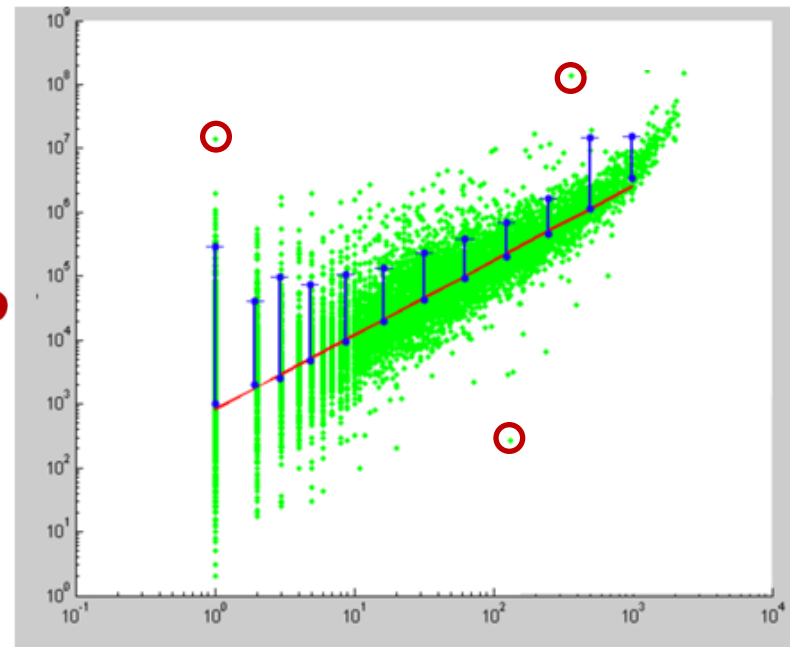
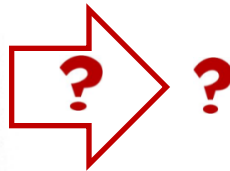
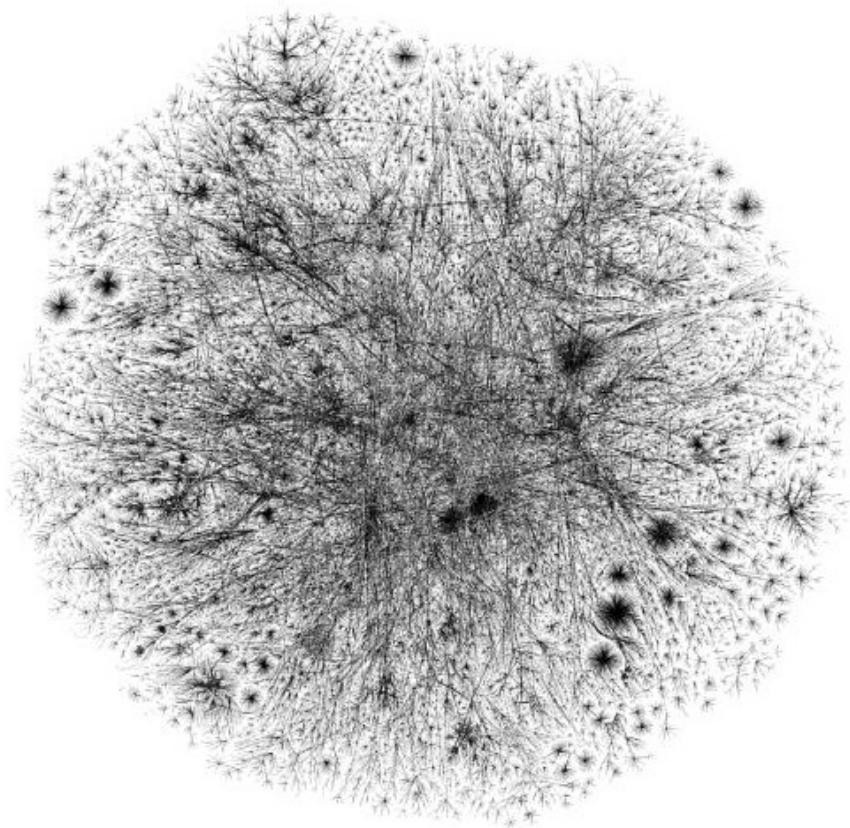




# Ego-net Patterns



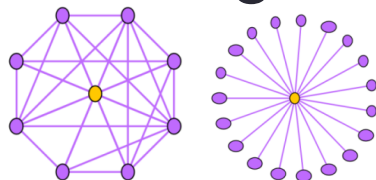
Oddball: Spotting anomalies in weighted graphs  
Leman Akoglu, Mary McGlohon, Christos Faloutsos  
PAKDD 2010



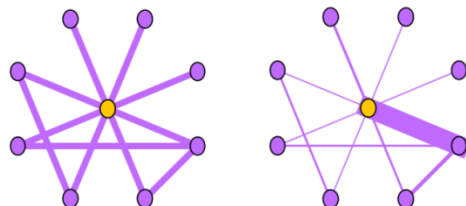
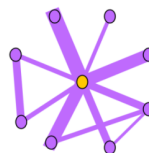


# Ego-net Patterns

- $N_i$ : number of neighbors (degree) of ego  $i$
- $E_i$ : number of edges in egonet  $i$

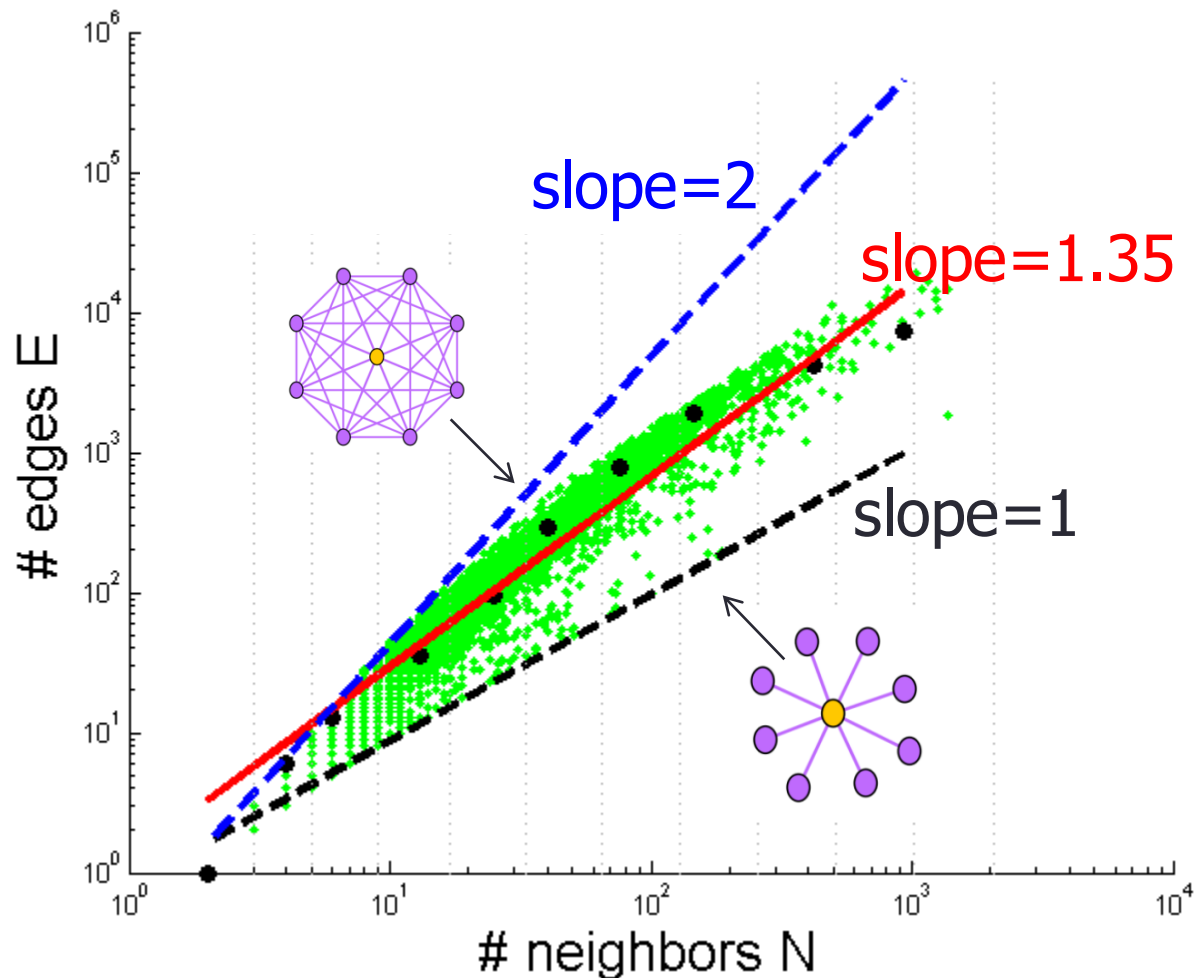


- $W_i$ : total weight of egonet  $i$
- $\lambda_{w,i}$ : principal eigenvalue of the **weighted** adjacency matrix of egonet  $i$





# Pattern: Ego-net Power Law Density



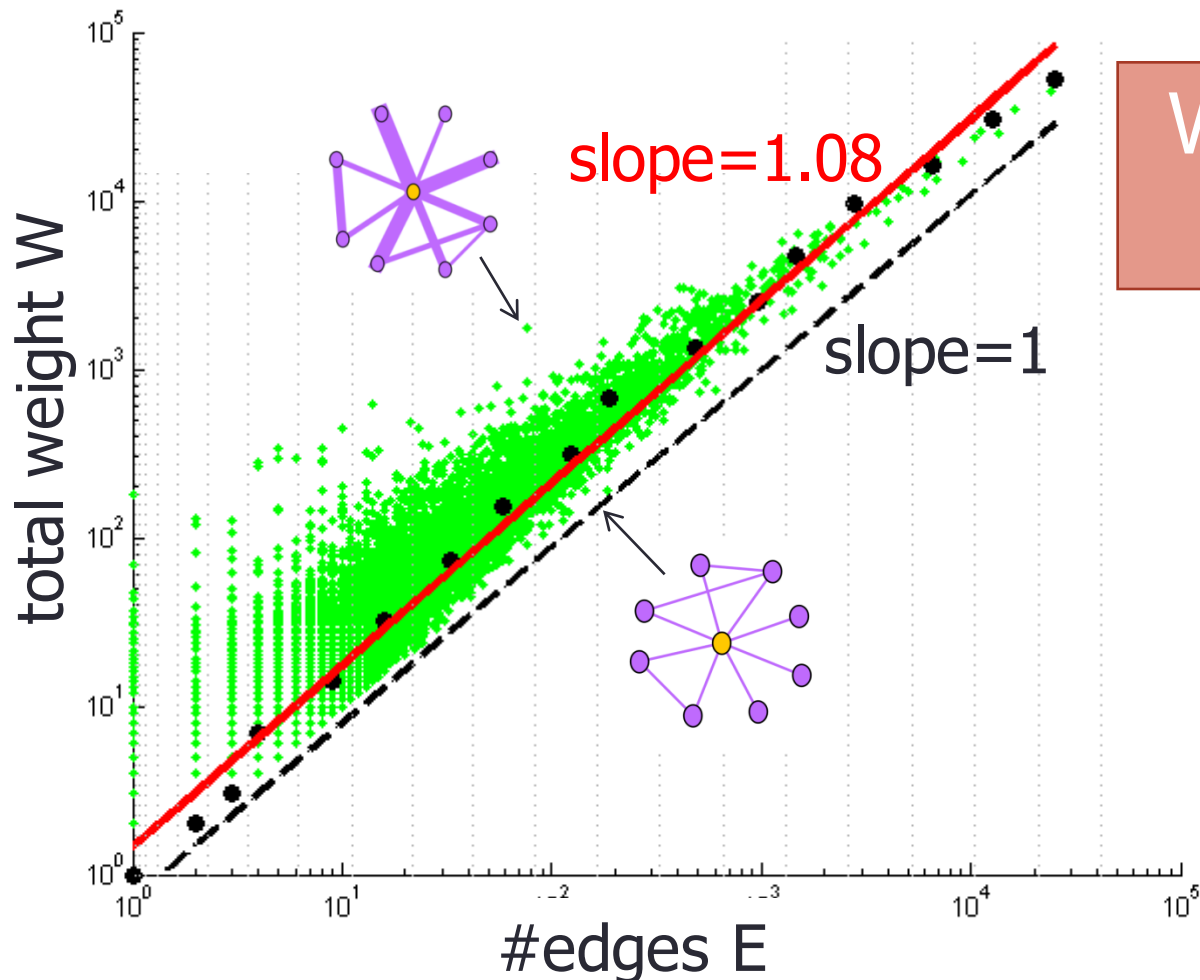
$$E_i \propto N_i^\alpha$$

$$1 \leq \alpha \leq 2$$

Oddball: Spotting anomalies in weighted graphs  
 Leman Akoglu, Mary McGlohon, Christos Faloutsos  
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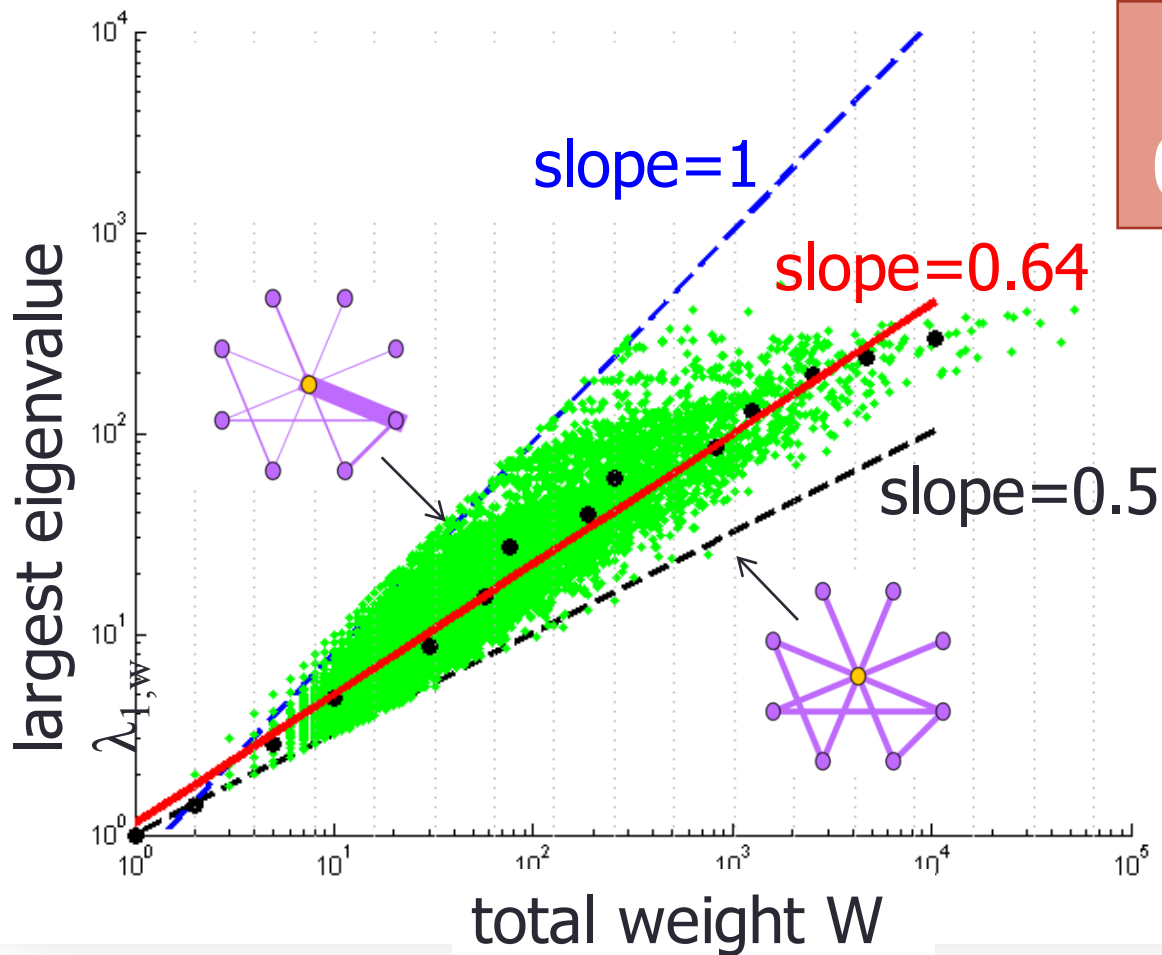
# Pattern: Ego-net Power Law Weight



Oddball: Spotting anomalies in weighted graphs  
Leman Akoglu, Mary McGlohon, Christos Faloutsos  
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# Pattern: Ego-net Power Law Eigenvalue



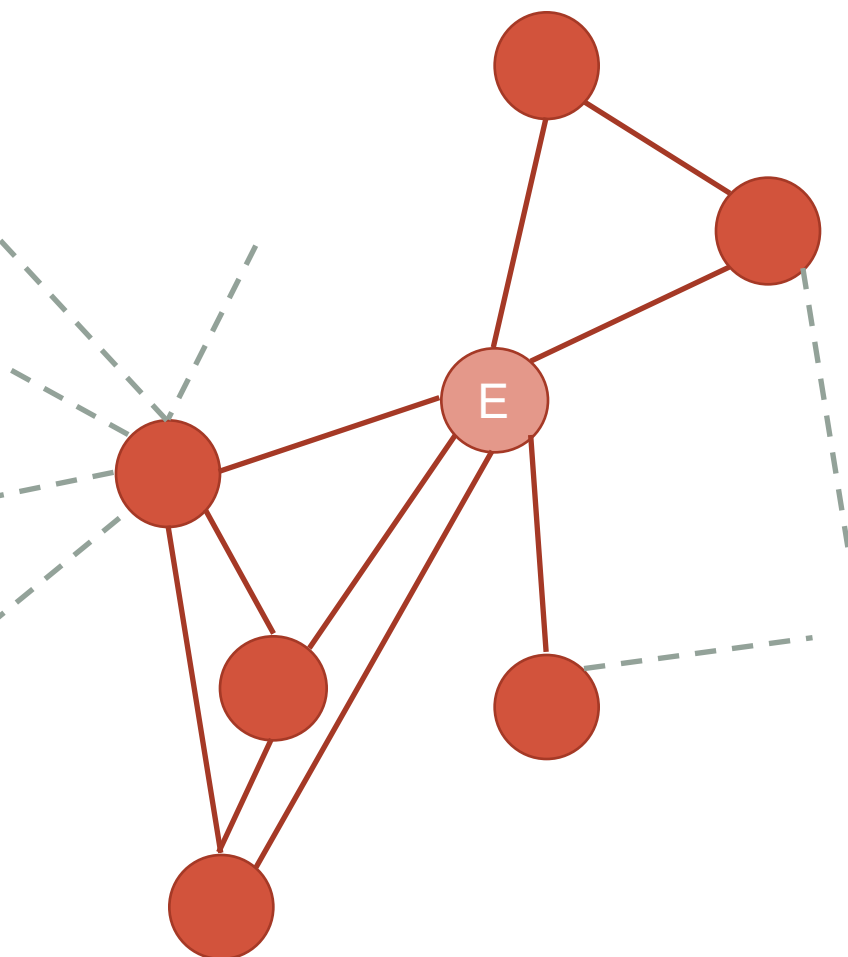
$$\lambda_i \propto W_i^\alpha$$

$$0.5 \leq \alpha \leq 1$$

Oddball: Spotting anomalies in weighted graphs  
 Leman Akoglu, Mary McGlohon, Christos Faloutsos  
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# Using graph patterns to find roles



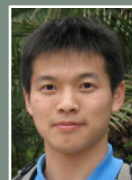
*Useful* node features:

- Degree
- Nodes in ego-net
- Edges in ego-net
- Edges leaving ego-net
- Mean of neighbor degree
- Sum of neighbor degree
- Expand recursively...

It's who you know: Graph mining using recursive structural features

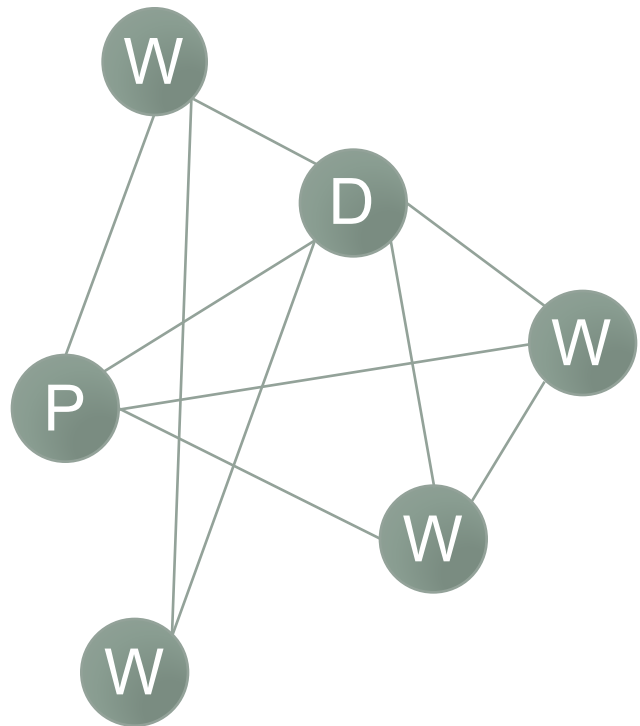
K. Henderson, B. Gallagher, L. Li, L. Akoglu,  
T. Eliassi-Rad, H. Tong, C. Faloutsos

KDD 2011

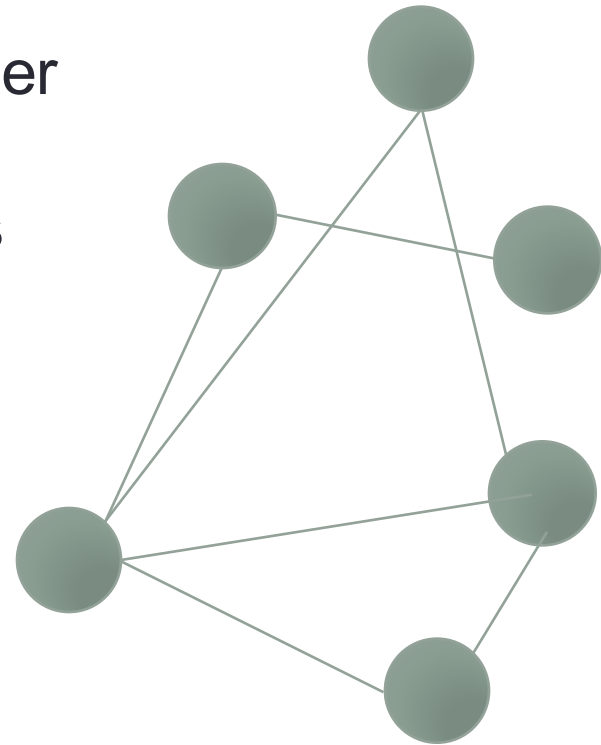




# Using graph patterns to find roles



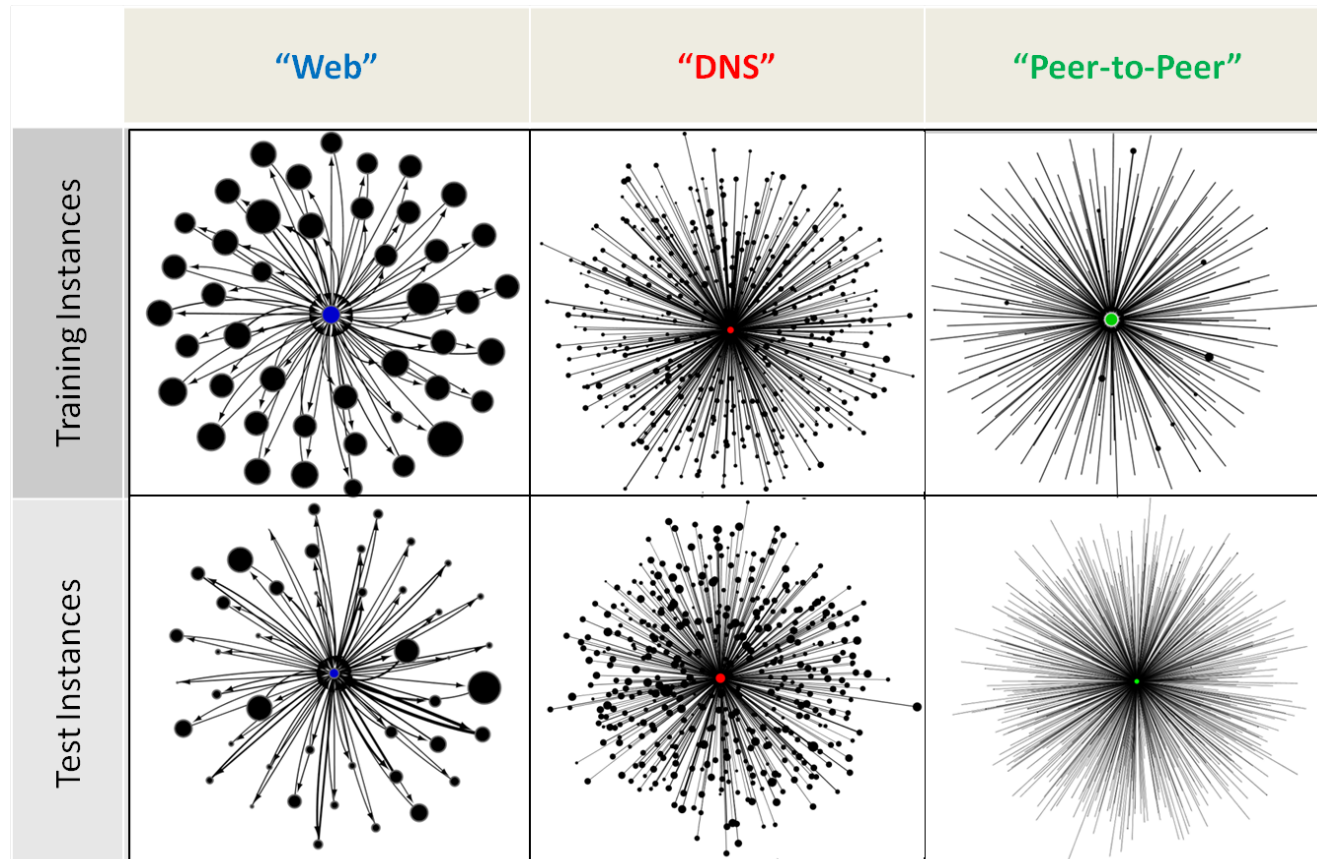
Learn classifier  
to predict  
node labels



It's who you know: Graph mining using recursive structural features  
Keith Henderson, Brian Gallagher, Lei Li, Leman Akoglu,  
Tina Eliassi-Rad, Hanghang Tong, Christos Faloutsos  
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# Using graph patterns to find roles



It's who you know: Graph mining using recursive structural features

Keith Henderson, Brian Gallagher, Lei Li, Leman Akoglu,

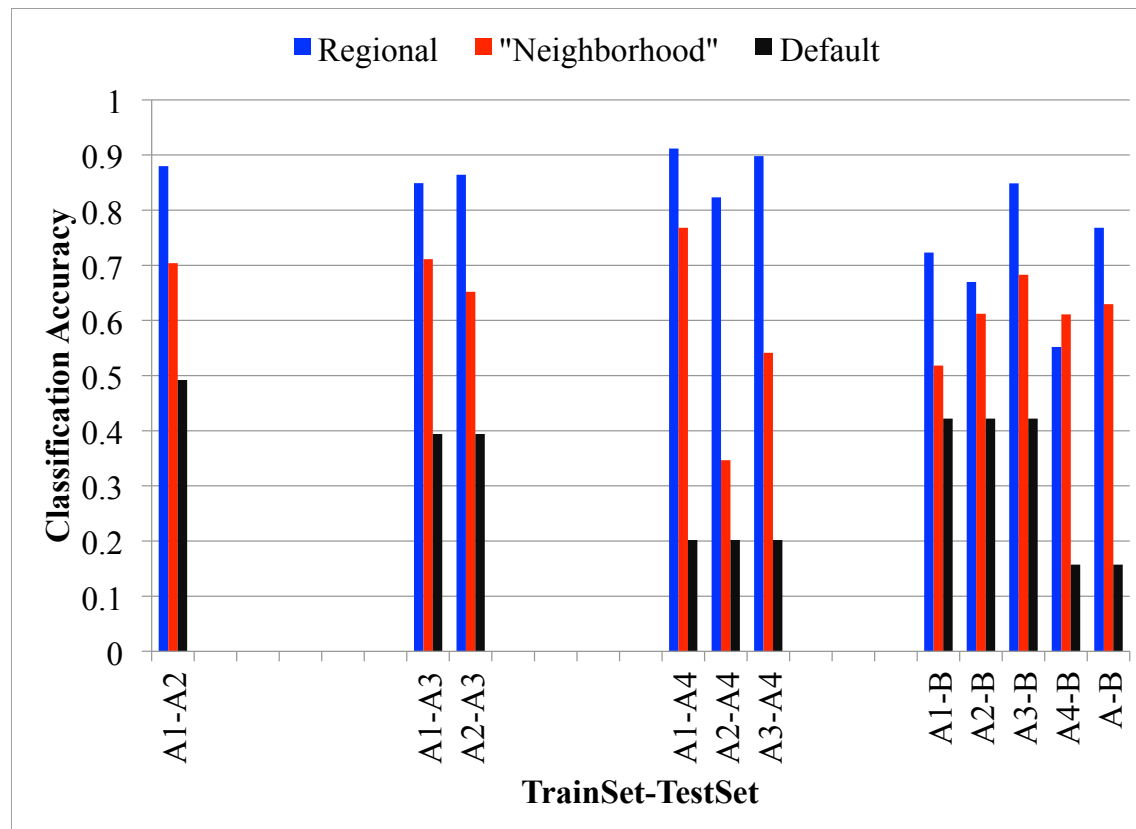
Tina Eliassi-Rad, Hanghang Tong, Christos Faloutsos

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# Using graph patterns to find roles



It's who you know: Graph mining using recursive structural features

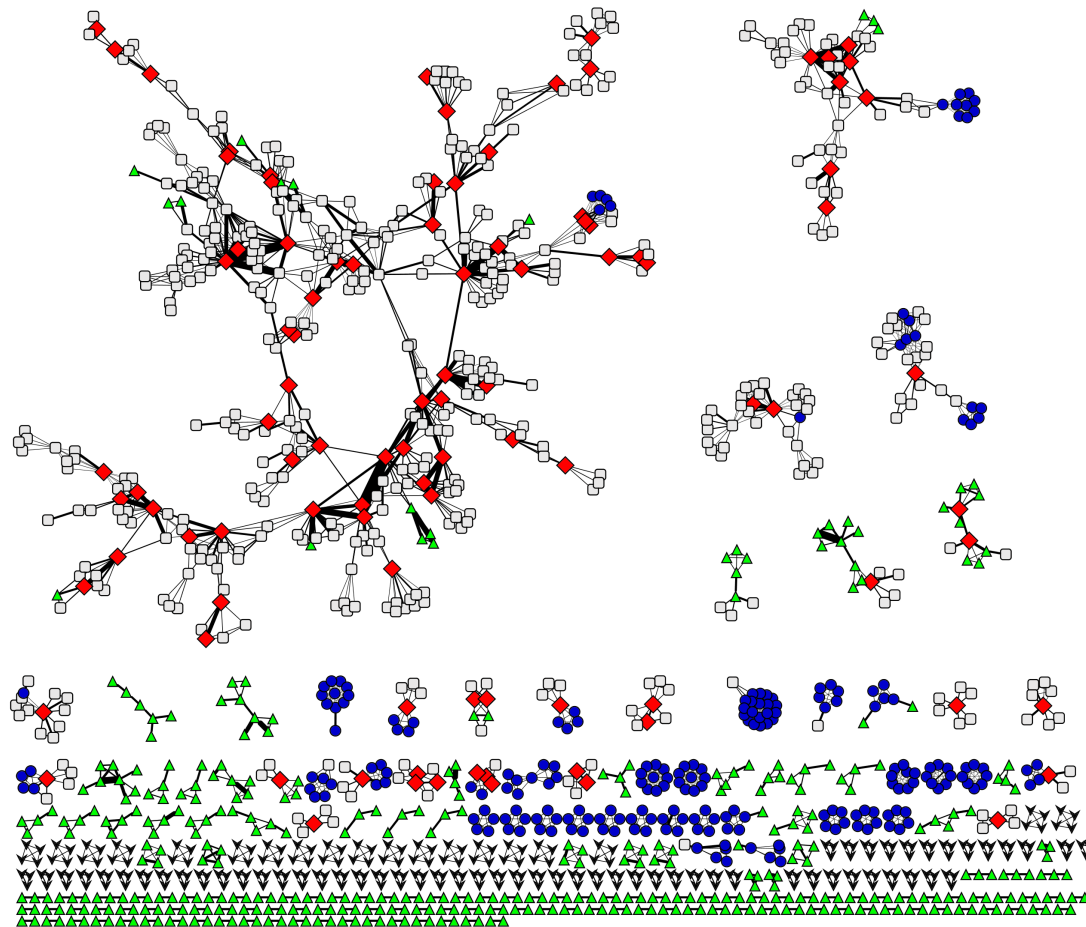
Keith Henderson, Brian Gallagher, Lei Li, Leman Akoglu,

Tina Eliassi-Rad, Hanghang Tong, Christos Faloutsos

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# Using graph patterns to find roles



Use graph features to find similar types of behavior:

- Christos Faloutsos & Andrei Broder: tightly knit communities
- Albert-Laszlo Barabasi & Mark Newman: bridge communities
- John Hopcroft and Jon Kleinberg: mainstream
- Lada Adamic and Bernardo Huberman: elongated clusters

RoIX: Structural Role Extraction & Mining in Large Graphs

K. Henderson, B. Gallagher, T. Eliassi-Rad,  
H. Tong, Sugato Basu, L. Akoglu,  
D. Koutra, C. Faloutsos, L. Li

KDD 2012

