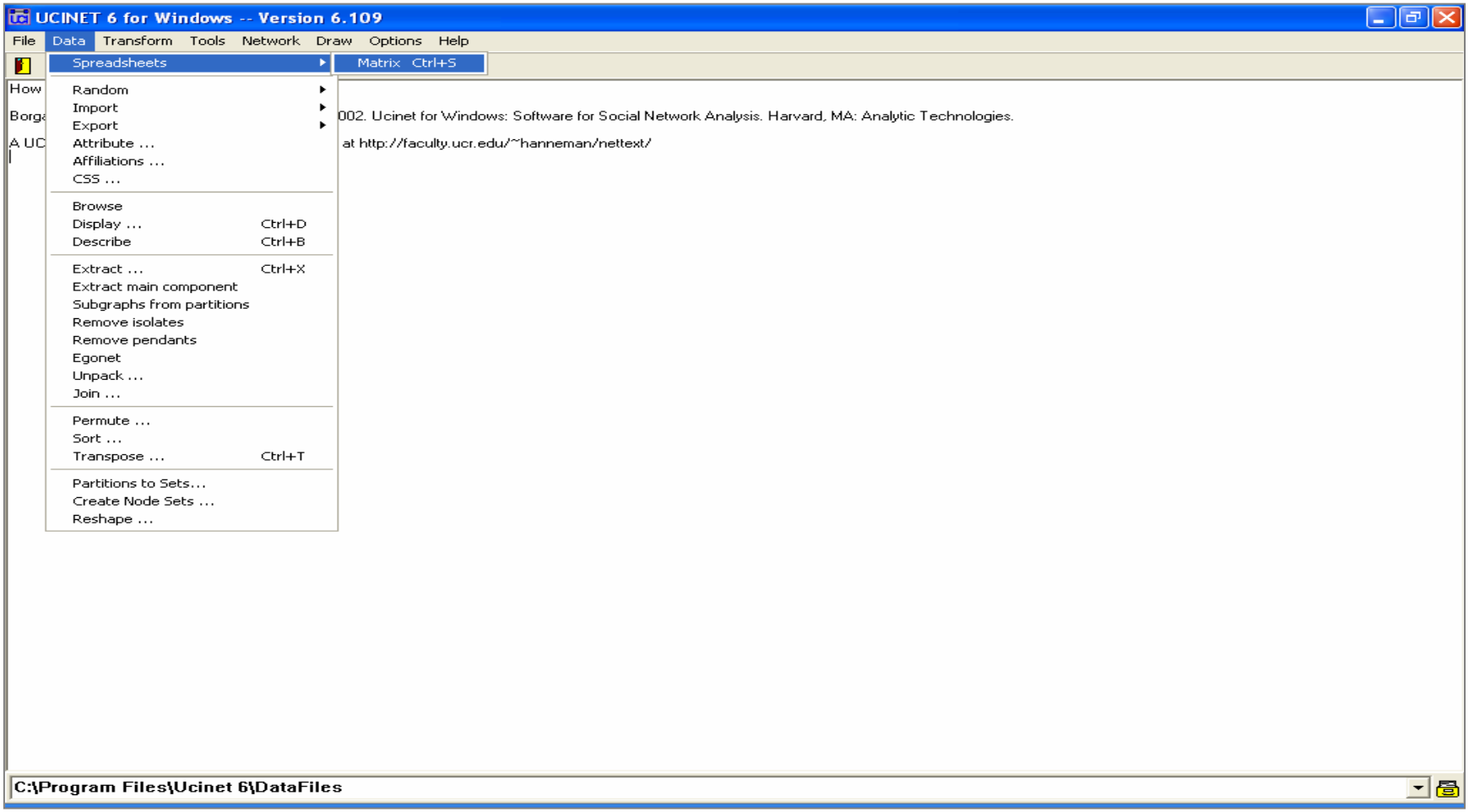
Log File Number 1

```
FREEMAN'S DEGREE CENTRALITY MEASURES
------------------------------------------------------------------------------

Diagonal valid?                 NO
Model:                          ASYMMETRIC
Input dataset:                  C:\Program Files\Ucinet 6\DataFiles\KNOKBUR

Relation 1: KNOKI

                1           2           3           4
        OutDegree   InDegree    NrmOutDeg   NrmInDeg
     ------------ ----------- ----------- -----------
  1        4.000       5.000      44.444      55.556
  2        7.000       8.000      77.778      88.889
  3        6.000       4.000      66.667      44.444
  4        4.000       5.000      44.444      55.556
  5        8.000       8.000      88.889      88.889
  6        3.000       1.000      33.333      11.111
  7        3.000       9.000      33.333     100.000
  8        6.000       2.000      66.667      22.222
  9        3.000       5.000      33.333      55.556
 10        5.000       2.000      55.556      22.222

DESCRIPTIVE STATISTICS

                    1           2           3           4
                OutDegree   InDegree    NrmOutDeg   NrmInDeg
               ----------- ----------- ----------- -----------
  1      Mean       4.900       4.900      54.444      54.444
  2   Std Dev       1.700       2.625      18.889      29.165
  3       Sum      49.000      49.000     544.444     544.444
  4  Variance       2.890       6.890     356.790     850.617
  5       SSQ     269.000     309.000   33209.875   38148.148
  6     MCSSQ      28.900      68.900    3567.901    8506.173
  7  Euc Norm      16.401      17.578     182.236     195.316
  8   Minimum       3.000       1.000      33.333      11.111
  9   Maximum       8.000       9.000      88.889     100.000

Network Centralization (Outdegree) = 38.272%
Network Centralization (Indegree) = 50.617%

Relation 2: KNOKM

                1           2           3           4
        OutDegree   InDegree    NrmOutDeg   NrmInDeg
```

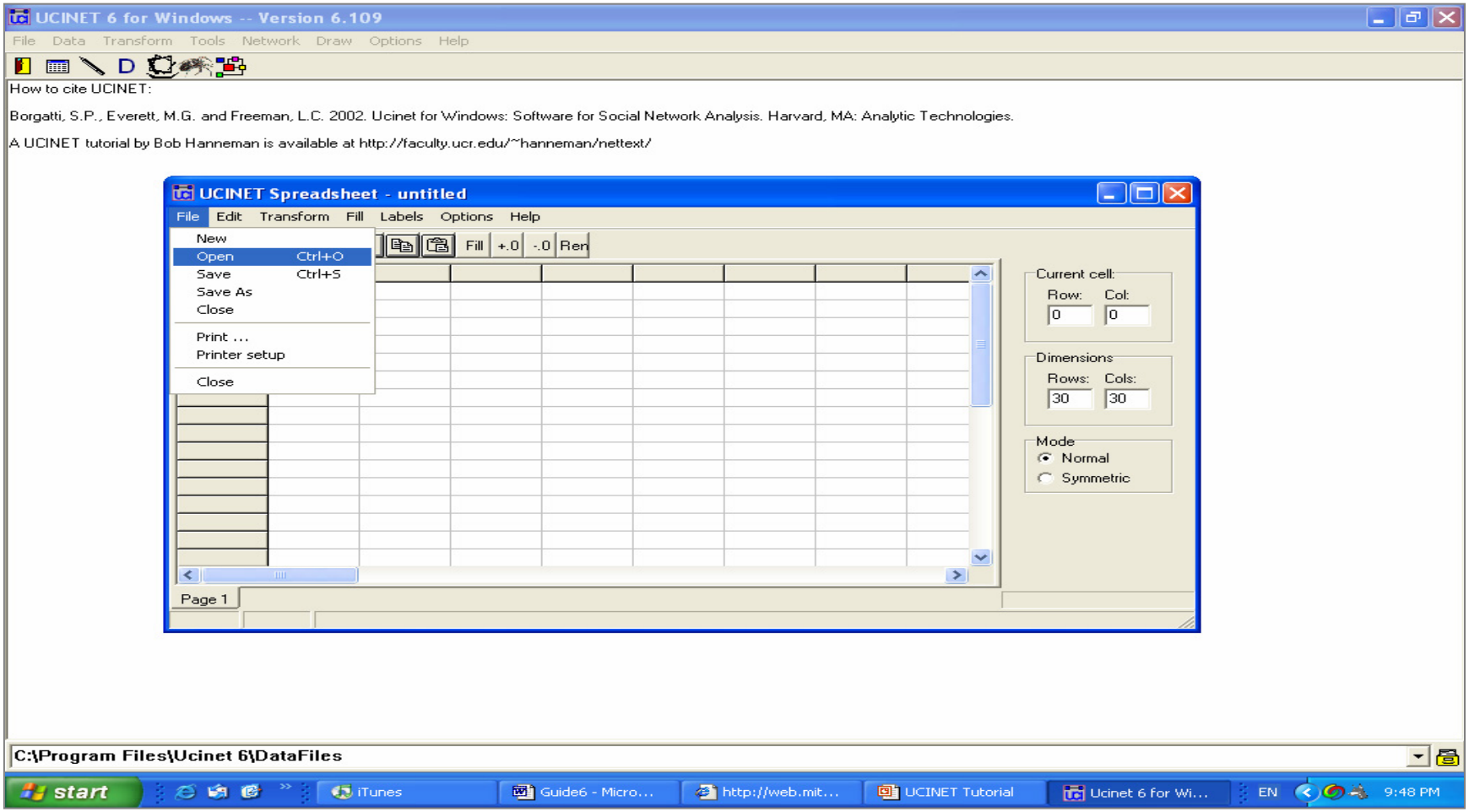
Main window:
File>View Previous Output…



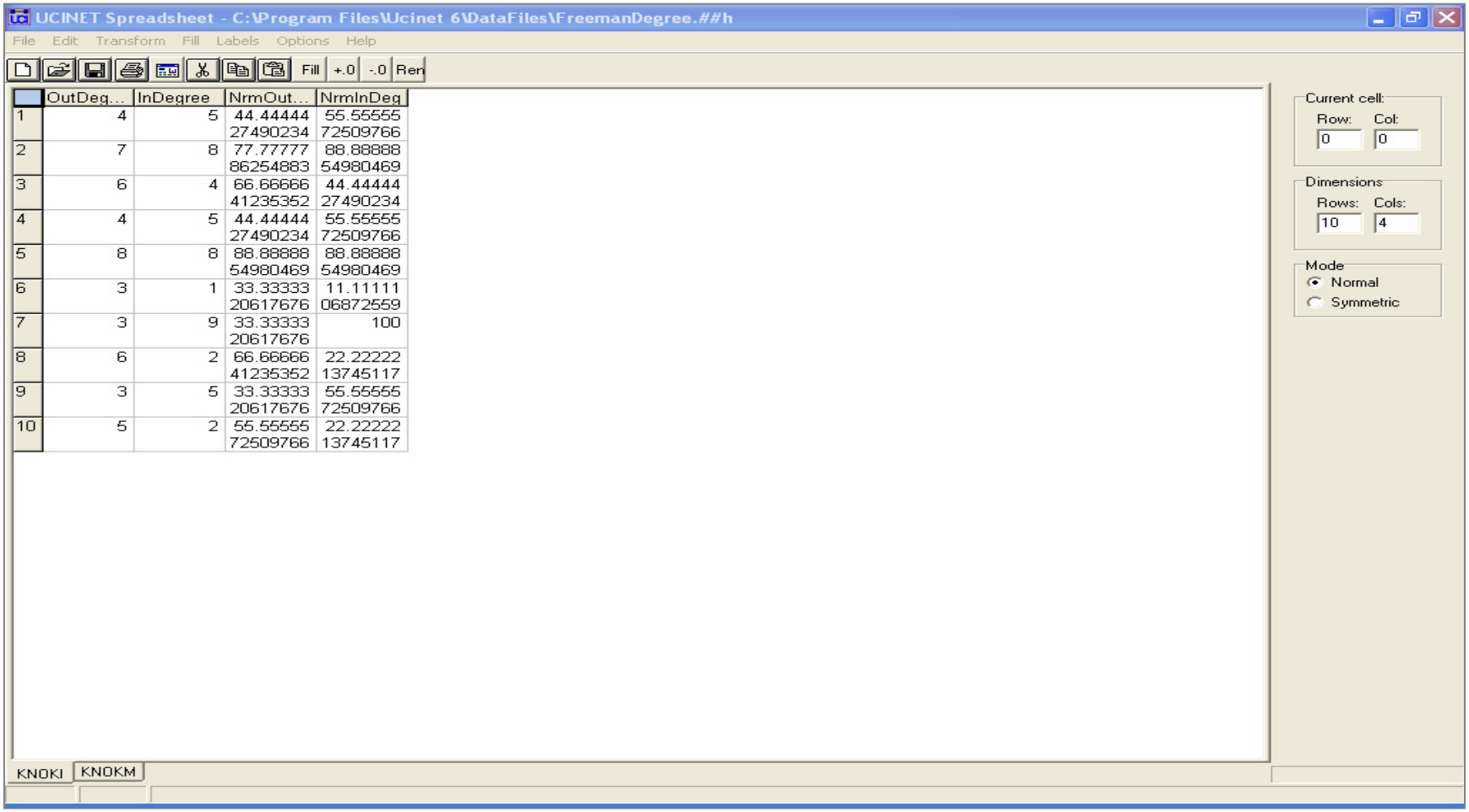
Main window: Data>Spreadsheets>Matrix



UCINET Spreadsheet: File>Open>FreemanDegree.##h



Spreadsheet of FreemanDegree.##h

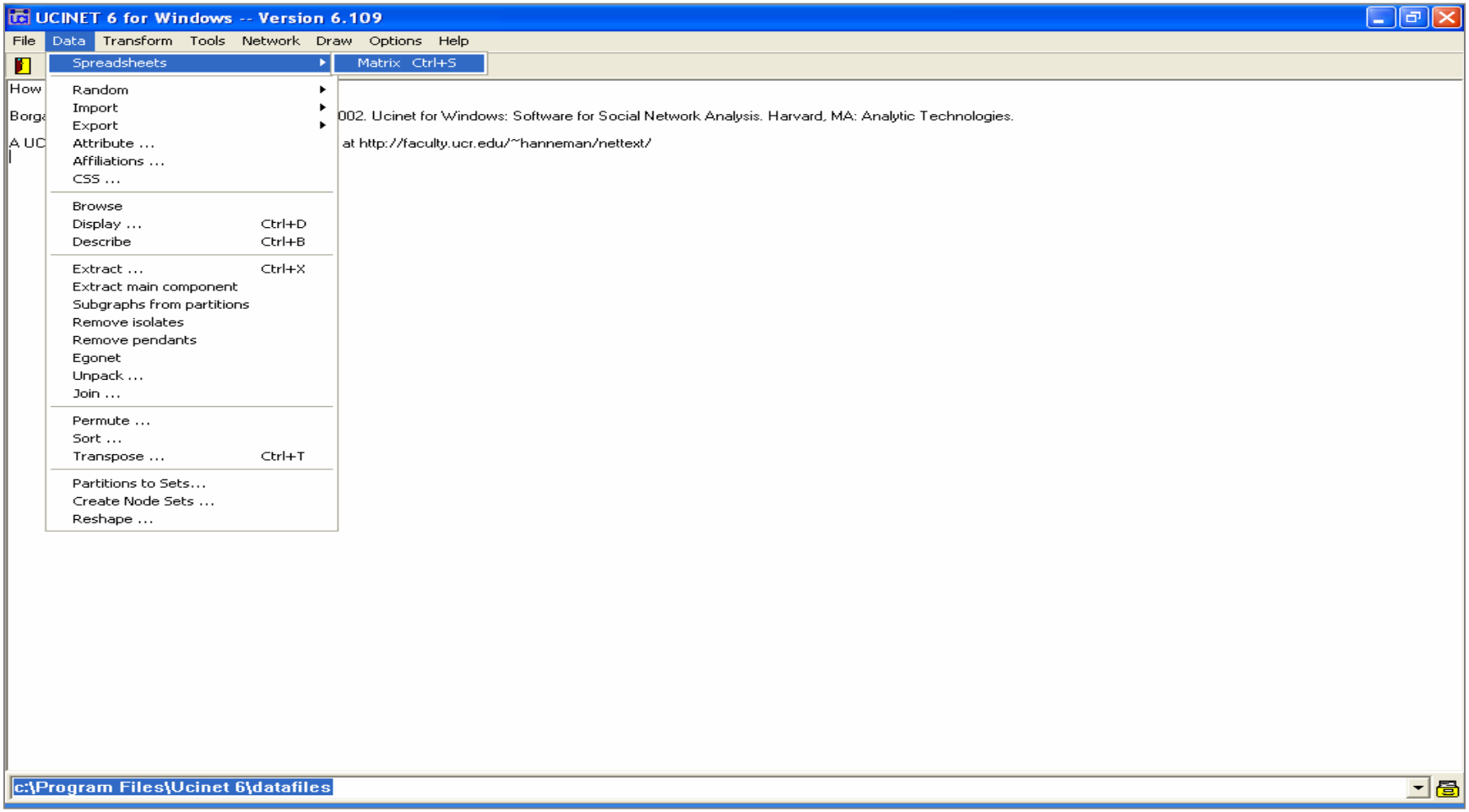


	OutDeg...	InDegree	NrmOut...	NrmInDeg
1	4	5	44.44444 27490234	55.55555 72509766
2	7	8	77.77777 86254883	88.88888 54980469
3	6	4	66.66666 41235352	44.44444 27490234
4	4	5	44.44444 27490234	55.55555 72509766
5	8	8	88.88888 54980469	88.88888 54980469
6	3	1	33.33333 20617676	11.11111 06872559
7	3	9	33.33333 20617676	100
8	6	2	66.66666 41235352	22.22222 13745117
9	3	5	33.33333 20617676	55.55555 72509766
10	5	2	55.55555 72509766	22.22222 13745117

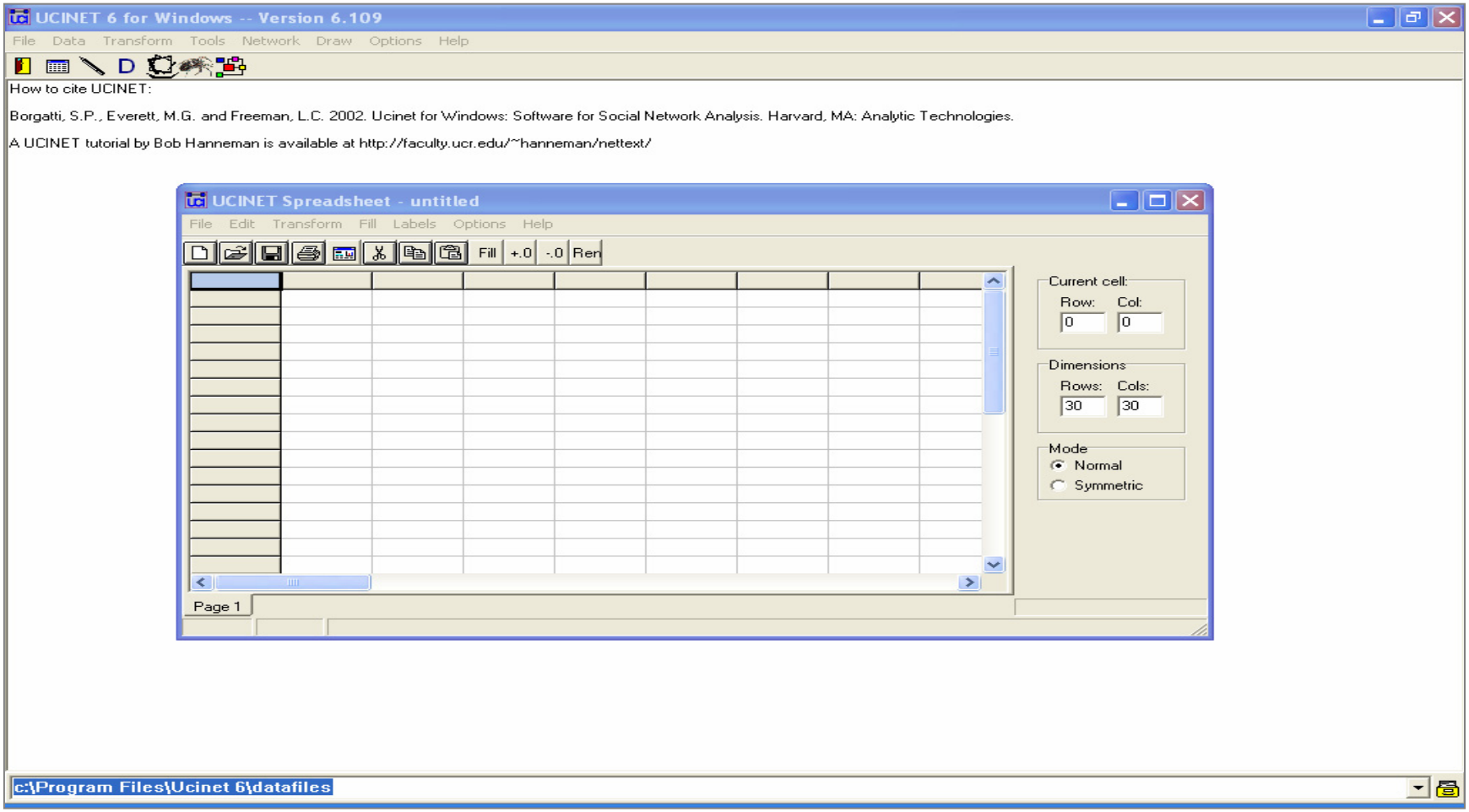
Import Data

- UCINET spreadsheet
  - Adjacency matrix
  - Manually input data or *cut and paste* from elsewhere
- From Excel file
- DL format
  - Full matrix & rectangular matrix
  - Multiple matrices
  - nodelist1 & nodelist2
  - ranklist1
  - edgelist1 & edgelist2
- More information about DL language
  - Main window: Help>Help Topics>Contents>DL

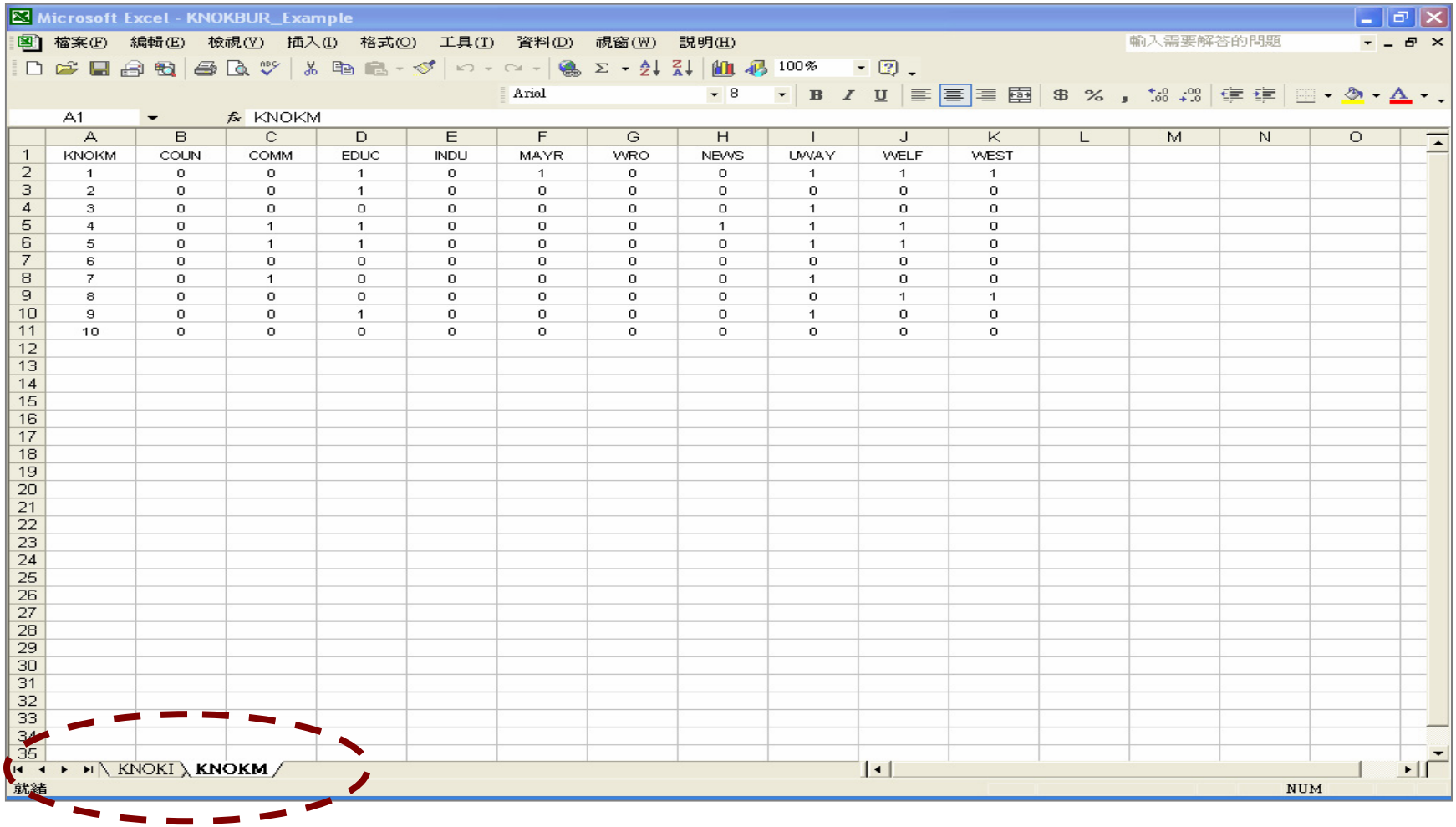
UCINET spreadsheet Data>Spreadsheets>Matrix



Manually Input Adjacency Matrix

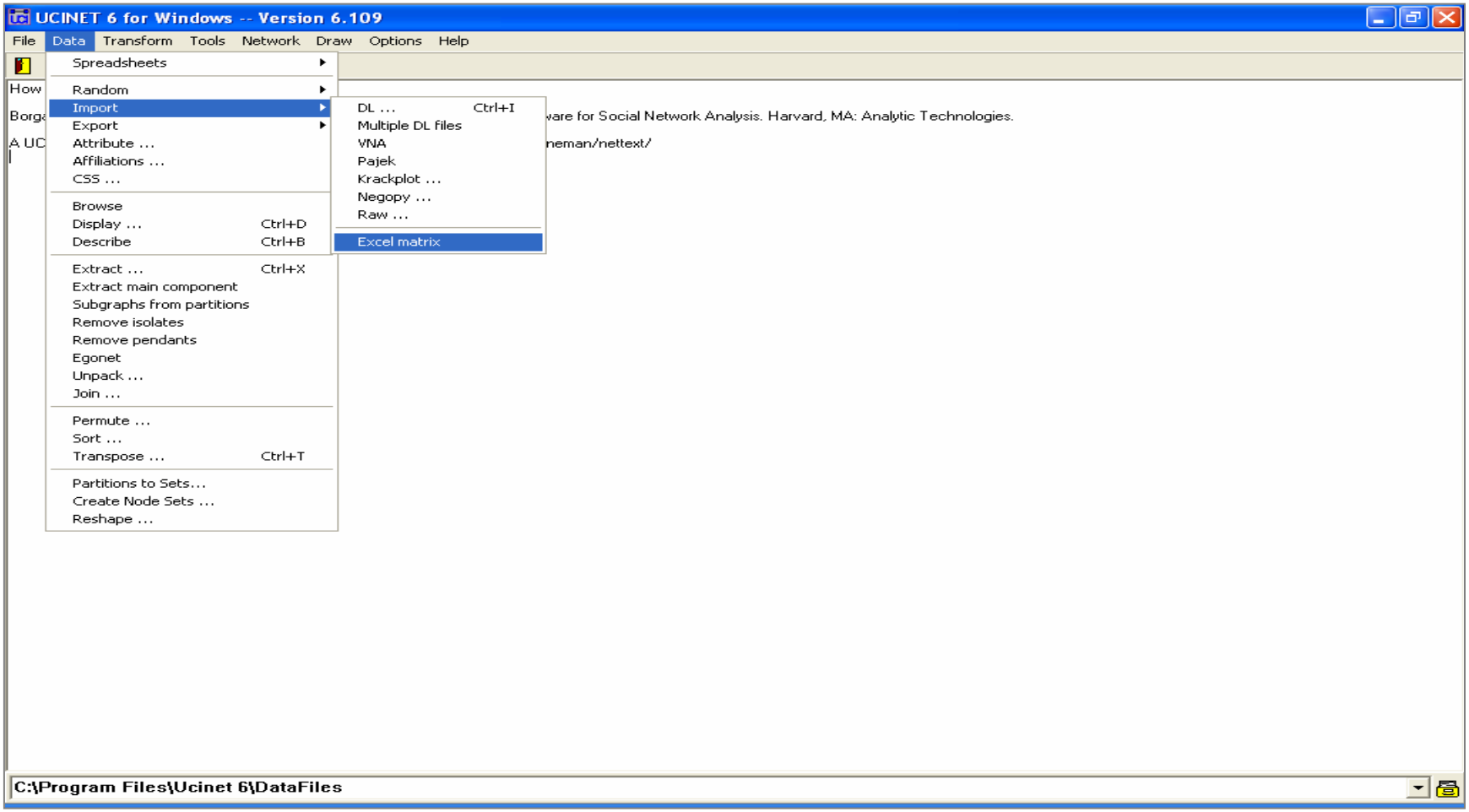


Import Adjacency Matrix from an Excel File

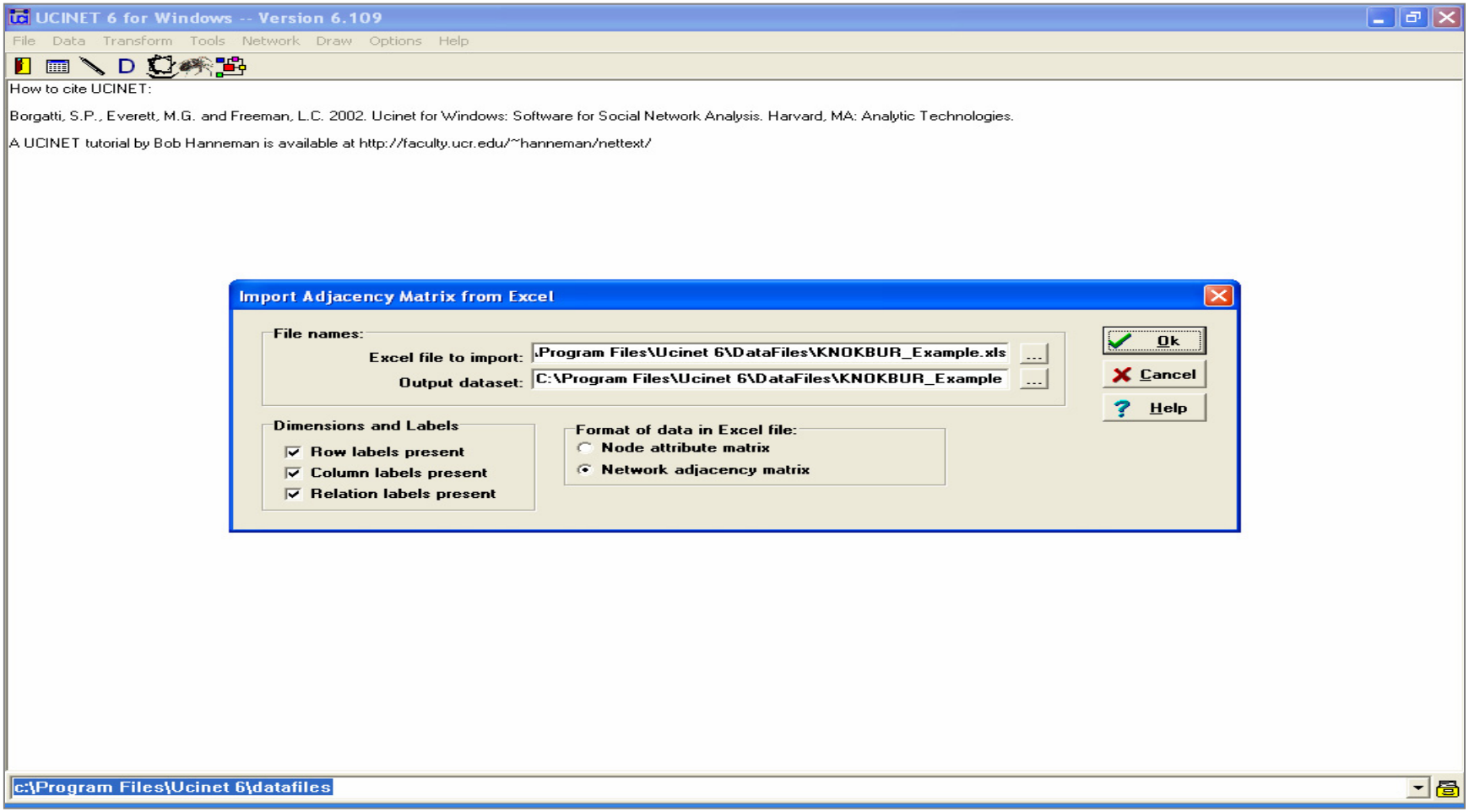


	A	B	C	D	E	F	G	H	I	J	K
1	KNOKM	COUN	COMM	EDUC	INDU	MAYR	WRO	NEWS	UWAY	WELF	WEST
2	1	0	0	1	0	1	0	0	1	1	1
3	2	0	0	1	0	0	0	0	0	0	0
4	3	0	0	0	0	0	0	0	1	0	0
5	4	0	1	1	0	0	0	1	1	1	0
6	5	0	1	1	0	0	0	0	1	1	0
7	6	0	0	0	0	0	0	0	0	0	0
8	7	0	1	0	0	0	0	0	1	0	0
9	8	0	0	0	0	0	0	0	0	1	1
10	9	0	0	1	0	0	0	0	1	0	0
11	10	0	0	0	0	0	0	0	0	0	0

Data>Import>Excel matrix



Excel file to import: KNOKBUR_Example.xls
Output dataset: KNOKBUR_Example



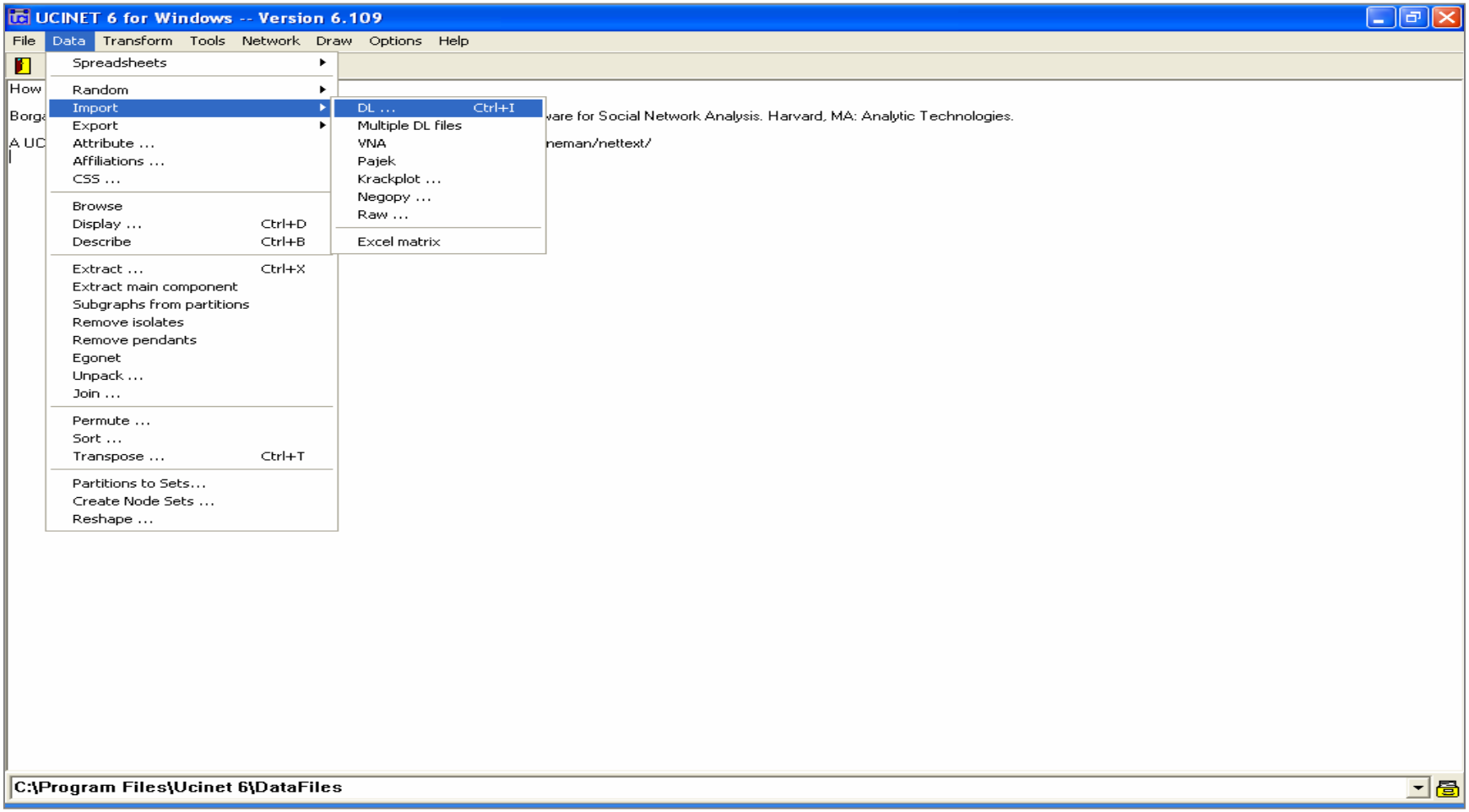
DL Format: Full Matrix

- **Full Matrix Format**

```
dl n=4 format=fullmatrix
data:
0 1 1 0
1 0 1 1
1 1 0 0
0 1 0 0
```

- **Save it as a text file (e.g. TEST.txt).**

Data>Import>DL…



DL Format: Rectangular Matrices

dl nr = 6, nc = 4

data:

0 1 1 0

1 0 1 1

1 1 0 0

0 1 0 0

1 0 1 1

1 1 0 0

DL Format: Labels

- **DL file may contain labels of the nodes**

dl n=4

labels:

MIT, “MIT ESD”, MIT.ESD.342, ESD_Students

data:

0 1 1 0

1 0 1 1

1 1 0 0

0 1 0 0

DL Format: Multiple Matrices

dl n = 4, nm = 2
labels:
GroupA,GroupB,GroupC,GroupD
matrix labels:
Marriage,Business
data:
0 1 0 1
1 0 0 0
0 0 1 0
1 0 0 1
!
0 1 1 1
1 0 0 0
1 0 0 1
1 0 1 0

DL Format: External Data

- Data file can be read from other sources

```
dl n = 8
labels:
a1,a2,a3,a4,a5,a6,a7,a8
datafile C:\DATA\External_Data.DAT
```

DL Format: nodelist1 (I)

dl n = 4, format = nodelist1

labels:

A,B,C,D

data:

1 2 3

2 1 3 4

3 1 2

4 2

Resulting Matrix =>

	A	B	C	D
A	0	1	1	0
B	1	0	1	1
C	1	1	0	0
D	0	1	0	0

DL Format: nodelist1 (II)

dl n = 4, format = nodelist1

labels:

A,B,C,D

data:

1 2 3

2 1 3

2 4

3 1 2

4 2

Resulting Matrix =>

	A	B	C	D
A	0	1	1	0
B	1	0	1	1
C	1	1	0	0
D	0	1	0	0

DL Format: nodelist1 (III)

dl n = 4, format = nodelist1

labels embedded

data:

A B C

B A C D

C A B

D B

Resulting Matrix =>

	A	B	C	D
A	0	1	1	0
B	1	0	1	1
C	1	1	0	0
D	0	1	0	0

DL Format: nodelist2

dl nr=3, nc=4 format = nodelist2

row labels embedded

column labels embedded

data:

GP1 A B

GP2 C D

GP3 A D

Resulting Matrix =>

	A	B	C	D
GP1	1	1	0	0
GP2	0	0	1	1
GP3	1	0	0	1

DL Format: ranklist1

dl n=4 format = ranklist1

labels embedded

data:

A B C

B C D A

C A B D

D A C

Resulting Matrix =>

	A	B	C	D
A	0	1	2	0
B	3	0	1	2
C	1	2	0	3
D	1	0	2	0

DL Format: edgelist1

dl n=4 format = edgelist1
labels:
A,B,C,D
data:
1 2 1
1 3 2
2 1 1
2 3 1
2 4
3 1 1
3 2 na
4 2 5.2

Resulting Matrix =>

	A	B	C	D
A	0	1	2	0
B	1	0	1	1
C	1		0	0
D	0	5.2	0	0

DL Format: edgelist2

dl nr=3 nc=5, format = edgelist2

labels embedded:

data:

A1 B1 1

A1 B2 1.5

A1 B3 2

A2 B1 1

A3 B2 3

A3 B4 2

A3 B5 1

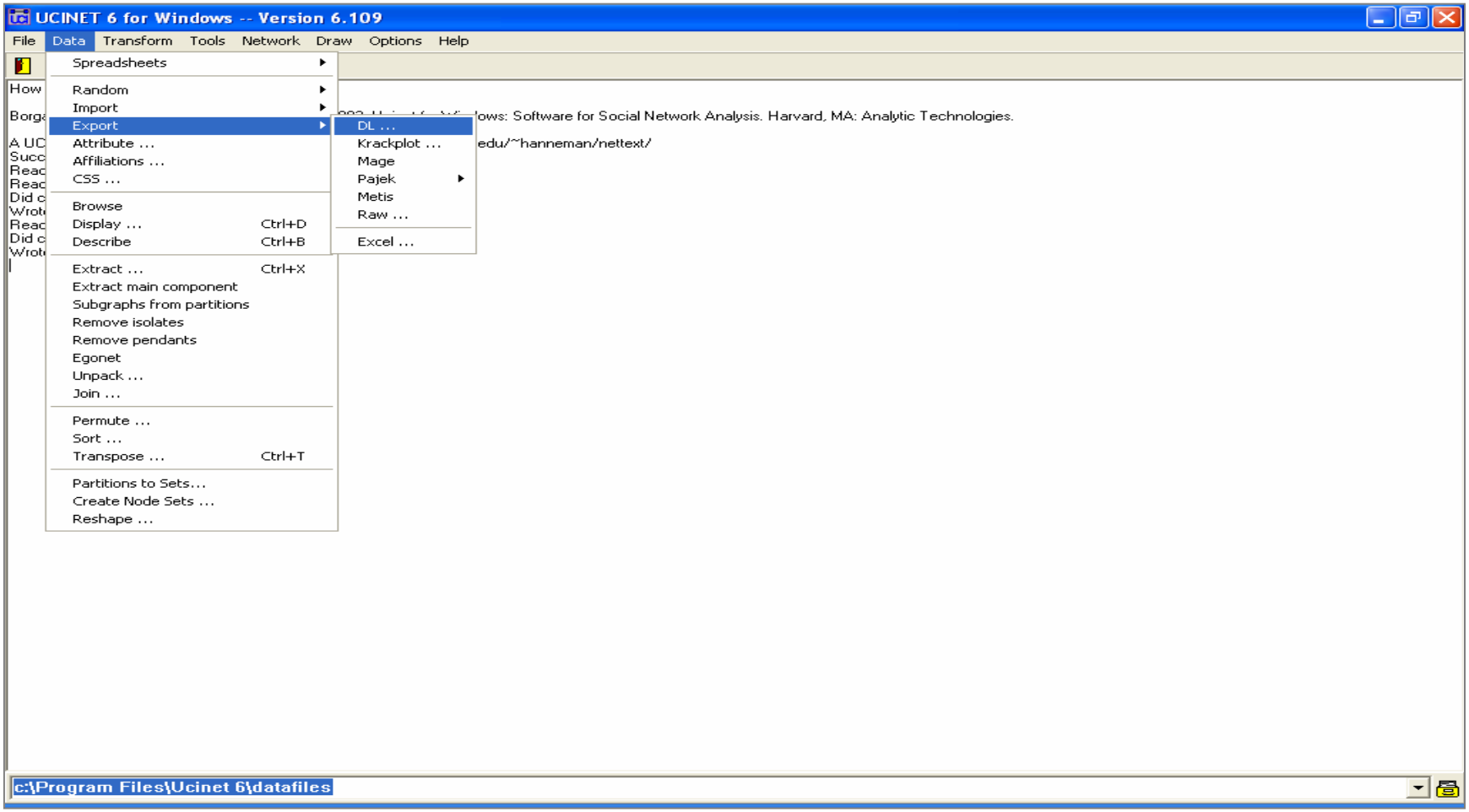
Resulting Matrix =>

	B1	B2	B3	B4	B5
A1	1	1.5	2	0	0
A2	1	0	0	0	0
A3	0	3	0	2	1

Export Data

- Export UCINET dataset to
  - Excel file
    - Number of columns < 257
  - DL format
    - Easy to do *cut and paste*
    - *Example: Cut and paste as a Matlab data file.*
  - Other format

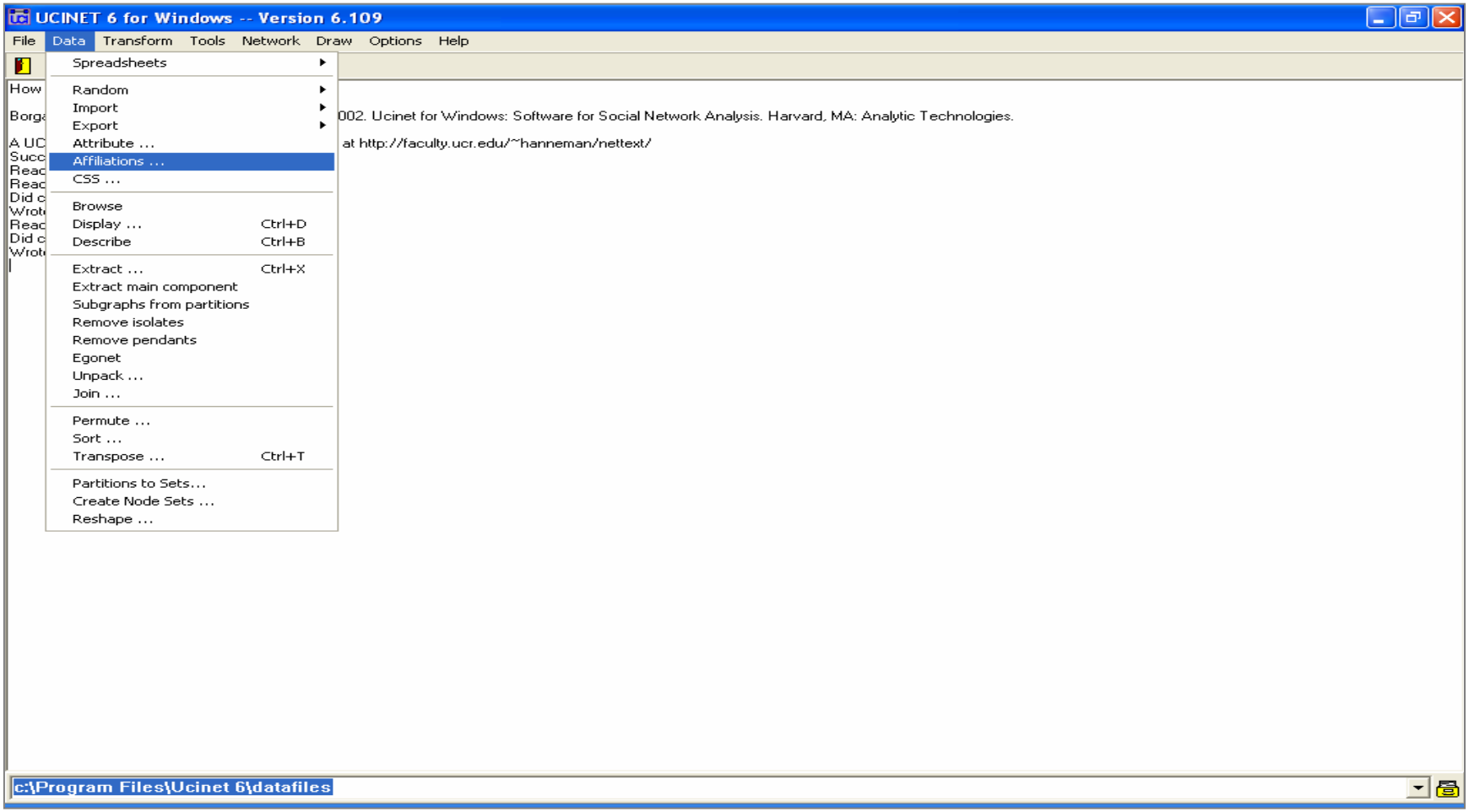
Export Dataset
Data>Export>DL…



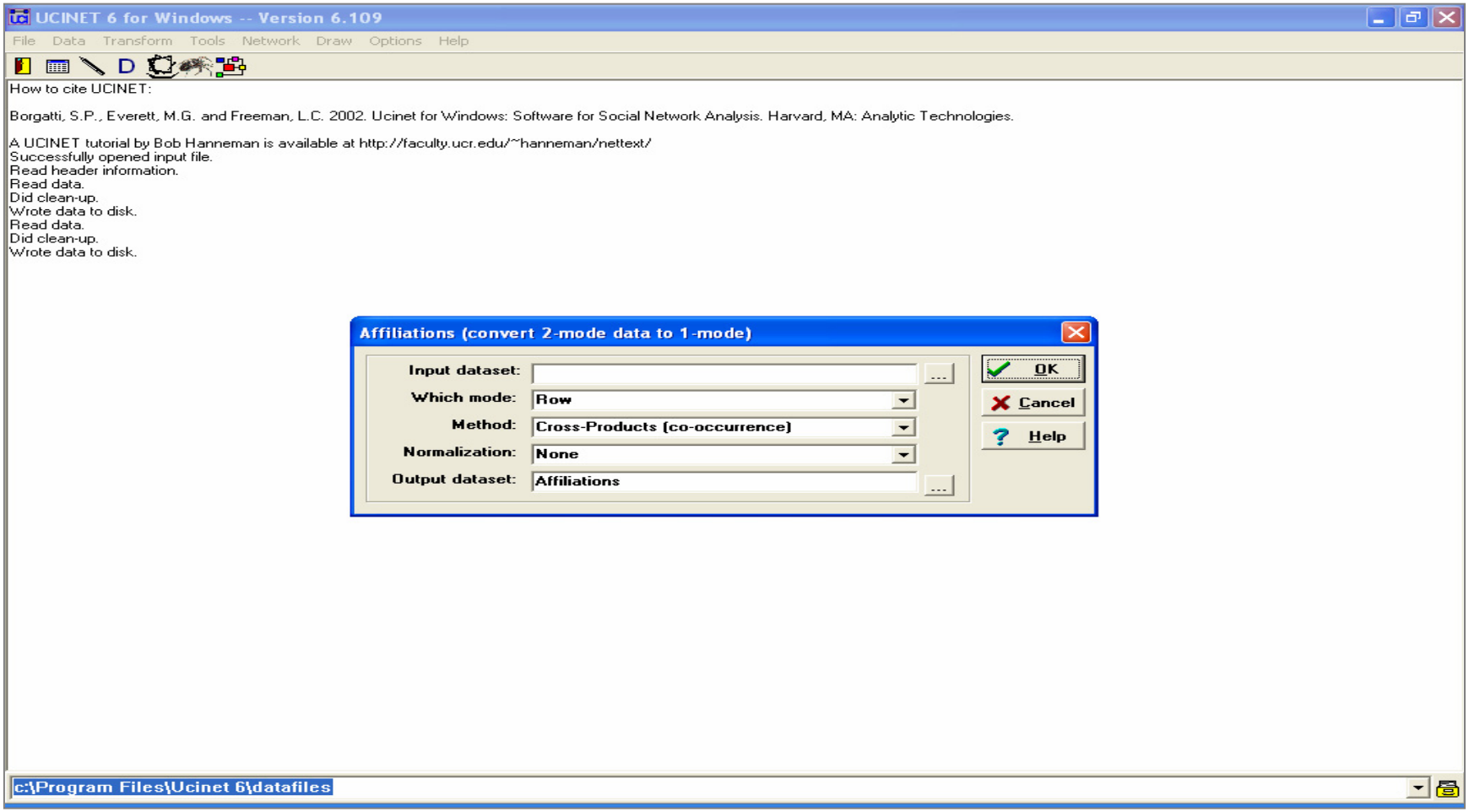
Data Processing

- Most of the data processing functions are in ***Data*** and ***Transform*** submenus.
- Some useful functions
  - Data>Affiliations…
  - Data>Extract…
  - Data>Remove isolates
  - Data>Join…
  - Data>Permute…
  - Data>Transpose…

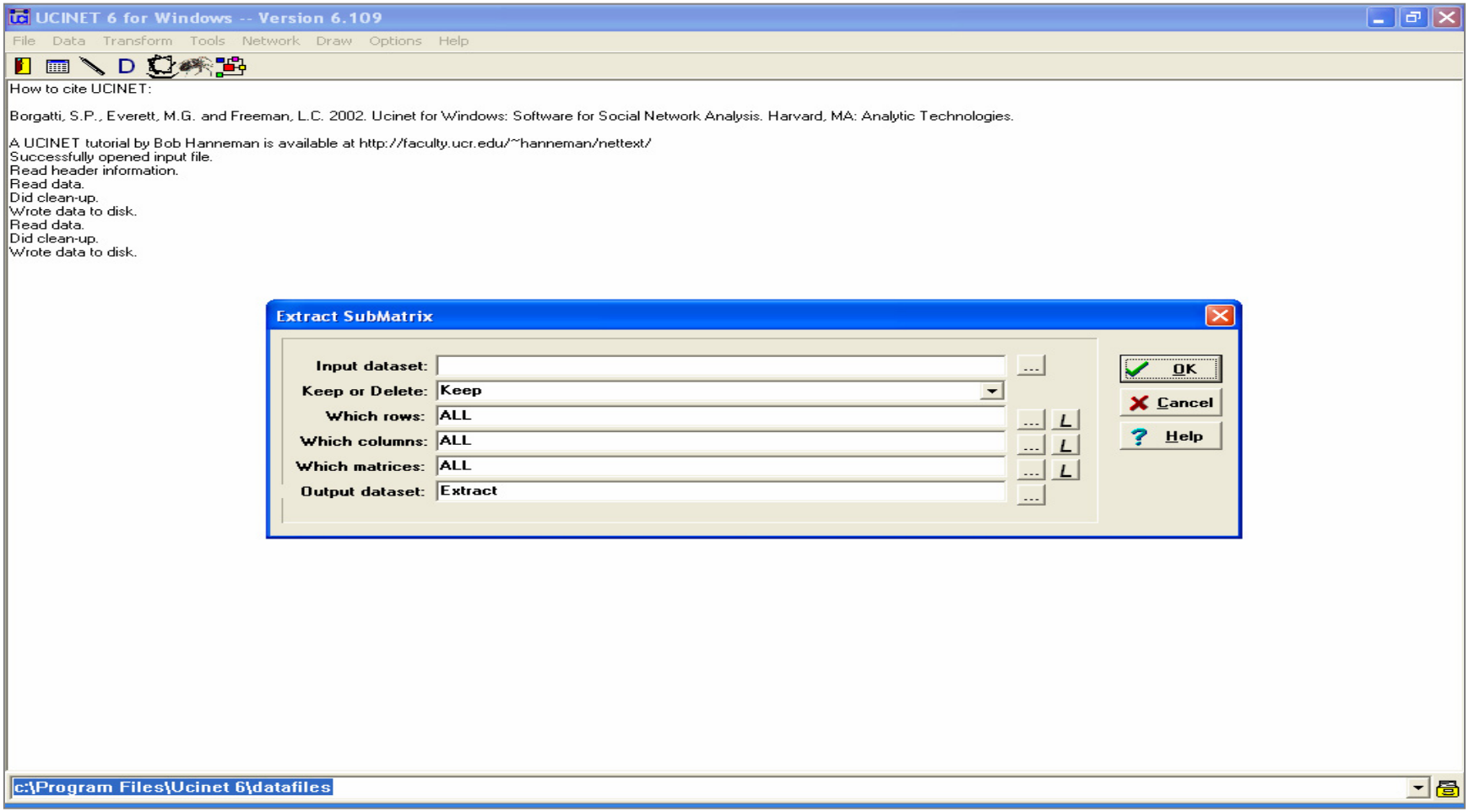
Data Processing
Data>Affiliations…



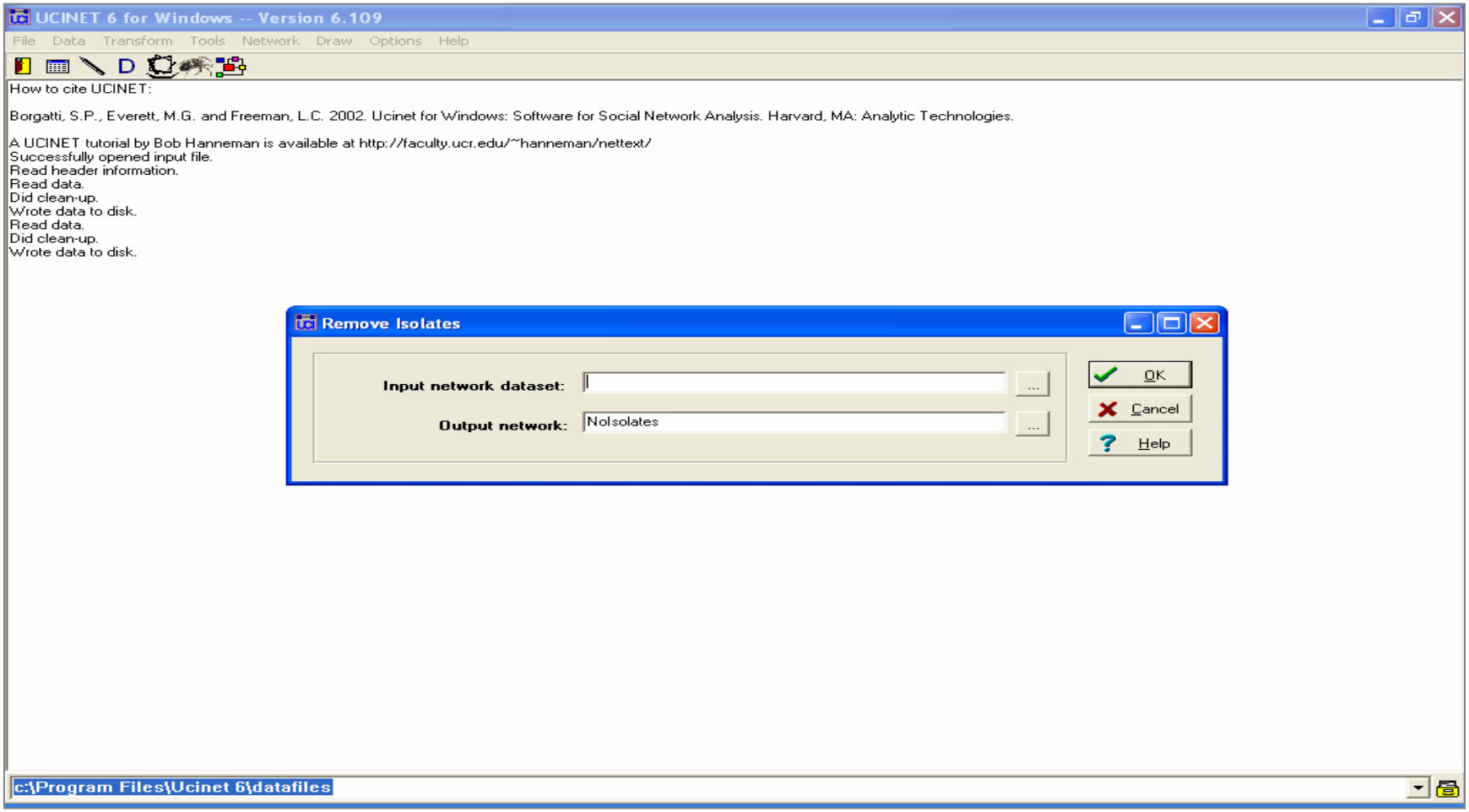
Convert 2-mode data to 1-mode



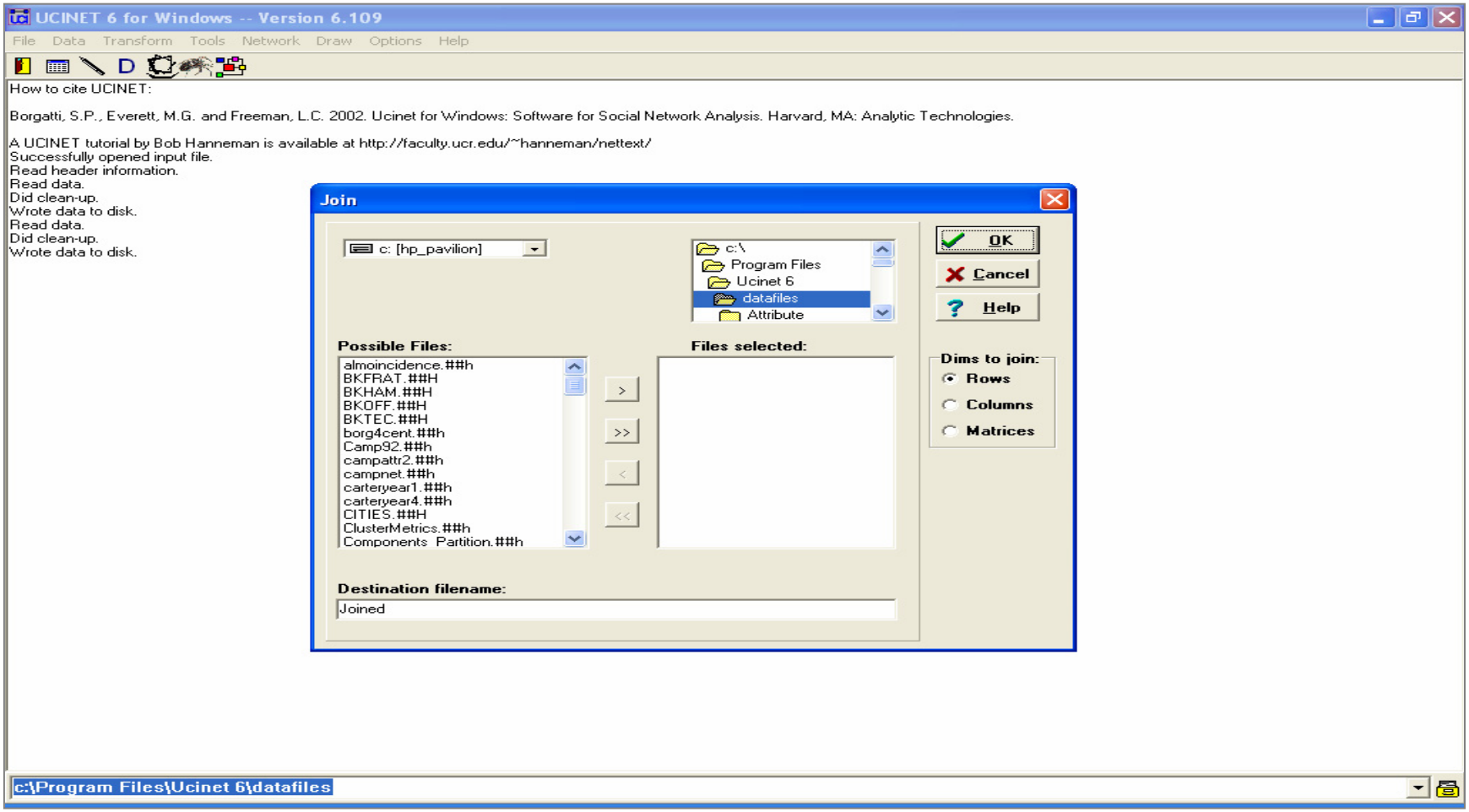
Data Processing
Data>Extract…



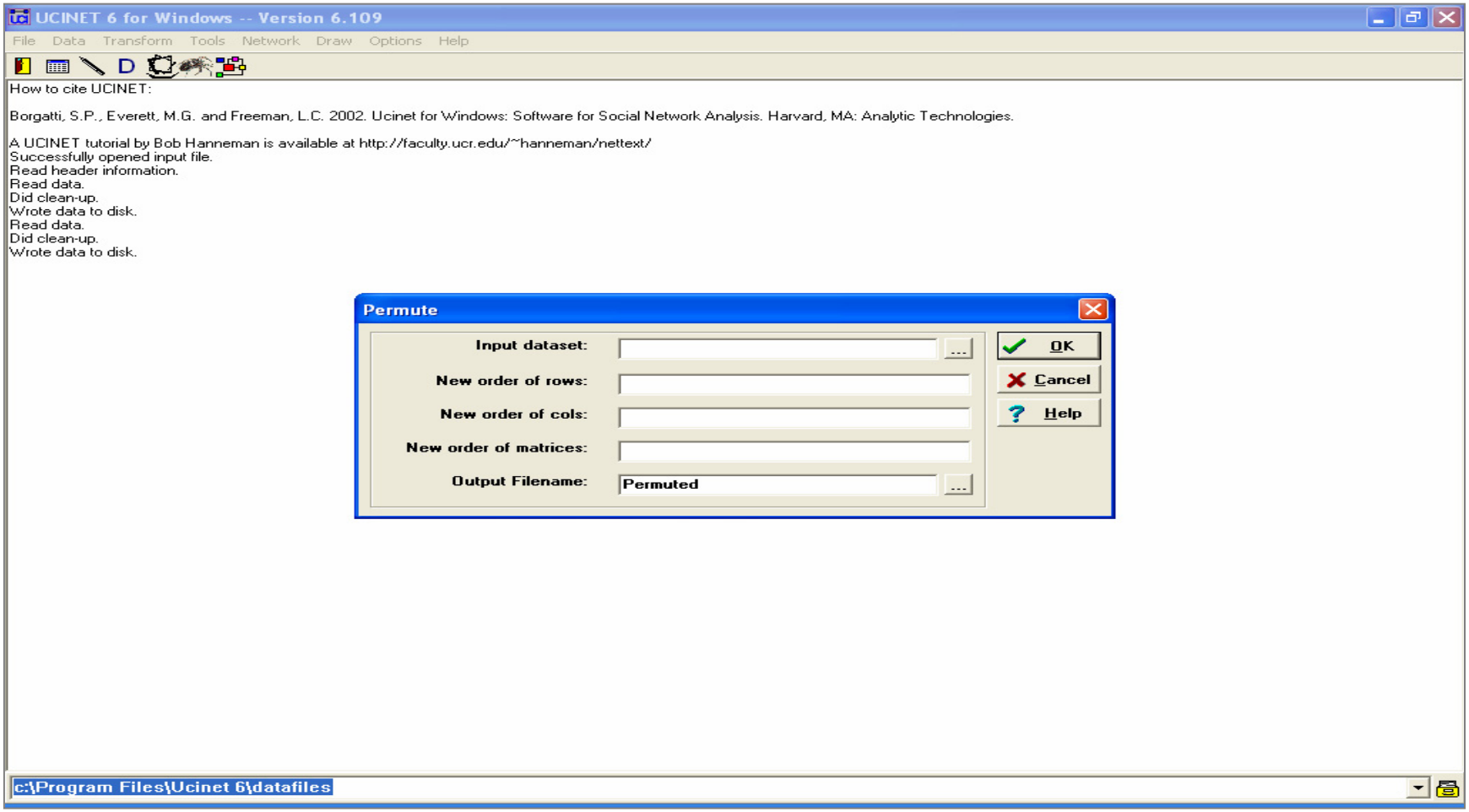
Data Processing
Data>Remove isolates



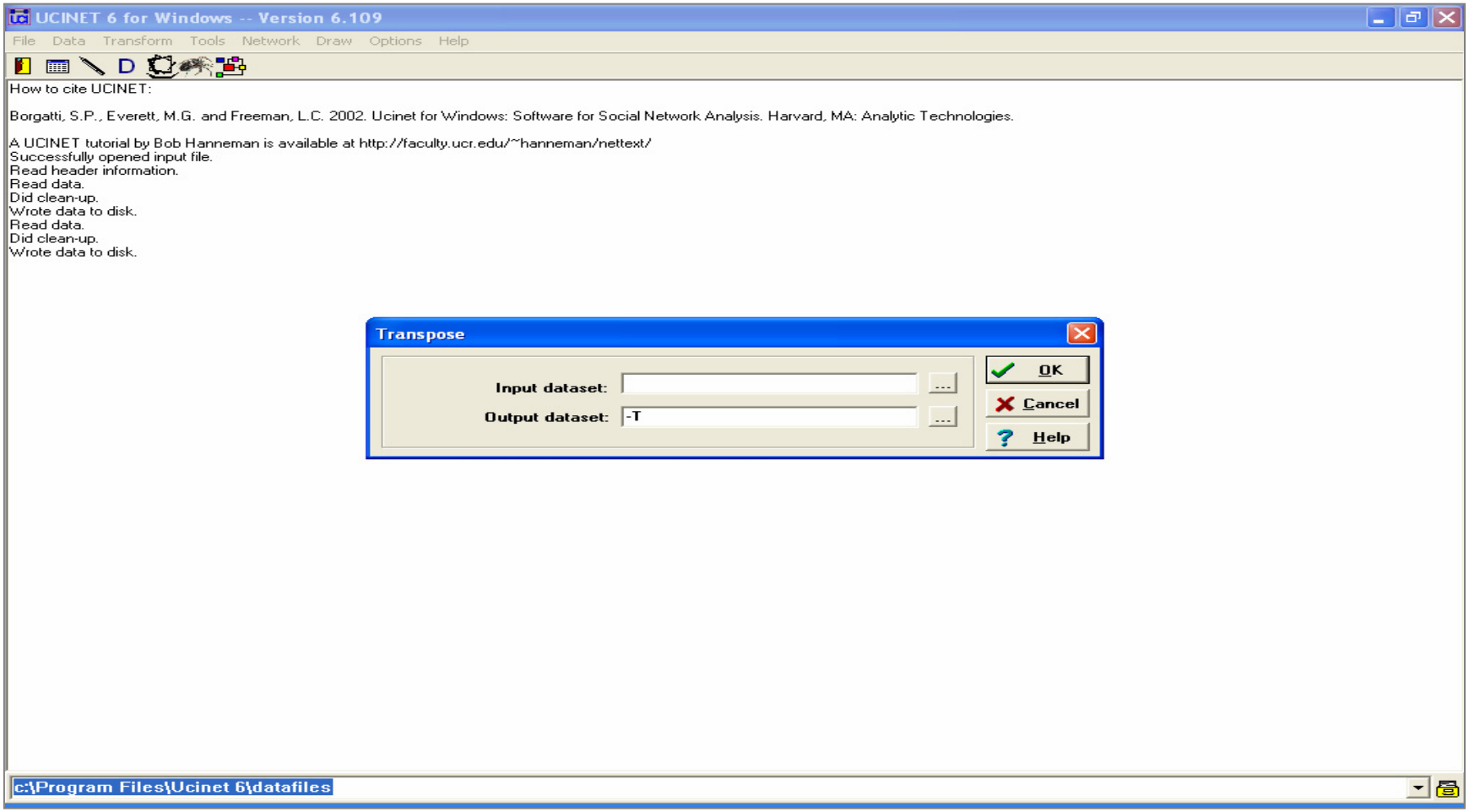
Data Processing
Data>Join…



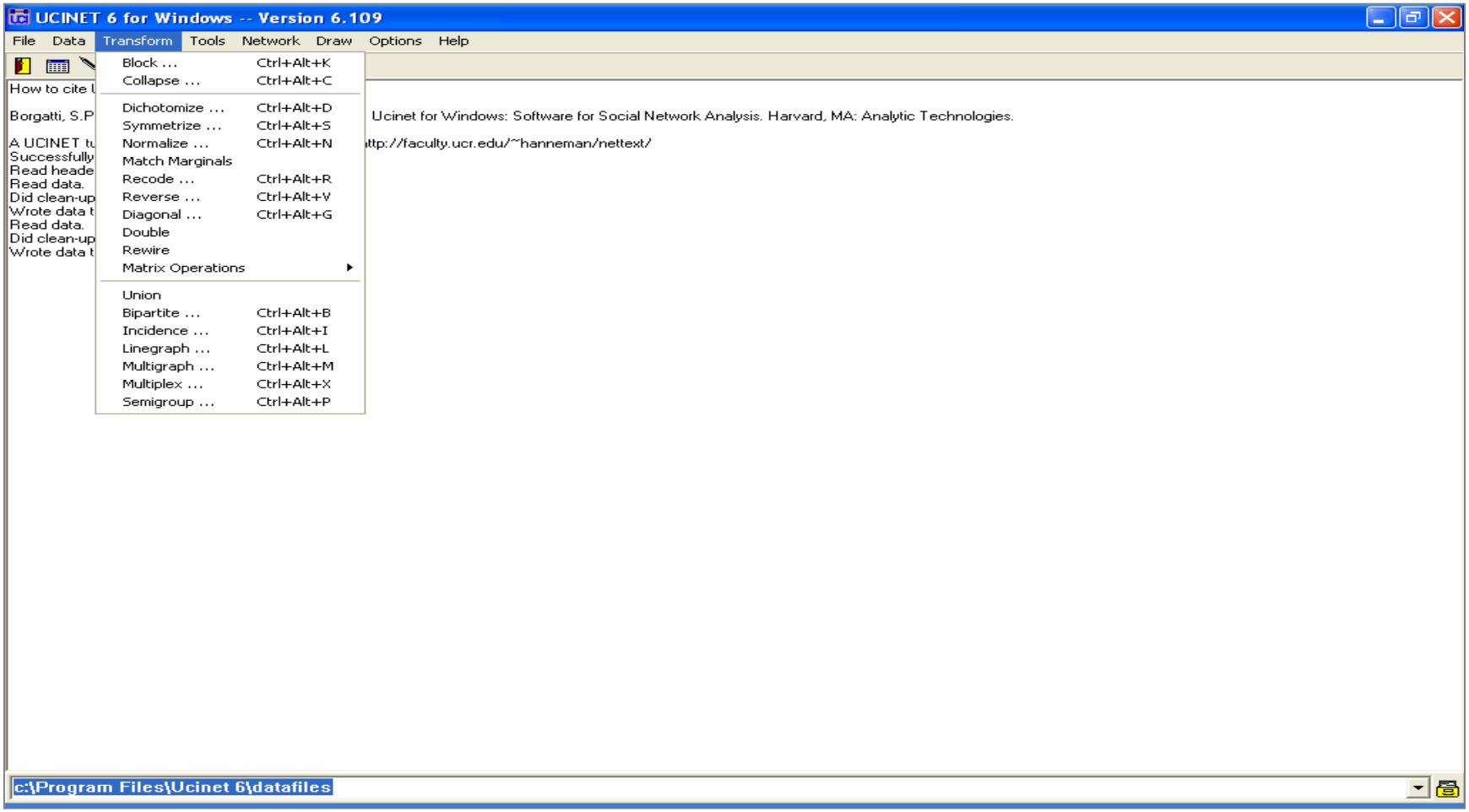
Data Processing
Data>Permute…



Data Processing
Data>Transpose…



Main window: Transform



Tips of Using UCINET

- Before using an UCINET function
  - Check it out in Help>Help Topics>Index
  - *Purpose, Description, Parameters, Log File, Timing, Comments, and References.*
  - Timing is sometimes important
    - Function with O(N^3) can be a problem for networks with more than 1,000 nodes.
- Setup the following two directories before start working with the UCINET
  - File>Change Default Folder…
  - Options>Output folder

References

- Borgatti, Everett and Freeman, UCINET 6 for Windows: User's Guide. Harvard: Analytic Technologies.
- Borgatti, S.P., Everett, M.G. and Freeman, L.C. 2002. Ucinet 6 for Windows. Harvard: Analytic Technologies.