

NETWORK SCIENCE vs WIKILEAKS etc.

Lovro Šubelj

Cookie seminar at FRI

19.3.2015

ACKNOWLEDGEMENTS



Aleksandar



Angelina



Peter



Marko



Slavko

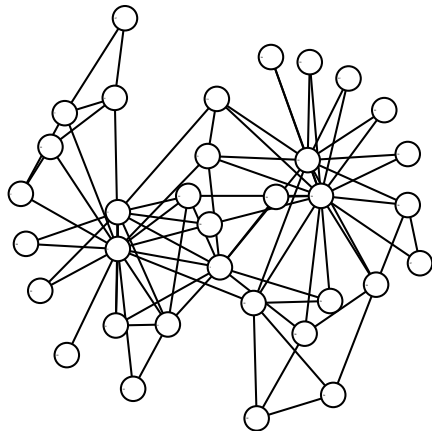


Marinka



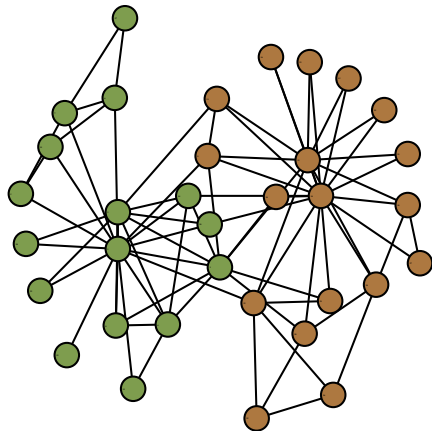
Julian

KARATE CLUB NETWORK



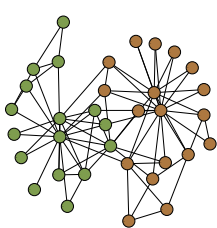
Zachary, W. W., *J. Anthropol. Res.* **33**, 452–473 (1977).

KARATE CLUB SPLIT

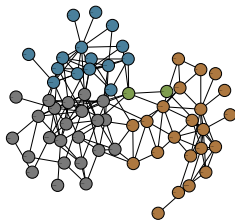


Zachary, W. W., *J. Anthropol. Res.* **33**, 452–473 (1977).

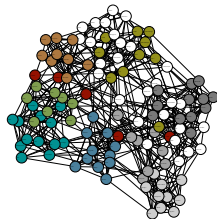
NETWORKS WITH COMMUNITIES



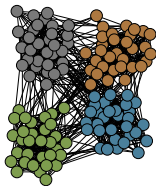
Karate club



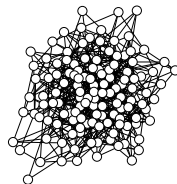
Bottlenose dolphins



American football



Synthetic graph



Random graph

NETWORK COMMUNITY DETECTION

- hierarchical clustering,
- modularity optimization,
- statistical inference,
- spectral methods,
- map equation,
- dynamics etc.

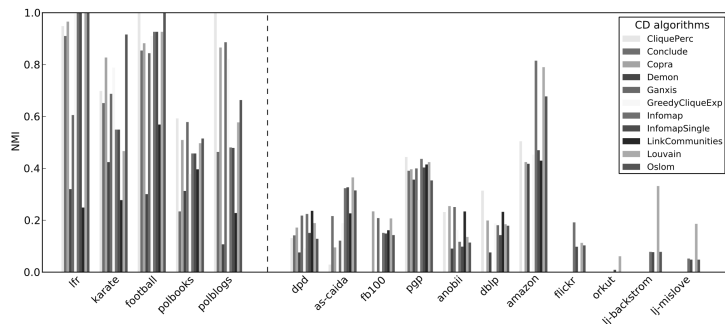
Girvan, M. & Newman, M. E. J., *P. Natl. Acad. Sci. USA* **99**, 7821–7826 (2002).

LABEL PROPAGATION ALGORITHM

Raghavan, U. N., Albert, R. & Kumara, S., *Phys. Rev. E* **76**, 036106 (2007).

Šubelj, L. & Bajec, M., *Phys. Rev. E* **83**, 036103 (2011) etc.

COMMUNITY DETECTION IN PRACTICE

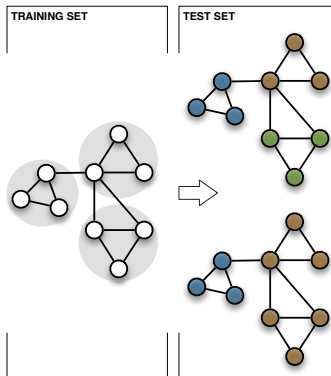


Hric, D., Darst, R. K. & Fortunato, S., *Phys. Rev. E* **90**, 062805 (2014).

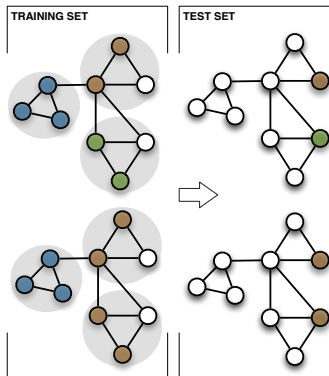
Hric, D., *Proceedings of NetSci '14*, Berkley, CA, USA (2014).

COMMUNITY DETECTION TASKS

EXPLORATORY TASK



PREDICTIVE TASK



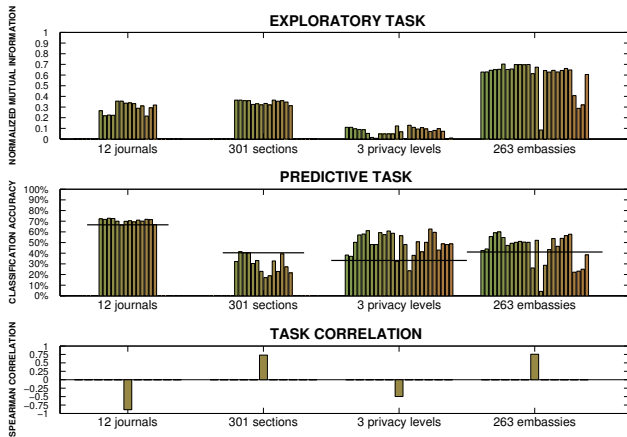
Šubelj, L., *Proceedings of ARS '15*, Capri, Italy (2015).

Šubelj, L., *submitted at NetSci '15*, Zaragoza, Spain (2015).

APS & WIKILEAKS NETWORKS

DATA	APS 1893-2013	WikiLeaks 1966-2010
NETWORK	citation 526,527 papers 5,989,263 citations	reference 52,416 cables 78,506 references
CLUSTERS	12 journals 301 sections	3 privacy levels 263 embassies
SETTING	14 algorithms	26 algorithms
TRAINING	1893-2012	1966-2009
TEST	2013 (4%)	2010 (17%)

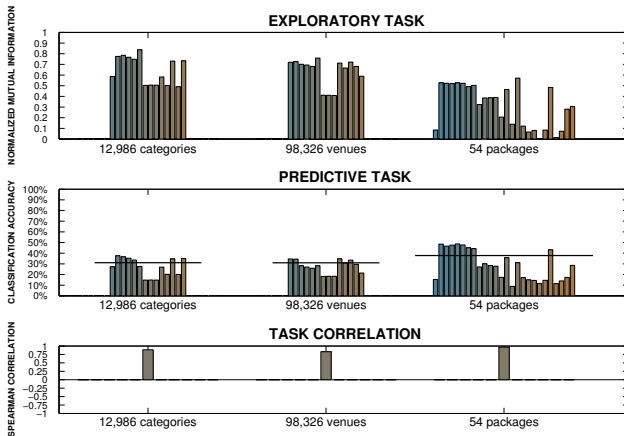
APS & WIKILEAKS RESULTS



YOUTUBE, DBLP & JAVA NETWORKS

DATA	YouTube	DBLP	java
NETWORK	social 39,841 users 224,235 friends.	collaboration 317,080 authors 1,049,866 collabs.	software 2,378 classes 14,619 dependens.
CLUSTERS	12,986 groups	98,326 venues	54 packages
SETTING	14 algorithms leave-one-out	14 algorithms leave-one-out	26 algorithms leave-one-out

YOUTUBE, DBLP & JAVA RESULTS



NETWORKS ARE FUN

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