

Blockplot scale:  Redraw

79 Sárkan/Sárkányfalva -> 44 Bátorové Kosihy/Bátorkeszi

Calculate ☐ Auto-update calculations

Block sums:

	H1	H	S	S1
H1	66	104	0	0
H	104	256	85	0
S	0	85	312	103
S1	0	0	103	66

Block densities:

	H1	H	S	S1
H1	0.36	0.27	0.00	0.00
H	0.27	0.34	0.11	0.00
S	0.00	0.11	0.44	0.29
S1	0.00	0.00	0.29	0.42

# Network science and network analysis

- Claims to be neither *qualitative* nor *quantitative*, but *relational*.
- Thus, avoids (or even bridges) 20<sup>th</sup> century debates between for instance behaviorist and critical theorists in social sciences.
  - E.g. stretches beyond cross-comparisons of properties of assumed independent units of analysis.
  - Encourages data-driven approaches appreciated by for instance policy-makers
- Important to understand system complexity and interrelatedness (*structure & function*).
- Social network analysis: known short-hand for applying network-analytical tools in social sciences

# Network analysis in border studies

- General (re(new(ed) interest in studying micro-level foundations of socio-spatial systems.
- Integration is a key concern
- Integration = a process of increasing and intensifying relations among entities that leads to the mergence and expansion of an inclusive integral whole (Svensson and Nordlund 2015: 372)
- Captures flows of different kinds (e.g. goods, services, information) taking place in different realms (e.g. economic, social, political)

# Governance and transportation policy networks in the cross-border metropolitan region of Luxembourg: A social network analysis Sabine Dörry, Antoine Decoville, *European Urban and Regional Studies*, 23:1, 2016

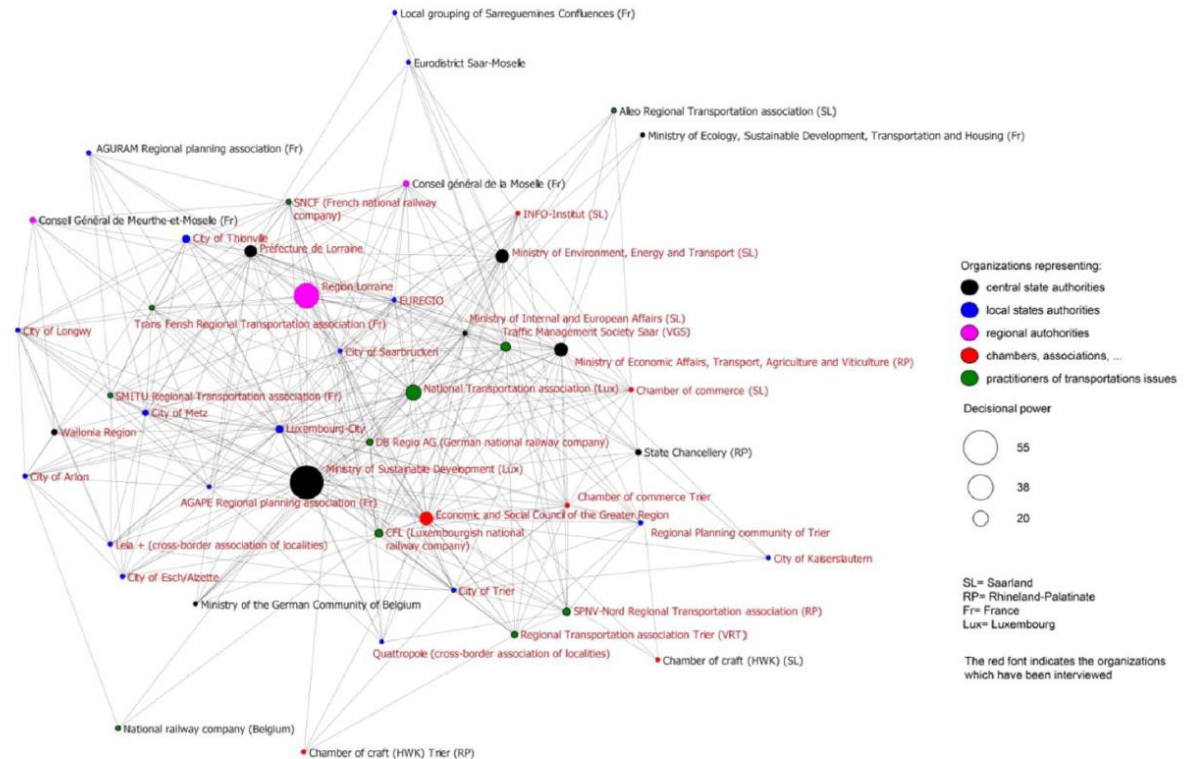
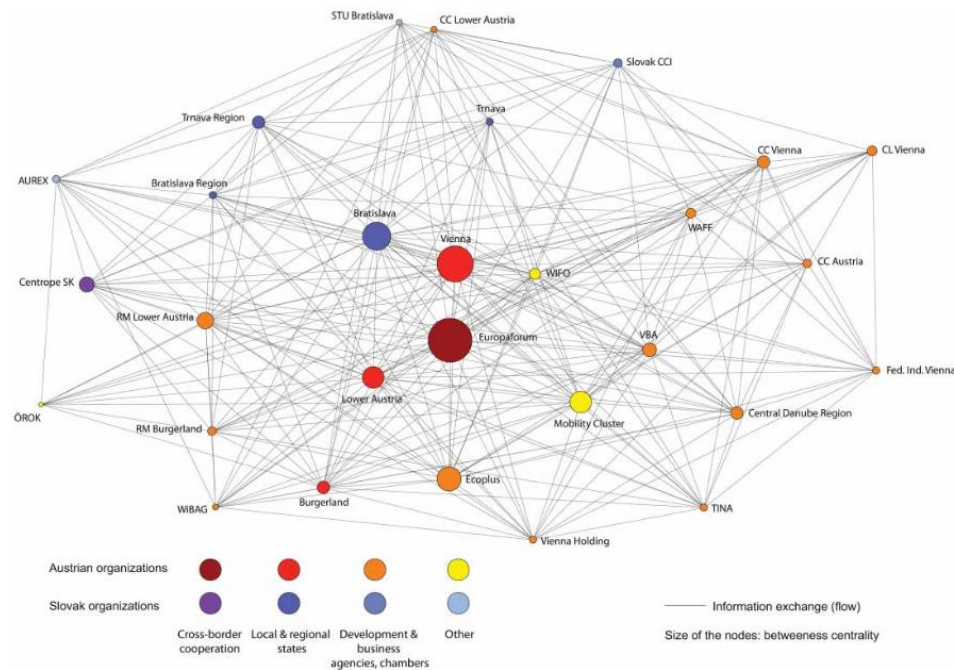


Figure 3. Cross-border public transportation policy network in the CBMR of Luxembourg.

# A Policy Network Approach to Cross-Border Metropolitan Governance: The Cases of Vienna and Bratislava. Christophe Sohn & Rudolf Giffinger. *European Planning Studies*, 23:6, 1187-1208, 2015.

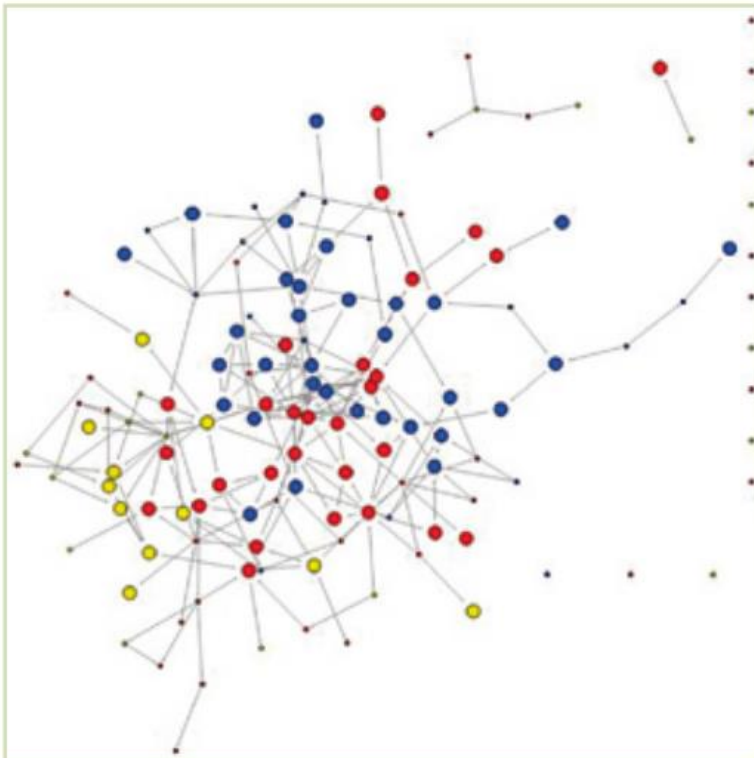
*A Policy Network Approach to Cross-Border Metropolitan Governance* 1199



**Figure 1.** Graph of the policy network with betweenness centrality of organizations.

**The Network Context of CBC.** Gerő, Márton and István Micsinai, in the Hungarian/Slovak/Ukrainian Tri-border, Endre Sik and Rachel Suranyi (eds.). Budapest: Tarki. Page 105-122. 2015.

**Figure 25** The network of the core actors in the tri-border region ( $N = 138$ )

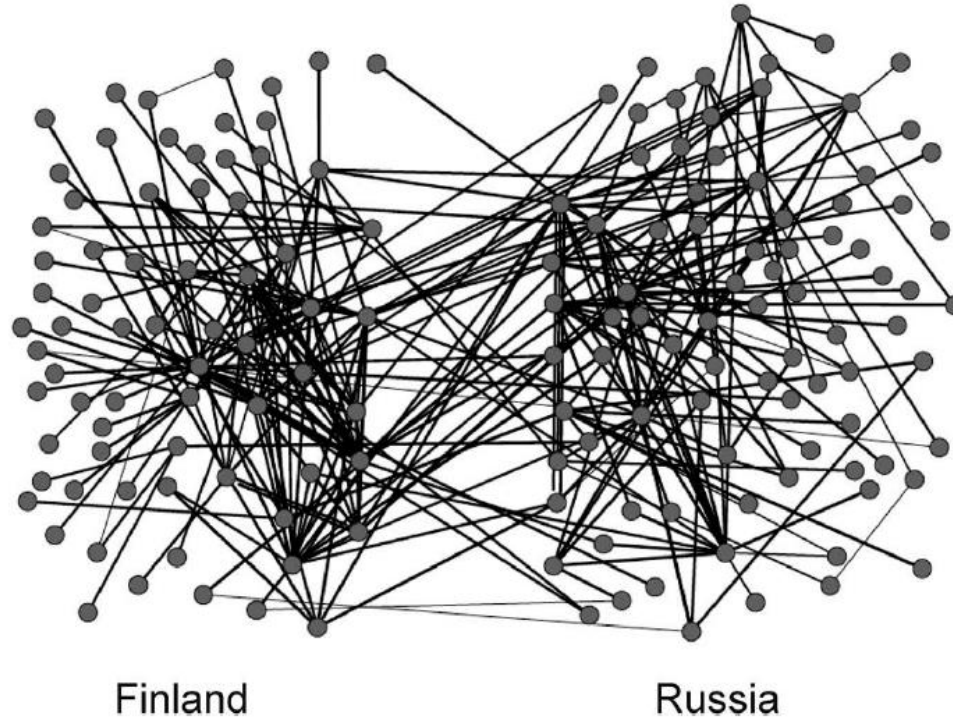


*Source: Own drawing*

*Legend:* Red – Hungarian, Blue – Ukrainian, Yellow – Slovak. The larger size of the dots indicates more relations.



**A social network analysis of cooperation in forest, mining and tourism industries in the Finnish–Russian cross-border region: connectivity, hubs and robustness** Teemu Makkonen, Timo J. Hokkanen, Tatyana Morozova & Mihail Suharev, *Eurasian Geography and Economics*, 59:5-6, 685-707, 2018.



**Figure 4.** Finnish–Russian cross-border cooperation network (as identified in the sample) within forest, mining and tourism industries.

# Metrics measuring integration

- Visual graphs
- Density
- E-I index
- New measure: connectivity (Svensson & Nordlund 2015)
  - Specifically devised for borderlands
  - Free software available (CrossBorder Blocker)



# New metrics (Svensson & Nordlund 2015)

- Based on block-modelling.
- *Connectivity*: indicates the share of actors with cross-border connections. The directional connectivity measure indicates the share of actors on one side with cross-border connections.
- *Overfit*: indicates the number of ties that are not necessary in order to maintain a given connectivity.
- See Svensson, Sara and Carl Nordlund. 2015. The Building Blocks of a Euroregion: Novel Metrics to Measure Cross-border Integration. *Journal of European Integration*, 37(3): 371-389.

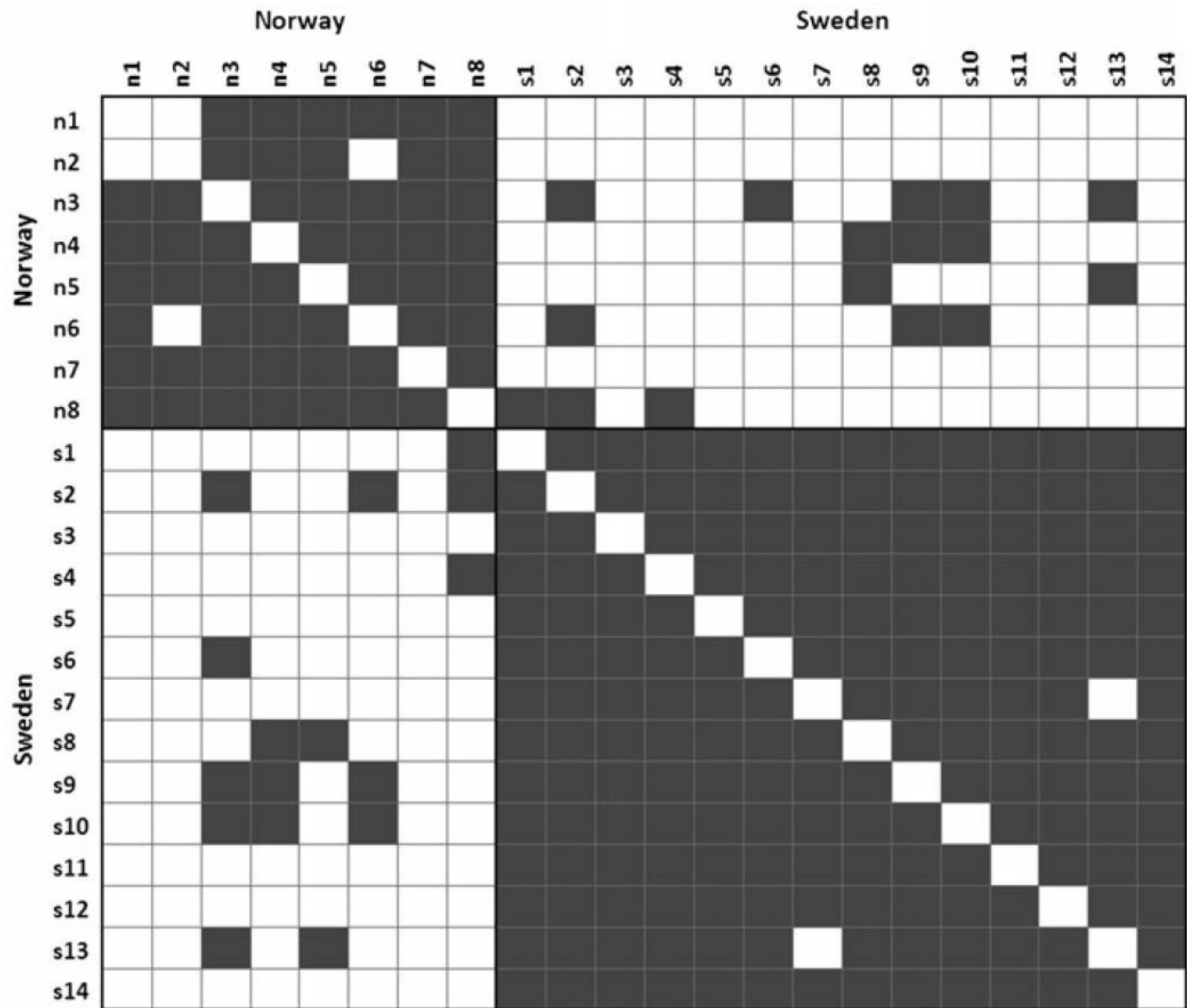


Figure 2. Positional (country-based) blockmodel of OstBoh monthly dataset

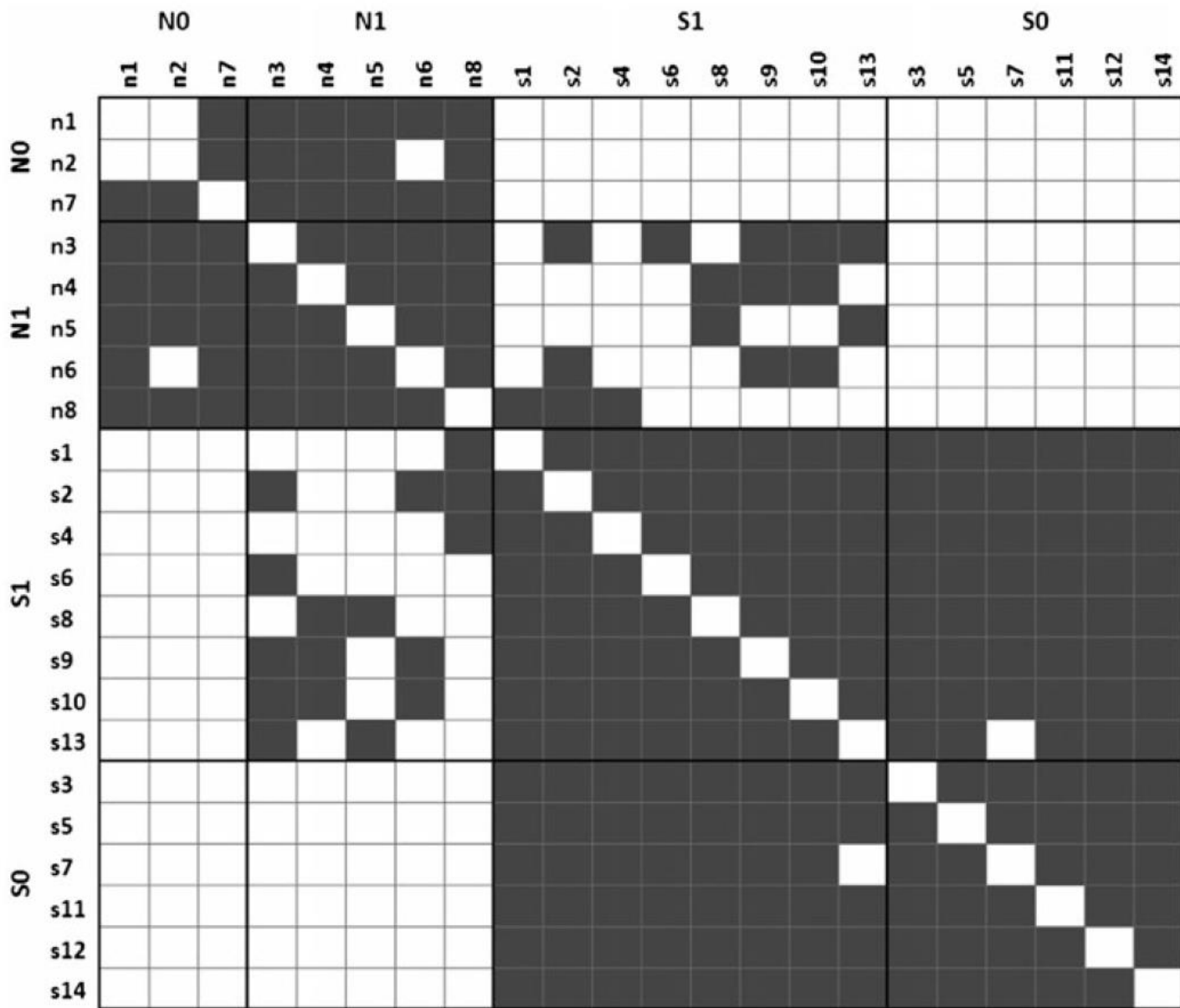


Figure 3. Positional (country- and cross-border-based) blockmodel of OstBoh monthly dataset

# Cross-border connectivity measures

A measure of integration

A complement to cross-border density (and E-I index)

## ...in conjunction with measure of overfit

Possibly useful as policy tool: how to be SMART about enhancing integration.

Not just "you should talk more", but where communication resources should be increased.

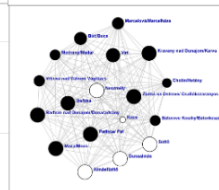
Still, analysis show that:



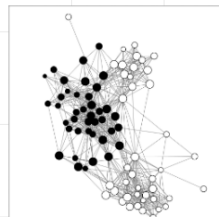
OstBoh has a relatively 'smart' communication network.  
Low degree of overfitting - could help in producing outputs.



VarmOst: better integrated, relatively smart cross-border communications  
Could explain high internal evaluation of performance.



Hidvero: highly integrated, but does not produce results in terms of outputs (or outcome)  
High degree of overfitting



Ister-Granum: disintegrated Hungarian side, peculiar case  
Significantly difference between density and cross-border connectivity  
External performance reviews: high, internal (satisfaction): low.



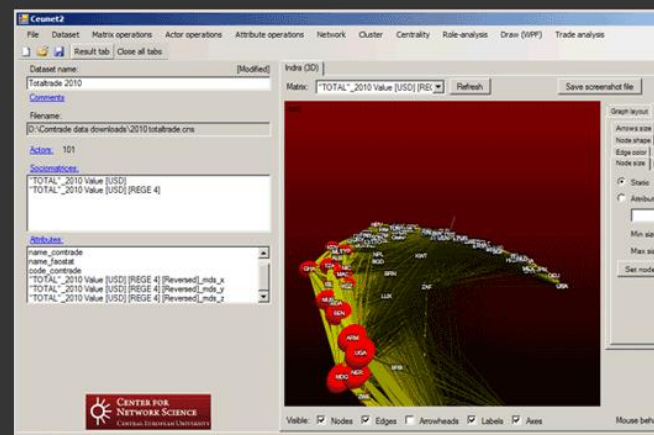
# CNSLABS

SOFTWARE AND DATA LABORATORY

CENTER FOR NETWORK SCIENCE  
CENTRAL EUROPEAN UNIVERSITY, BUDAPEST

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## SOFTWARE PROJECTS



### CEUNET

Platform: Windows client (.NET)  
Last update: 22 Jan 2015

Primarily a framework for the development of various heuristics/algorithms, CEUNET has turned into a relatively user-friendly program. With basic functions for centrality, role-analysis, and multi-dimensional scaling, it contains an extensive array of import/export filters from/to various relational data formats and a visualization module in 2- and 3 dimensions. Connected to NetRepository, Ceunet can both upload and download public and private datasets from the repository.

[DOWNLOAD](#)

**KrishKrosh - notesharing.txt**

Documentation | Load/view data | Blockimage specification | Search/view blockmodel | Export data

### KrishKrosh (version 0.3beta)

#### User manual and documentation (17 Sep 2015)

Carl Nordlund - nordlundc@ceu.edu

Center for Network Science, Central European University, Budapest  
cns.ceu.edu

*Demonstrational software for deviational blockmodeling of valued network, supplementing the article by Nordlund, C. 2016, A deviational approach to blockmodeling of valued networks, Social Networks, pp. 160-178*

#### Introduction

KrishKrosh is a Windows client (written in C#) to demonstrate the deviational approach to blockmodeling of valued networks. After loading a valued network, the software allows for calculating the various deviational measures, specifying a blockimage, setting the optional deviational threshold parameter, and subsequently finding optimal partitions for these input. It also allows for calculating the individual deviational measure of structural equivalence. Found solutions can be inspected in the software interface. Matrices and attribute vectors can be exported in various formats (raw text, Gephi, Ucinet DL, etc.).

### KRISHKROSH

Platform: Windows client (.NET)  
Last update: 17 Sep 2015

KrishKrosh is a software client to demonstrate the deviational approach to blockmodeling of valued networks as specified in [this article](#). Having loaded a valued directional network and specified a target blockimage, a search algorithm (local optimization) finds the most optimal blockmodel and penalty solution(s). Resulting matrices and partitions can subsequently be exported to Ucinet, Gephi and as text files.

This package also contains example datasets.

[DOWNLOAD](#)


### FLUFFIX

CrossborderBlocker - D:\CrossborderBlocker\cbb\_demodata.txt

File Operations

Actors

Set 2-positional partition

Index	Label	Country
0	n1	N
1	n2	N
2	n3	N
3	n4	N
4	n5	N
5	n6	N
6	n7	N
7	n8	N
8	s1	S
9	s2	S
10	s3	S
11	s4	S
12	s5	S
13	s6	S
14	s7	S
15	s8	S
16	s9	S
17	s10	S
18	s11	S
19	s12	S
20	s13	S

### CrossborderBlocker

A Windows client software implementing the two novel metrics suggested in *The building blocks of a Euroregion: Novel metrics to measure cross-border integration* (Nordlund and Svensson, manuscript in-progress).

Developed by Carl Nordlund and Sara Svensson. Corresponding emails: [nordlundc@ceu.hu](mailto:nordlundc@ceu.hu) (software), [svenssons@ceu.hu](mailto:svenssons@ceu.hu) (article).

Version 1.0beta (very much beta - we will likely add more nice stuff)

#### Loading data

Data to be analyzed has to be created as csv-style text files, using the tab character as value-separator. Two types of such csv/txt files can be loaded - those with, and without, information on the initial country membership of actors.

An example data file WITHOUT such country info could look as follows (where blanks are singular tab characters):

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

Providing information of actors in country C1 (A and B) and C2 (A, B and C), respectively, the file could look as follows:

	A	B	C	D	E	
C1	A	0	1	0	0	1

## CROSSBORDER BLOCKER

Platform: Windows client (.NET)

Last update: 22 Oct 2013

CrossborderBlocker is an example client to demonstrate the heuristic and metrics of crossborder collaboration - as presented in [this article](#).

This package also contains a demonstration dataset

DOWNLOAD