

P. Behrouzi, S.M. Mahmoudi, F. Richter, M. Shafiee, M. Signorelli, E. Wit  
p.behrouzi@rug.nl, s.m.mahmoudi@rug.nl, f.richter@rug.nl, m.shafiee.kamalabad@rug.nl, m.signorelli@rug.nl, e.c.wit@rug.nl

## Introduction

Donec feugiat sagittis **neque**, nec ultrices risus vestibulum at. Suspendisse enim purus, tempus sed malesuada et, aliquam non nulla. Cras vel tortor justo. Vestibulum viverra purus id risus lacinia quis malesuada lorem mattis. **Nullam ornare egestas** metus vel posuere. In hac habitasse platea dictumst. In malesuada aliquet nulla, quis iaculis mauris accumsan ac. Maecenas placerat hendrerit mollis. Nunc fringilla sollicitudin pulvinar. Vestibulum a odio arcu. *Ut tristique enim ut odio pulvinar non dignissim risus dignissim.* Nullam nibh augue.

## Box 1

**ER1** Sed a orci non ipsum posuere placerat. Nunc in mi augue, a adipiscing massa. Donec dapibus gravida odio, condimentum convallis urna.

**ER2** Nullam sagittis cursus neque, sit amet mollis elit auctor in. Etiam sed lectus a nulla rhoncus interdum a tempus nunc. Sed at eleifend purus.

Nullam sollicitudin lobortis urna quis varius. Nullam sagittis blandit diam,  $DN = G_t(V_t, E_t)$ , risus  $E_t \subseteq V_t \times V_t$  ( $\forall t \geq 0$ ). vel tortor justo,  $G_0$ , quis malesuada lorem.

$$\cos^3 \theta = \frac{1}{4} \cos \theta + \frac{3}{4} \cos 3\theta \quad (1)$$

Vivamus porta lacus et lectus **porta lacus**. Pellentesque habitant morbi tristique senectus et netus et malesuada fames ac turpis. torte  $G_t$  hac millis **plates** Idk

## Box 3

Nunc sit amet sem ut nulla tincidunt mattis vel nec mauris. Vestibulum odio tellus, lobortis. Vel adipiscing, Aliquam dictum, ligula egestas commodo posuere, lectus lectus congue ligula, sed posuere urna lectus at nisi. Aenean commodo risus ut dolor (viverra scelerisque). Nullam varius, lacus et interdum hendrerit, odio orci ultrices mauris, id interdum eros mauris at urna. Fusce in nisi eros, sit amet volutpat turpis, **porttior magna** (commodo blandit euismod) **facilisis ornate magnis** (dis magnis).

Treatments	Response 1	Response 2
Treatment 1	0.0003262	0.562
Treatment 2	0.0015681	0.910
Treatment 3	0.0009271	0.296

Table 1: Table caption

## Simplification of complex networks

### RESEARCH QUESTION:

Large networks challenge our capacities to visualize and interpret them. Often, one can exploit information on communities to derive a reduced graph summarizing relations between communities.

### EXAMPLES:

- use ontologies/pathways to summarize gene regulatory networks;
- groups of individuals in social networks (e.g., parties in a Parliament).

### METHODS:

- significance test based on number of links between communities: implemented in R package **neat** ( $\rightarrow$  *arXiv:1604.01210*);
- penalized stochastic blockmodels ( $\rightarrow$  *arXiv:1607.08743*).

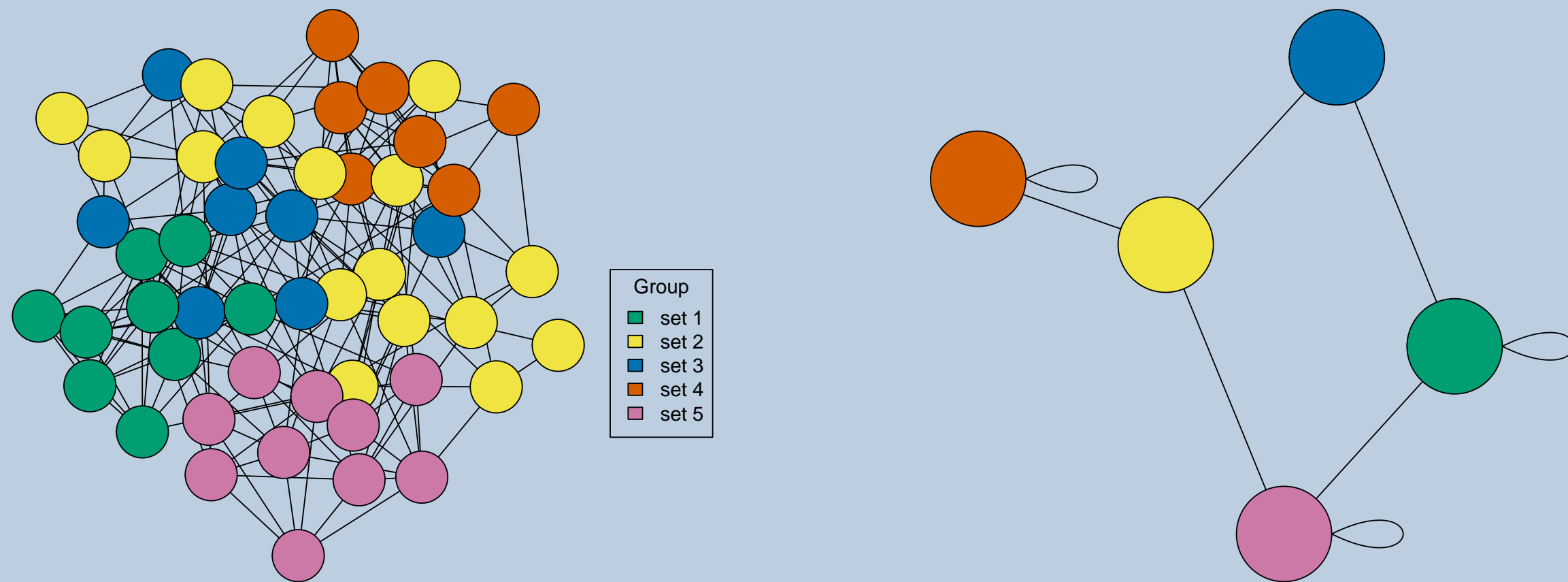


Figure 1: We develop statistical methods that allow to summarize relations between communities in large graphs (left) with a reduced graph (right).

### CONCLUSION:

Reduced graphs displaying relations between communities can provide a synthetic and meaningful insight on complex networks.

**CONTACT:** Mirko Signorelli, m.signorelli@rug.nl.

## Box 4

Nunc sit amet sem ut nulla tincidunt mattis vel nec mauris. Vestibulum odio tellus, lobortis. Vel adipiscing, Aliquam dictum, ligula egestas commodo posuere, lectus lectus congue ligula, sed posuere urna lectus at nisi.

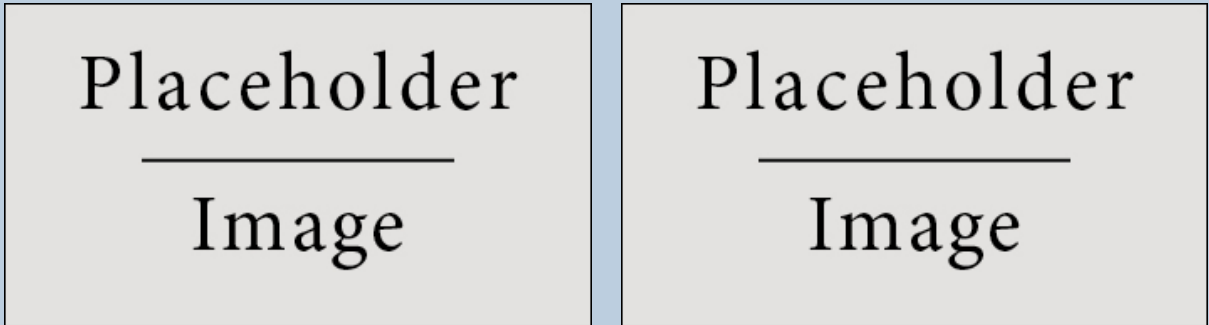


Figure 2: Figure caption 1 (left); Figure caption 2 (right)

Aliquam ac justo lectus. Nunc ultrices aliquet purus non dictum. Nulla facilisi. Quisque vitae urna non purus sollicitudin venenatis. Aliquam erat volutpat. Cum sociis natoque penatibus et magnis dis parturient montes, nascetur ridiculus mus. In hendrerit tortor sed massa consequat eu viverra justo porta. Ut nec felis sem, non elementum.