

# Characteristics of the World Scientific Collaboration Network



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Cracow University  
of Technology

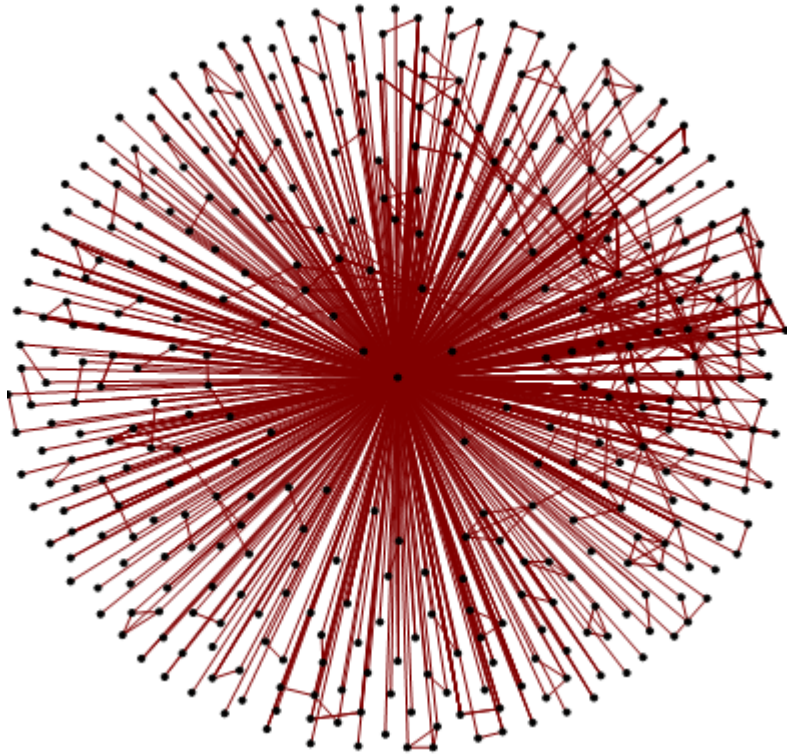
A. Kulig, A. Niewiarowski, M. Stanuszek, S. Drożdż  
IFJ PAN Kraków, Politechnika Krakowska Instytut Informatyki

# Characteristics of the World Scientific Collaboration Network

## Exact science

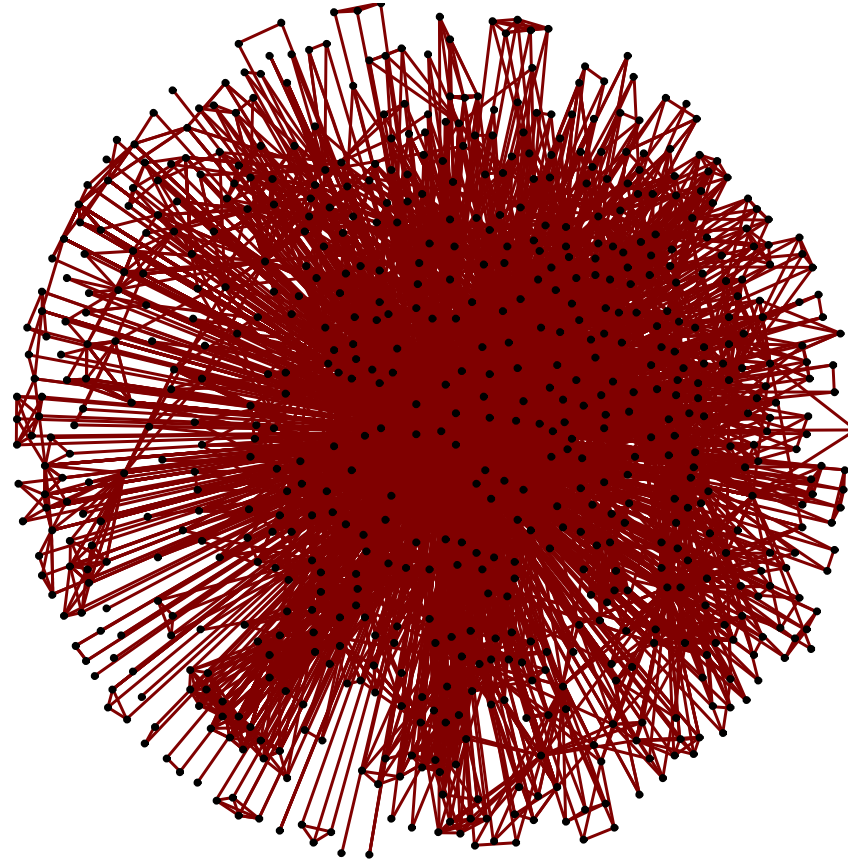
P. Erdős

$h_{\text{index}} = 46$



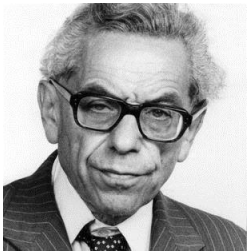
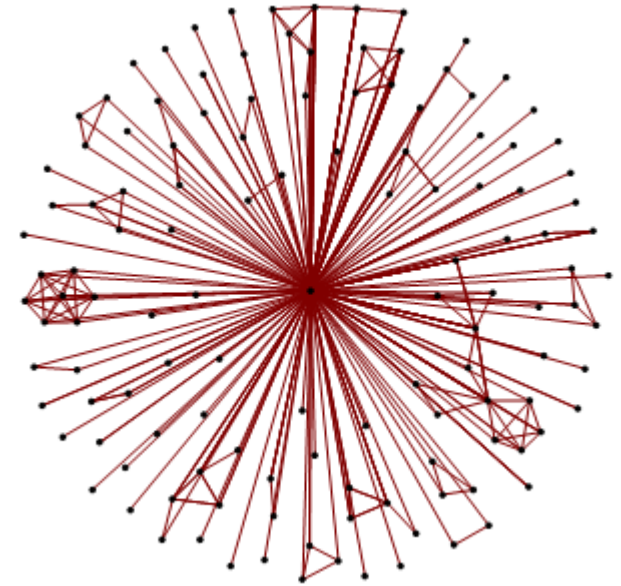
H.E. Stanley

$h_{\text{index}} = 123$



E. Witten

$h_{\text{index}} = 131$



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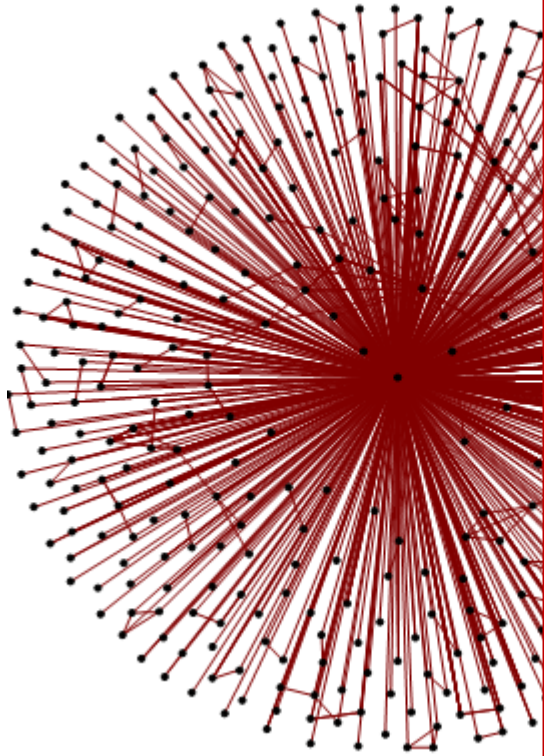
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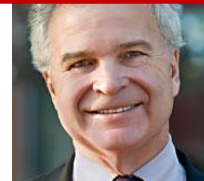
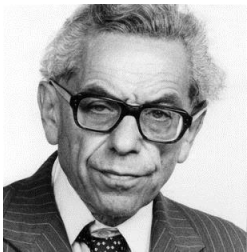
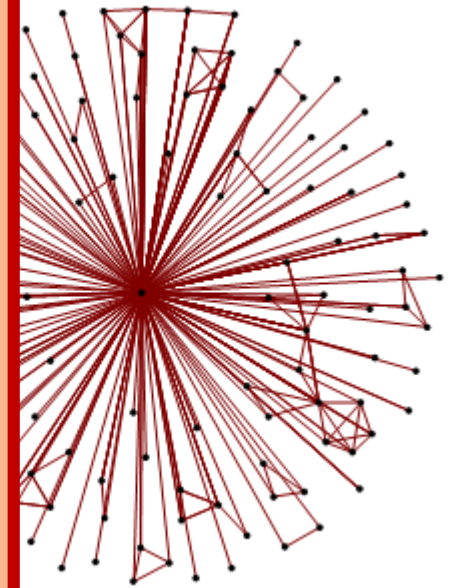
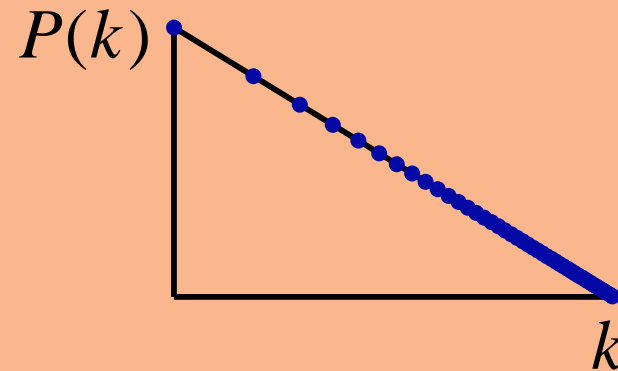


### Degree distribution

$$\frac{\partial k_i}{\partial t} = m \frac{k_i}{\sum_j k_j}$$

$$P(k) \propto k^{-\gamma}$$

$$2 \leq \gamma \leq 3$$





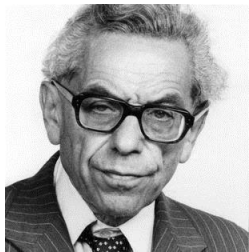
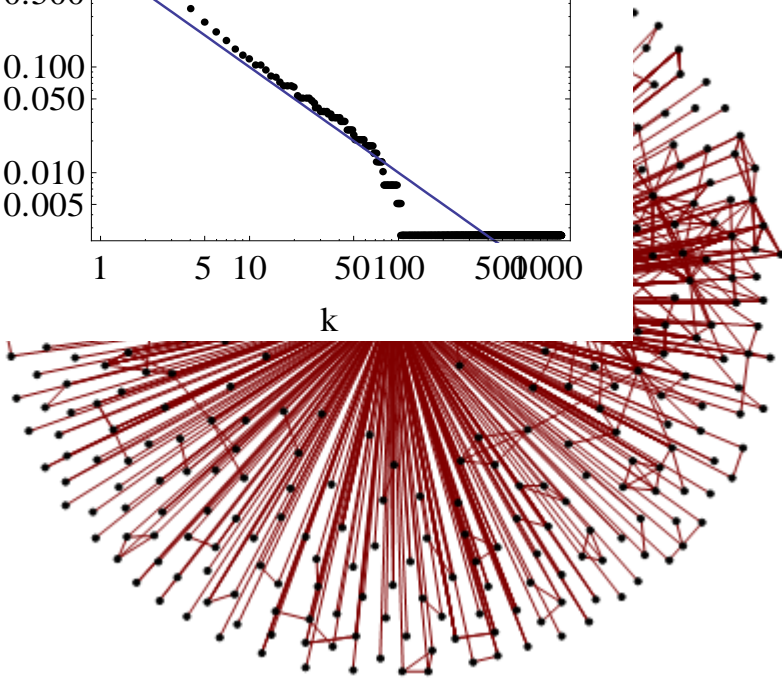
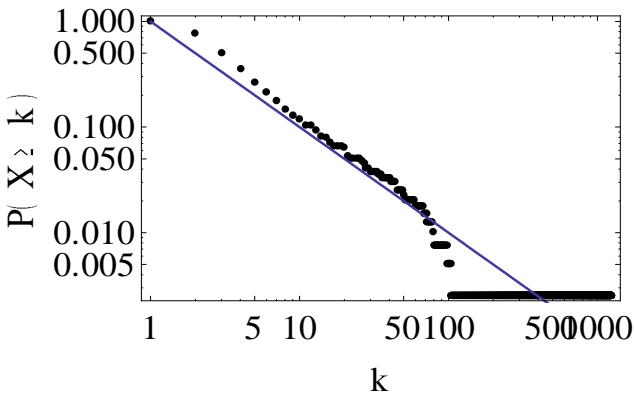
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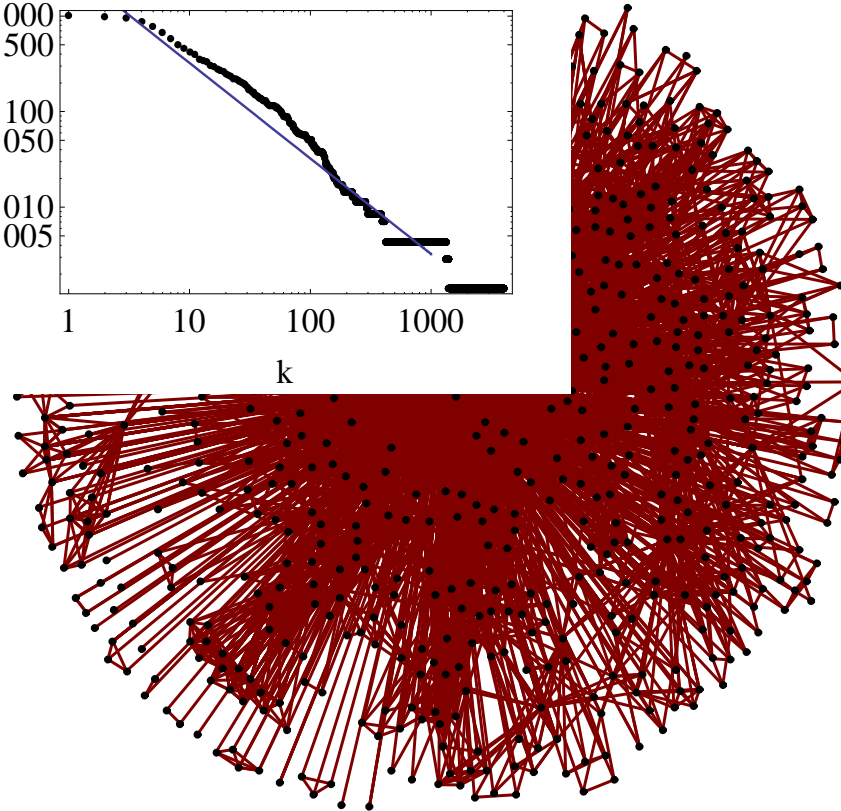
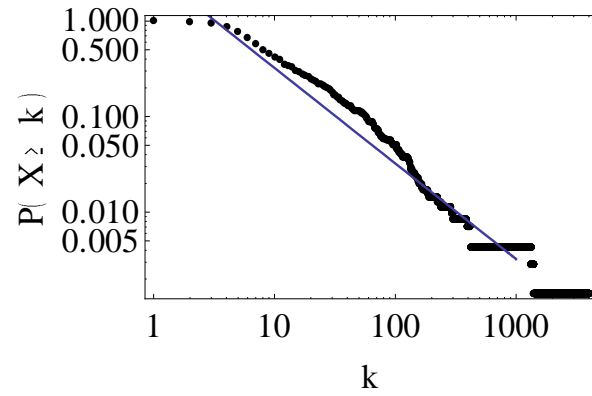
Cumulative degree distribution



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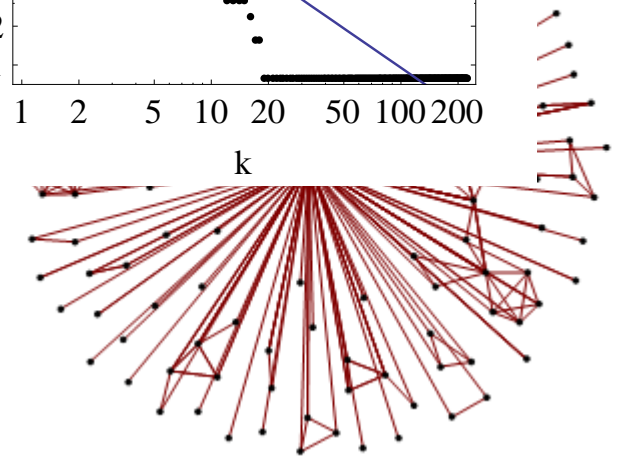
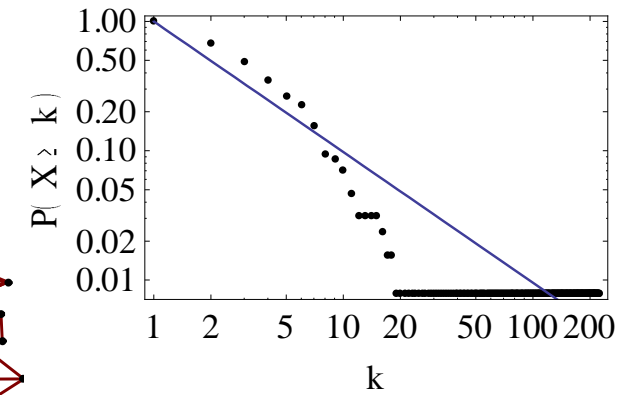
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Cumulative degree distribution



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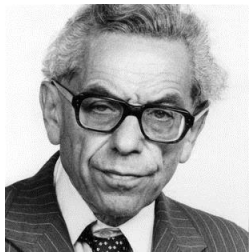
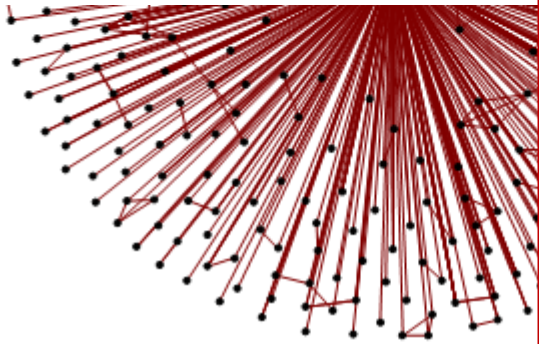
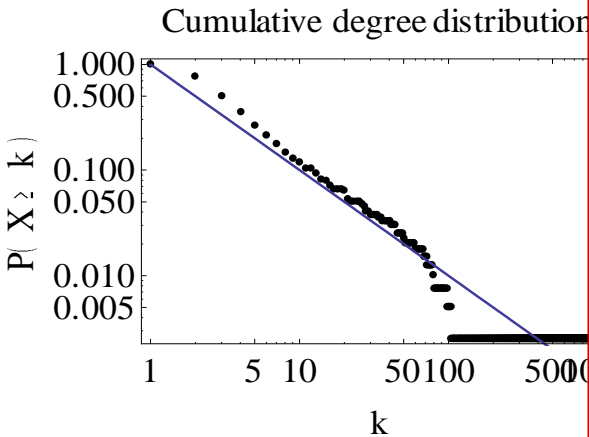
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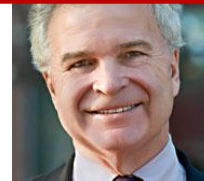
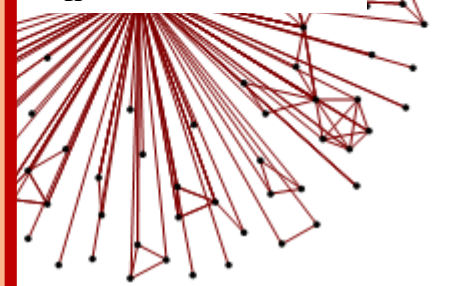
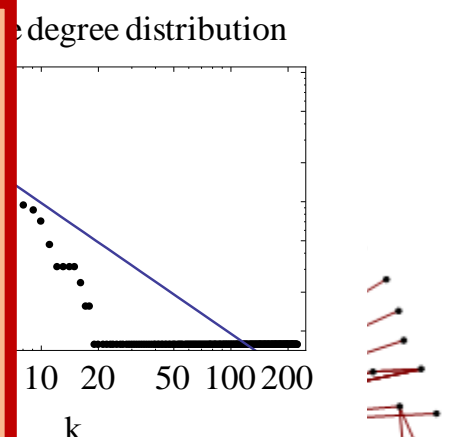
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### Clustering coefficient

$$C_i = \frac{2E_i}{k_i(k_i - 1)}$$
$$C(k) \propto k^{-\lambda}$$
$$\lambda \approx 1$$

A plot of the clustering coefficient  $C(k)$  versus  $k$ . The y-axis is labeled  $C(k)$  and the x-axis is labeled  $k$ . The data points (blue dots) follow a blue line that represents a power-law distribution, indicating a scale-free network.



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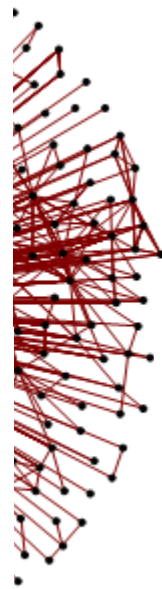
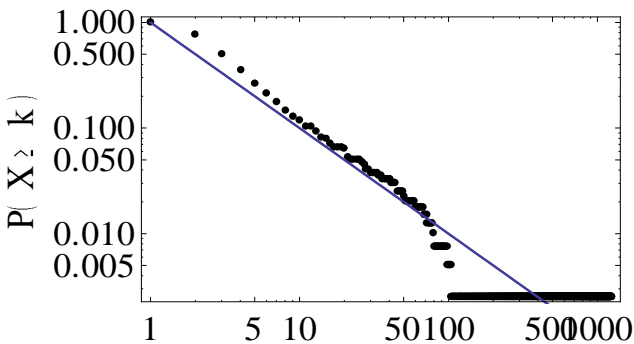
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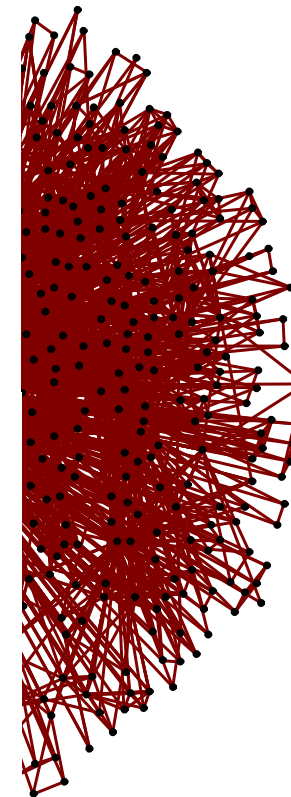
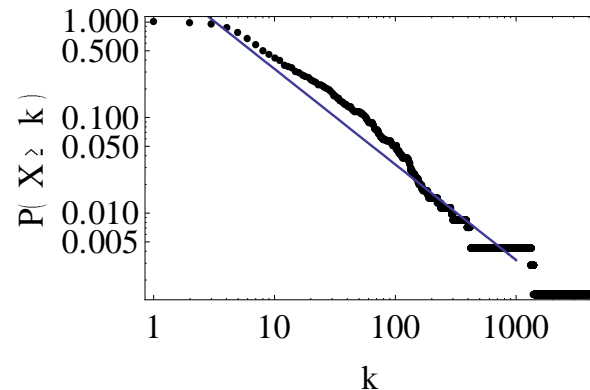
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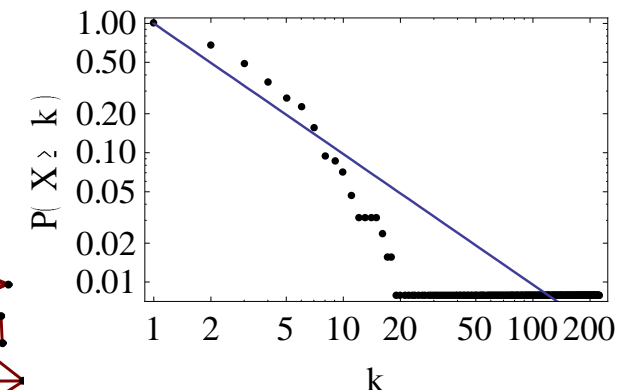
Cumulative degree distribution



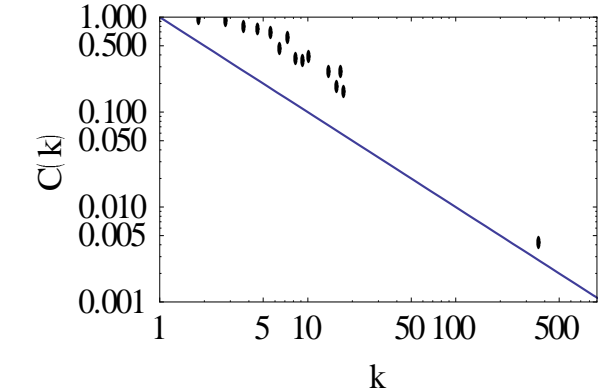
Cumulative degree distribution



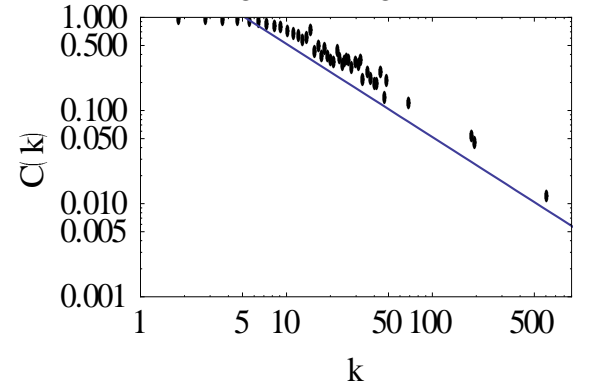
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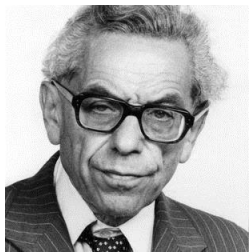
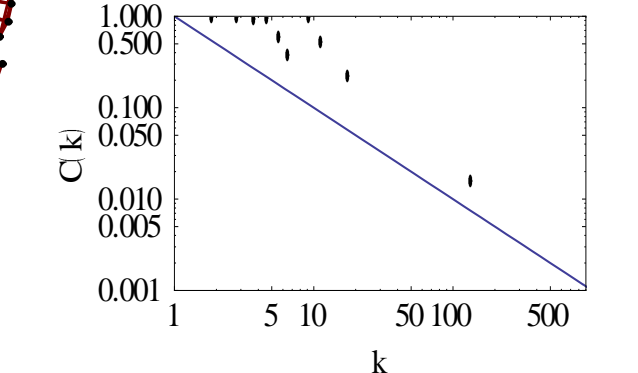
Average clustering coefficient



Average clustering coefficient



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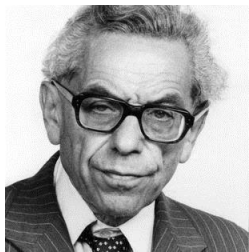
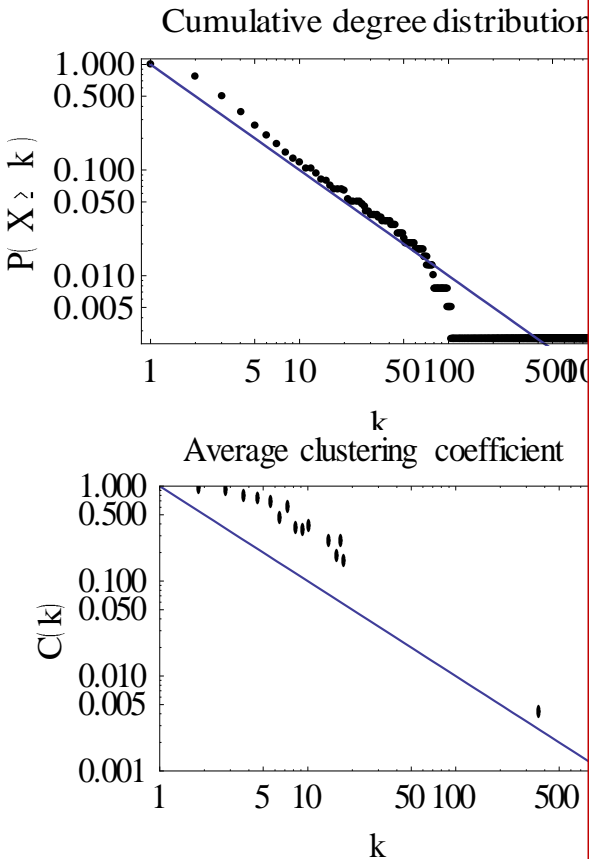
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**Main conclusions:**

- a new bibliometric measure
- complex networks approach gives a lot of useful information
- most collaboration networks have a hierarchical structure

