Extracting information from a network by grouping nodes into different partitions

Toni Vallès Català
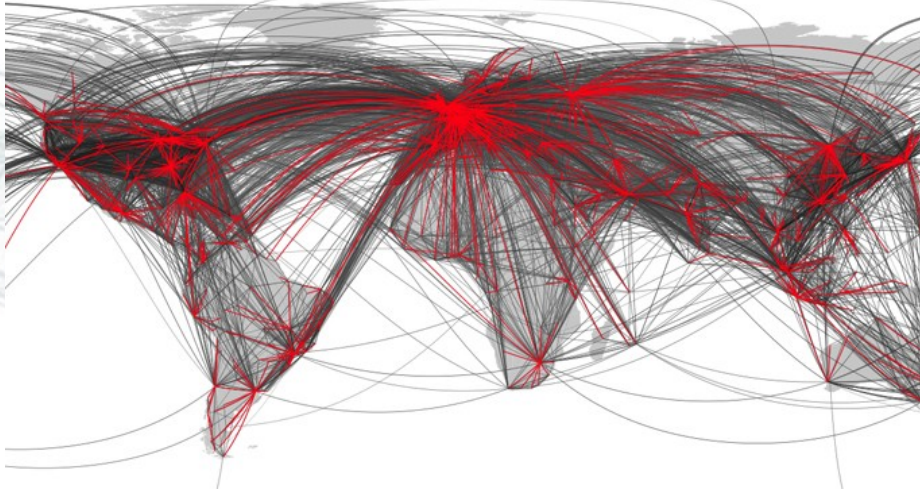
Supervisors: Roger Guimerà and Marta Sales

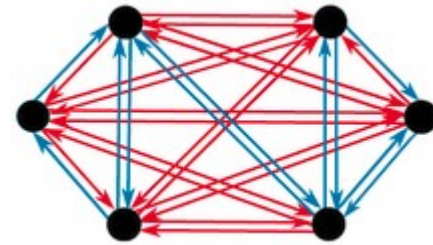**2nd Graph-TA 2014**
21/02/2014

sees:lab

The Structure of a network contains information
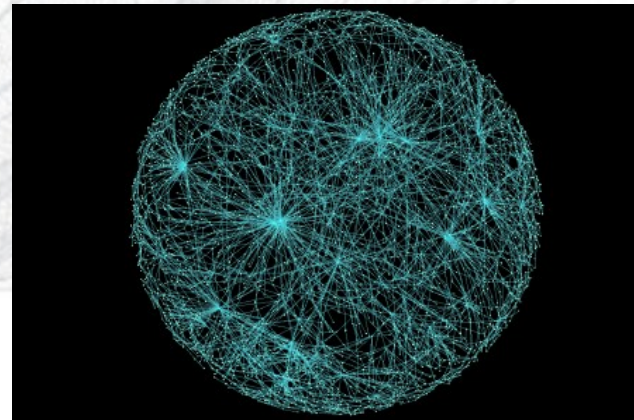
- Worldwide air transportation network

Robust classification of salient links in complex networks. Grady D; Thiemann C; Brockmann D, *Nature communications*, 3, **864**, 2012
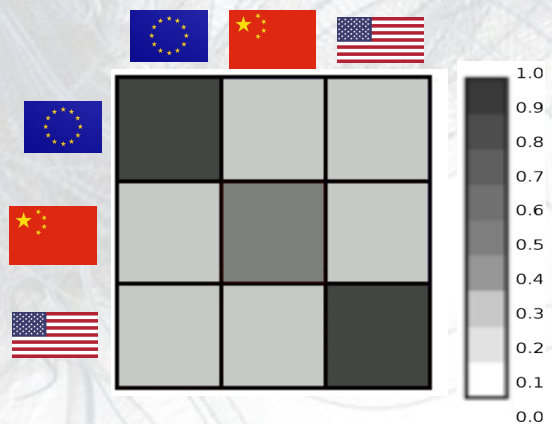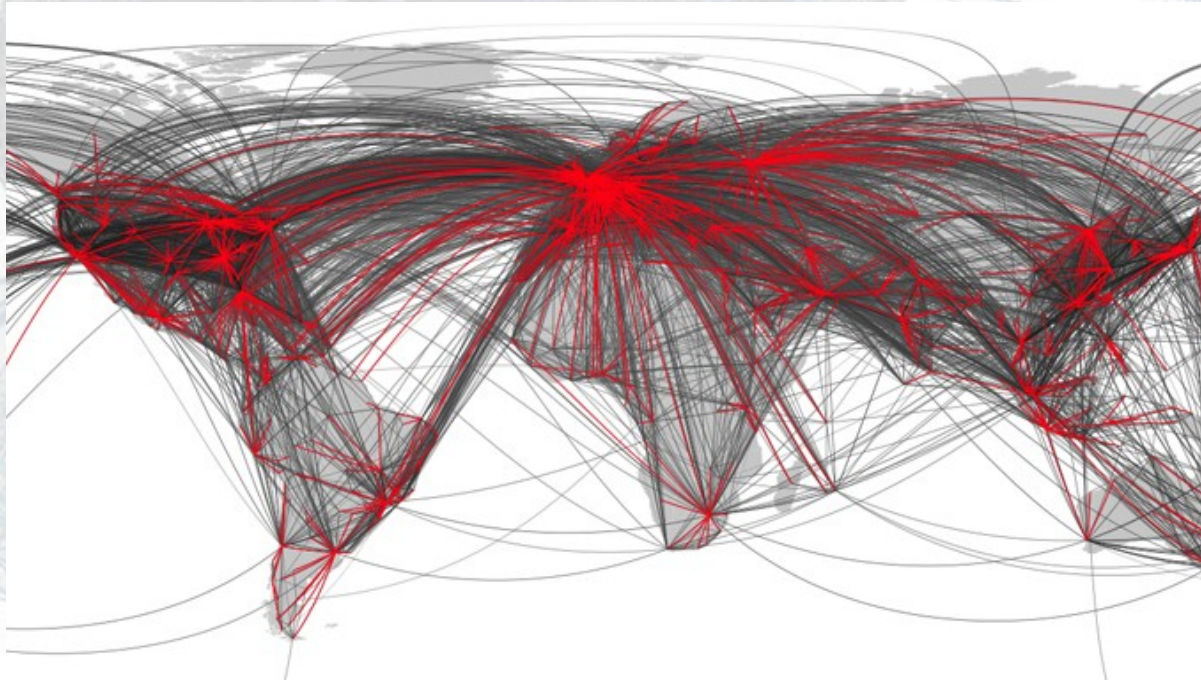
- Teamwork network

Predicting future conflict between team-members with parameter-free models of social networks
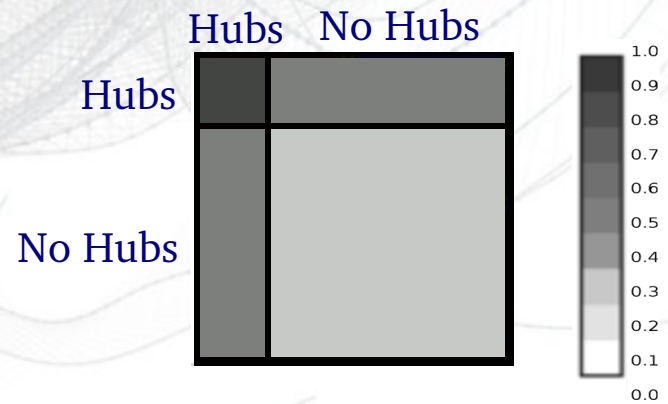Rovira-Asenjo, N, Gumi, T, Sales-Pardo, M, Guimera, R. *Sci. Rep.* 3, art. no. 1999 (2013)
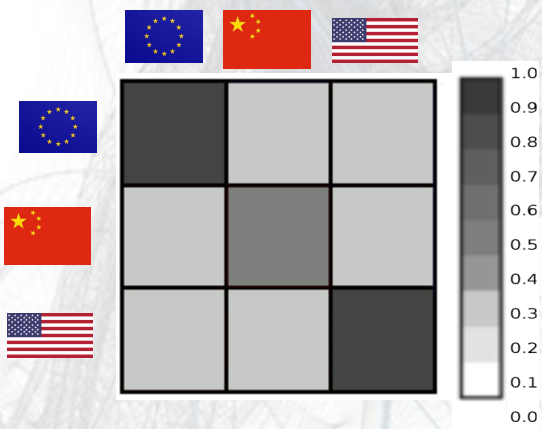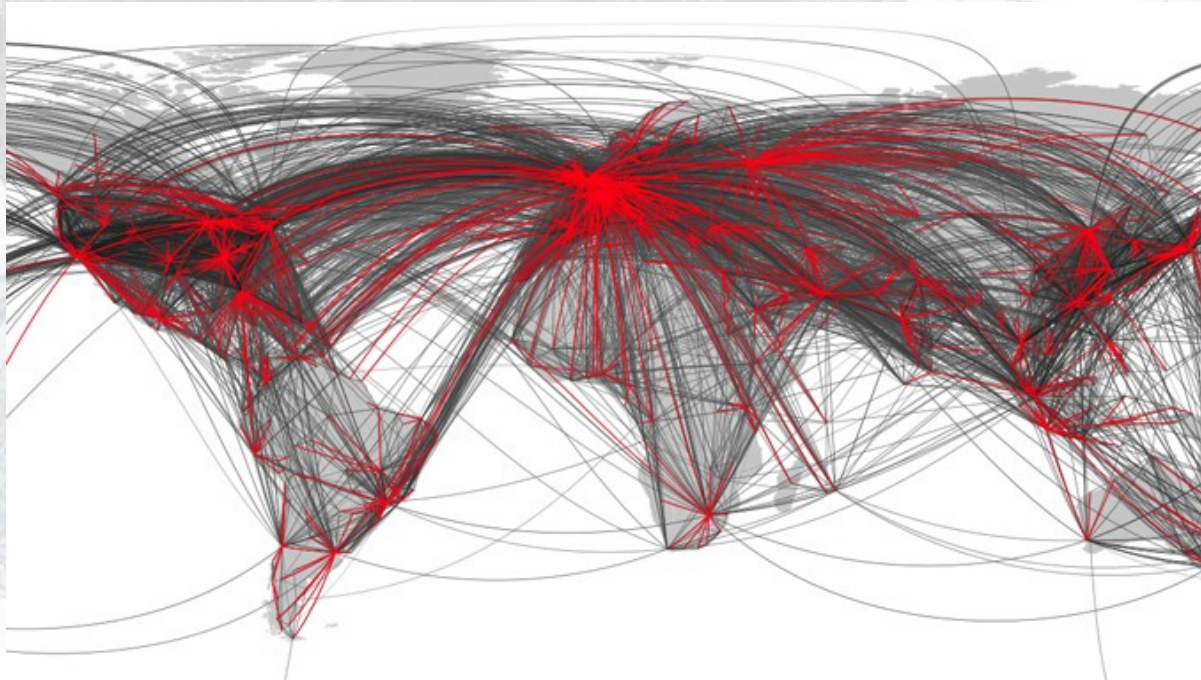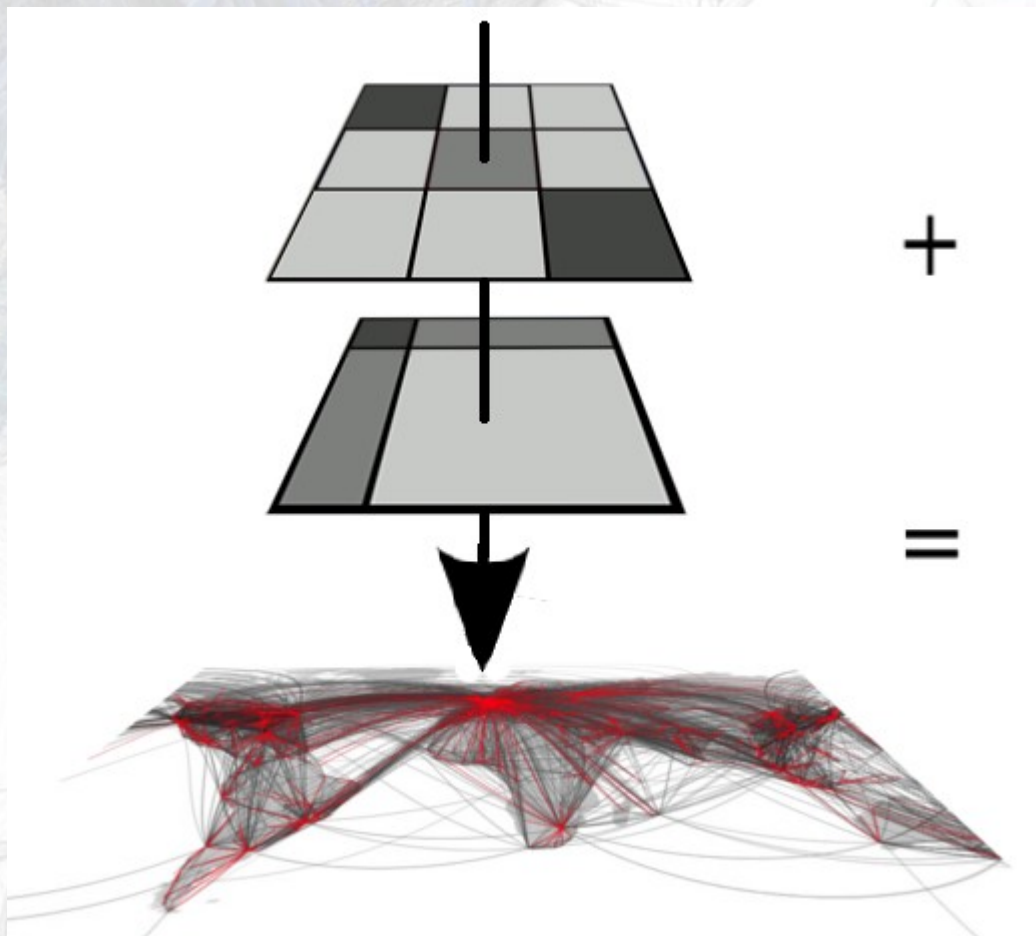
- Mitochondrial metabolic network

Robinson A, Medical Research Council, picture retrieved from
http://www.mrc-mbu.cam.ac.uk/research/gallery/slides/mitochondrial-metabolic-network

Stochastic Block Models (SBM) capture information
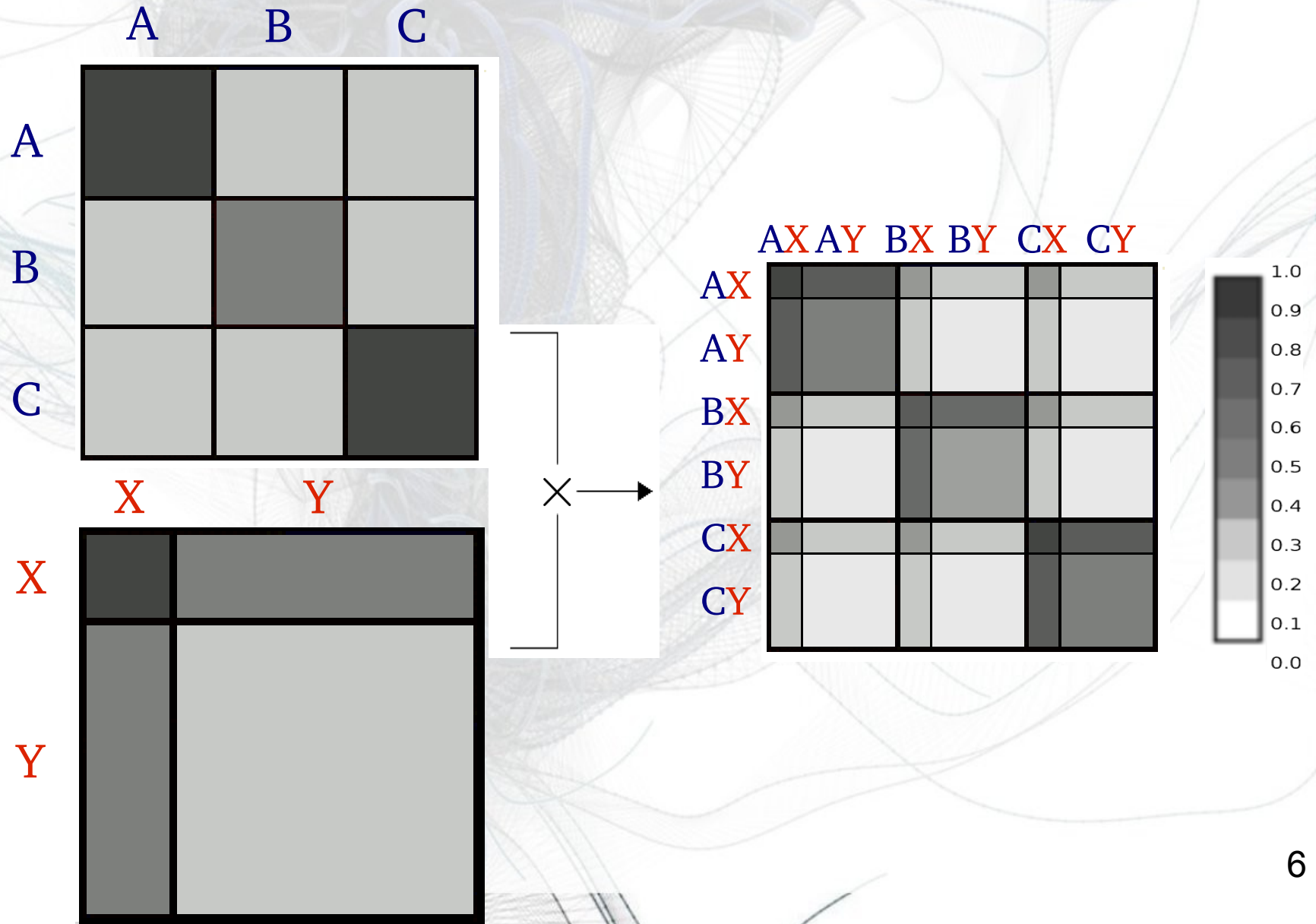
Hubs   No Hubs

Hubs

No Hubs

4

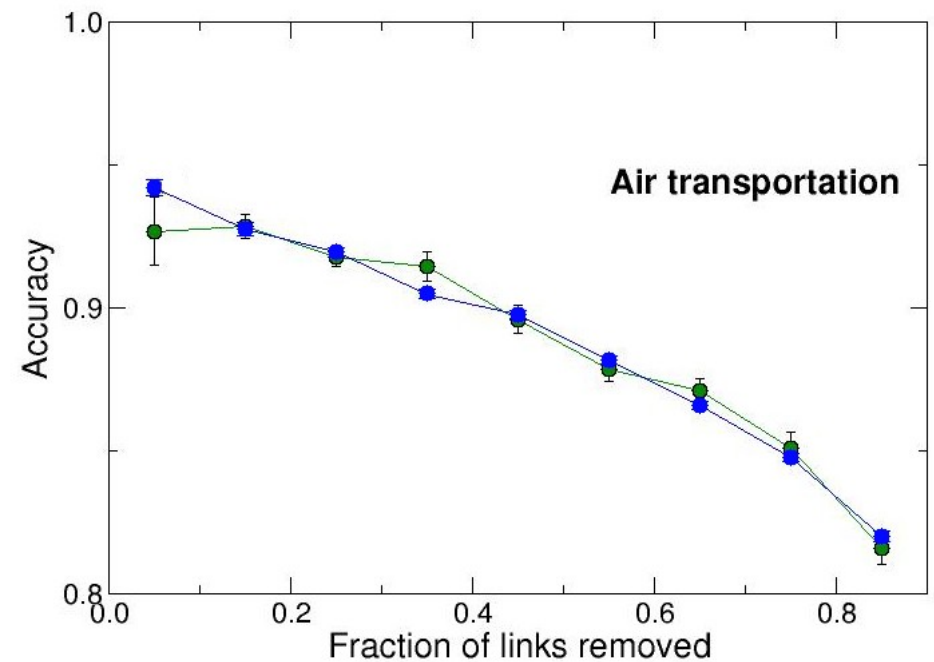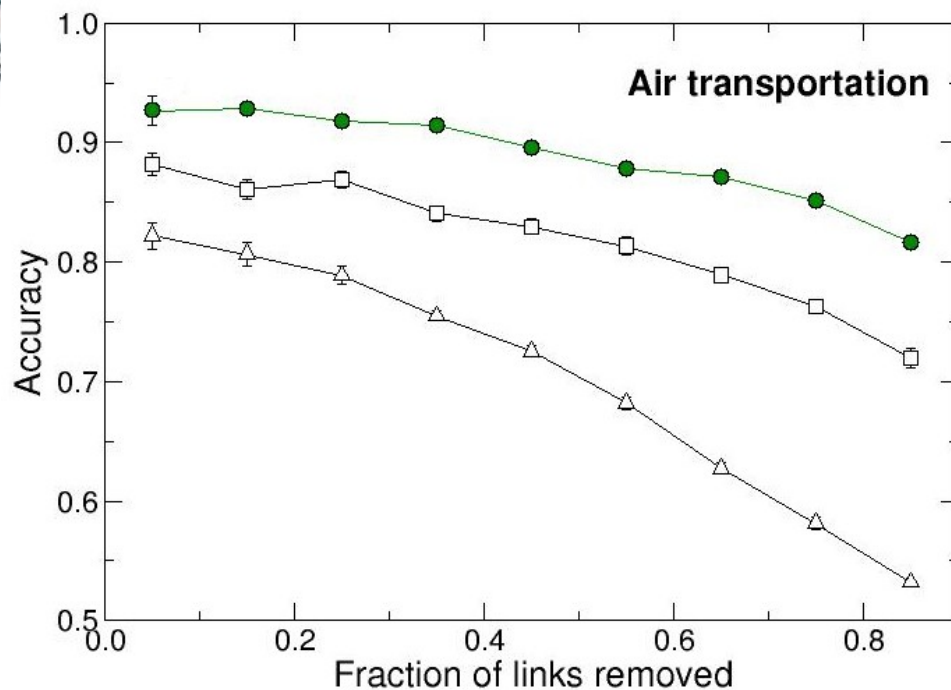# Multiblock Model uses two SBM to describe the network

The Model depends only on probabilites between groups

SBM are a good approach to predict missing links

- European air transportation network

  – Stochastic Block Model (green circles)

  – Clauset approach et al. (white squares)

  – Number of common neighbors (white triangles)

- European air transportation network

  – Stochastic Block Model (green circles)

  – Multiblock Model (blue circles)

Missing and spurious interactions and the reconstruction of complex networks. Guimera, R, Sales-Pardo, *M.Proc. Natl. Acad. Sci. U. S. A.* 106, 22073-22078 (2009)
Hierarchical structure and the prediction of missing links in networks Clauset A, Moore C, Newman MEJ .*Nature* 453:98–101 (2008)
The link-prediction problem for social networks. Liben-Nowell D, Kleinberg J .*J Am Soc Inf Sci Technol* 58:1019–1031 (2007)

7

Thanks for your Attention

http://www.etseq.urv.cat/seeslab/

https://twitter.com/sees_lab