Insights from bibliometric network properties into technology evolution
- wind energy example -

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Aim and approach of this work

Aim

- Detect/better understand patterns of wind energy technology emergence and advancement

Approach

- Analyse evolution of basic bibliometric network properties
- Put numbers to network topologies in keyword co-occurrence maps
- Boolean searches, analysis with TIM and Gephi

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Search strings bibliometric networks (1996-2016)

Electric Power (> 170 000 articles retrieved**)**
ti_abs_key: ("**electric power**" OR "**electric energy**" OR "**power plant**" OR "**power station**")

Wind (~ 67 000 articles retrieved**)**
ti_abs_key: ("**wind power**" OR "**wind energy**" OR "**wind turbine**" OR "**wind energy converter**" OR "**wind farm**" OR "**wind park**") NOT ti_abs_key: (interstellar OR eutrophic OR …

Wind – Blades (9 000 articles retrieved**)**
ti_abs_key: ("wind power" OR "wind energy" OR "wind turbine" OR "wind energy converter" OR "wind farm" OR "wind park") **AND** ti_abs_key: (**blades**)

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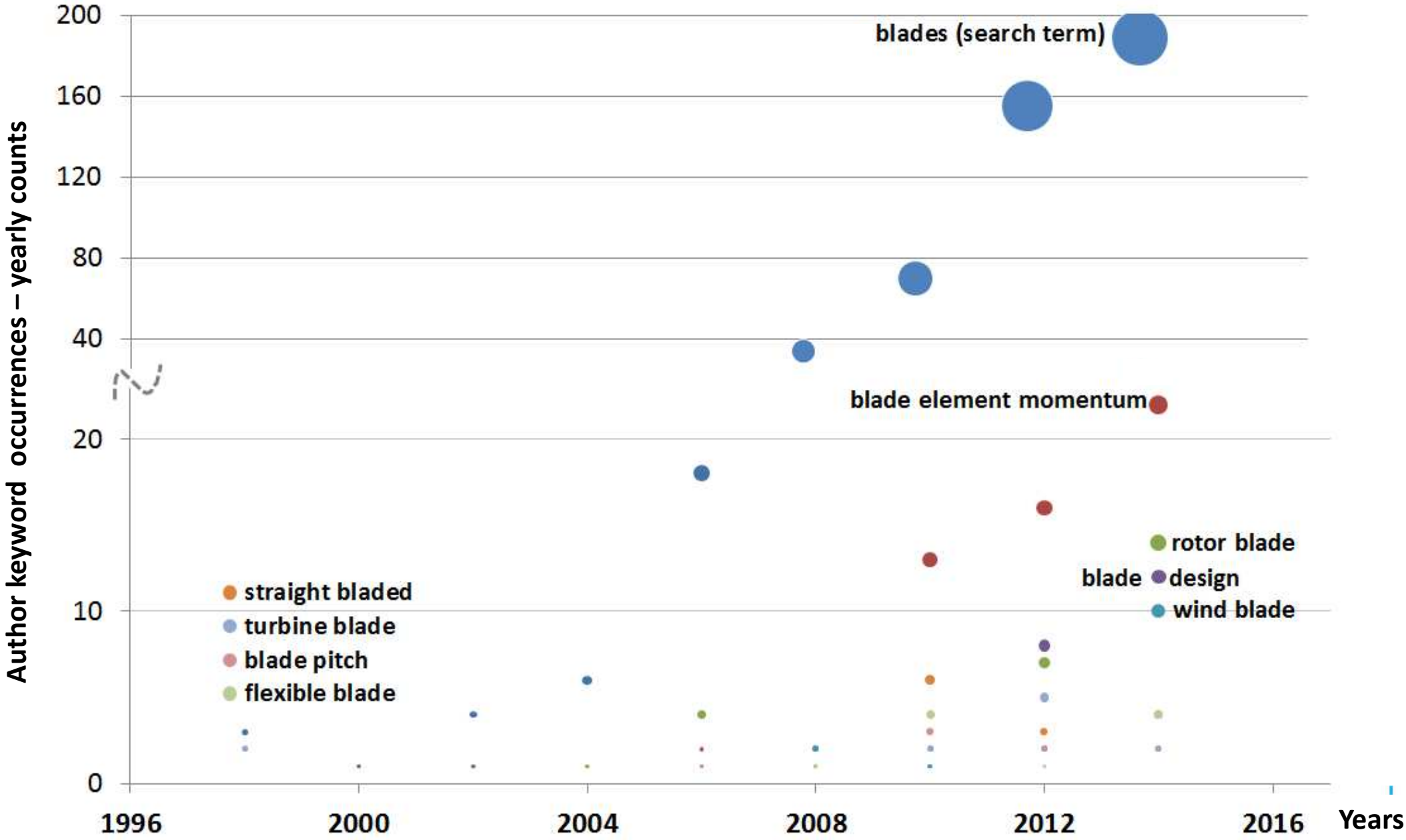
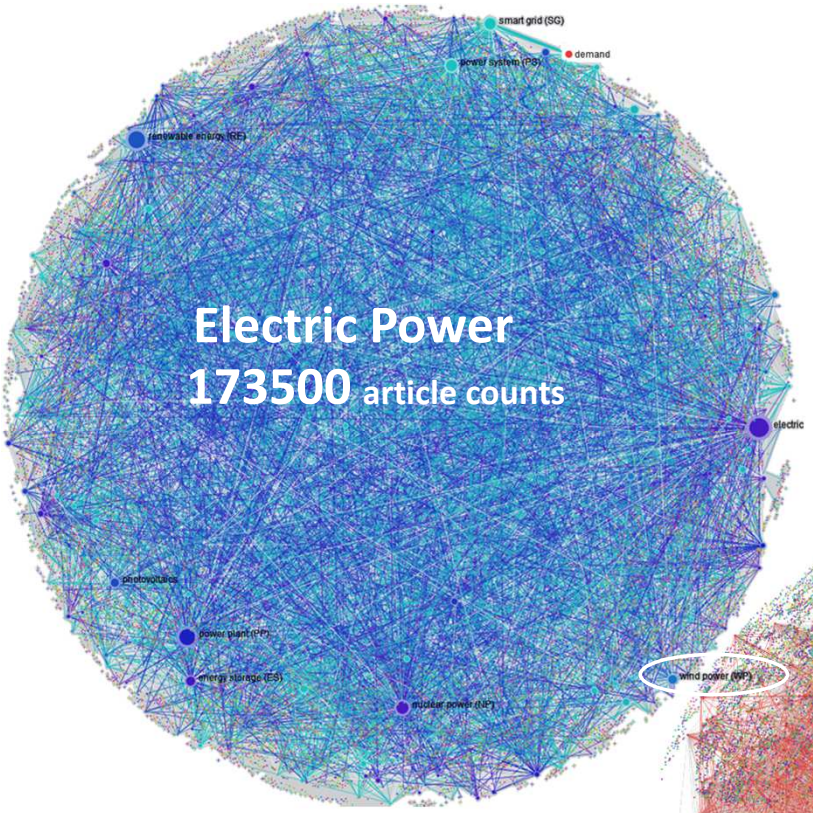
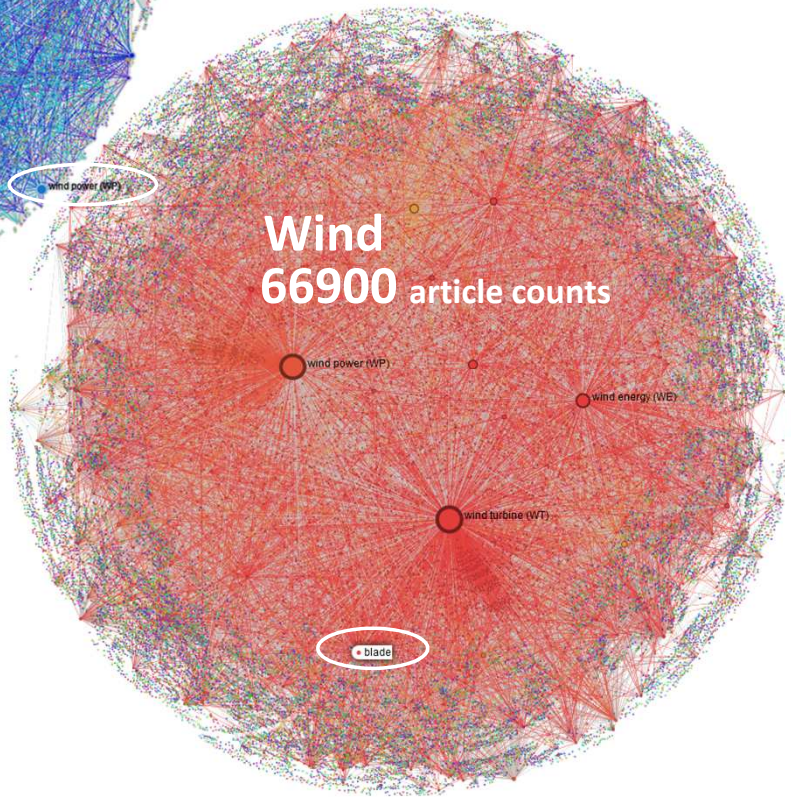

Author keyword occurrences – yearly counts
200
160
120
80
40
20
10
0
1996
2000
2004
2008
2012
2016
Years
blades (search term)
blade element momentum
straight bladed
turbine blade
blade pitch
flexible blade
rotor blade
blade
design
wind blade

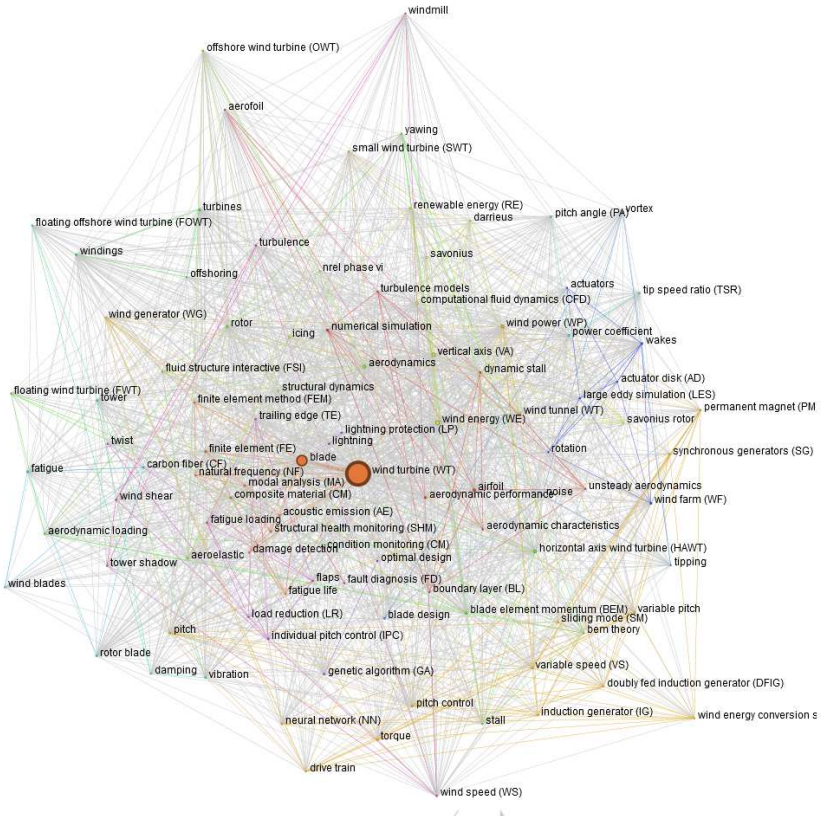
Size of bibliometric networks
1996-2016



Electric Power
173500 article counts



Wind
66900 article counts

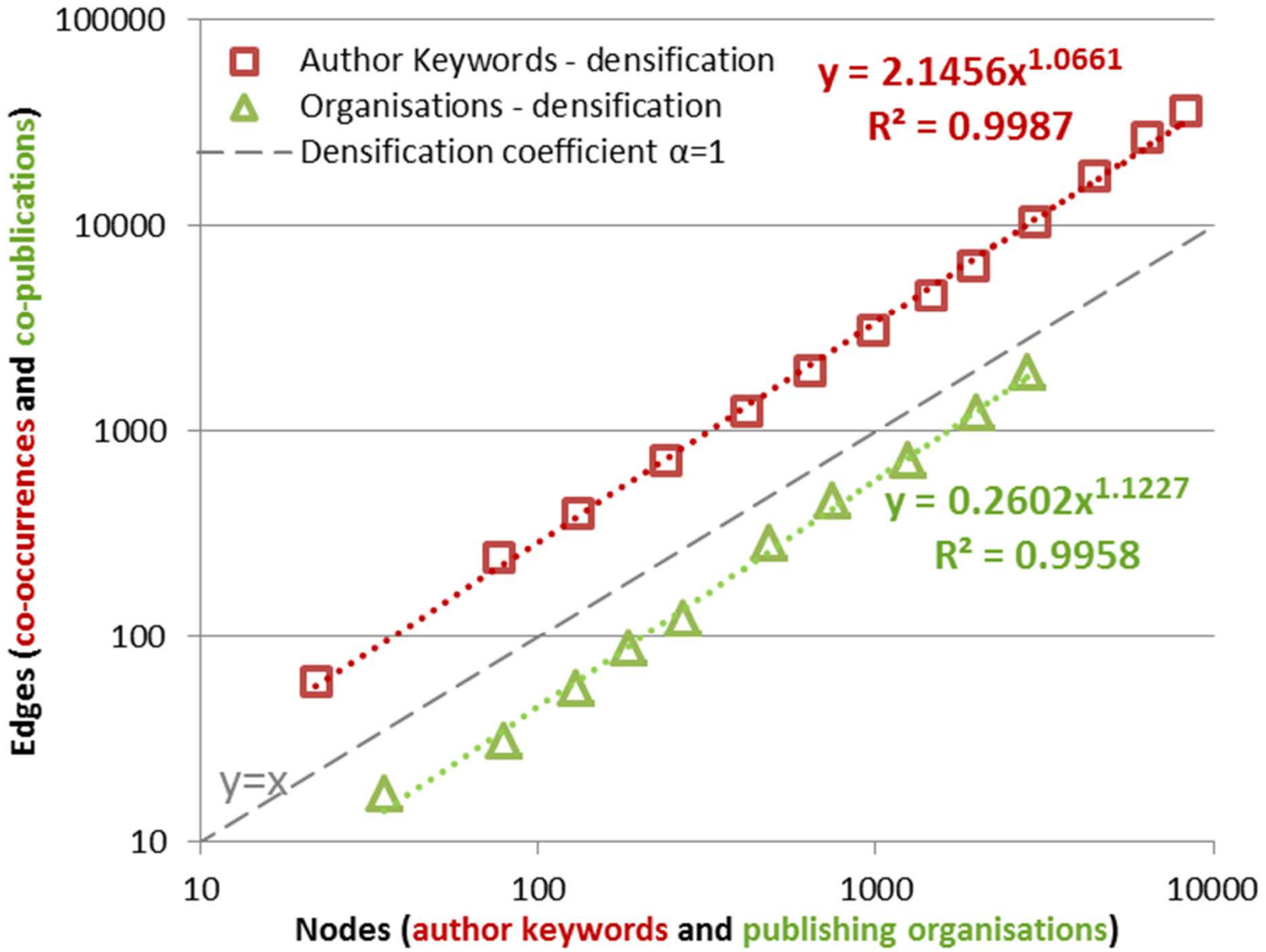


Blades, 9200 article counts

Bibliometric network densification

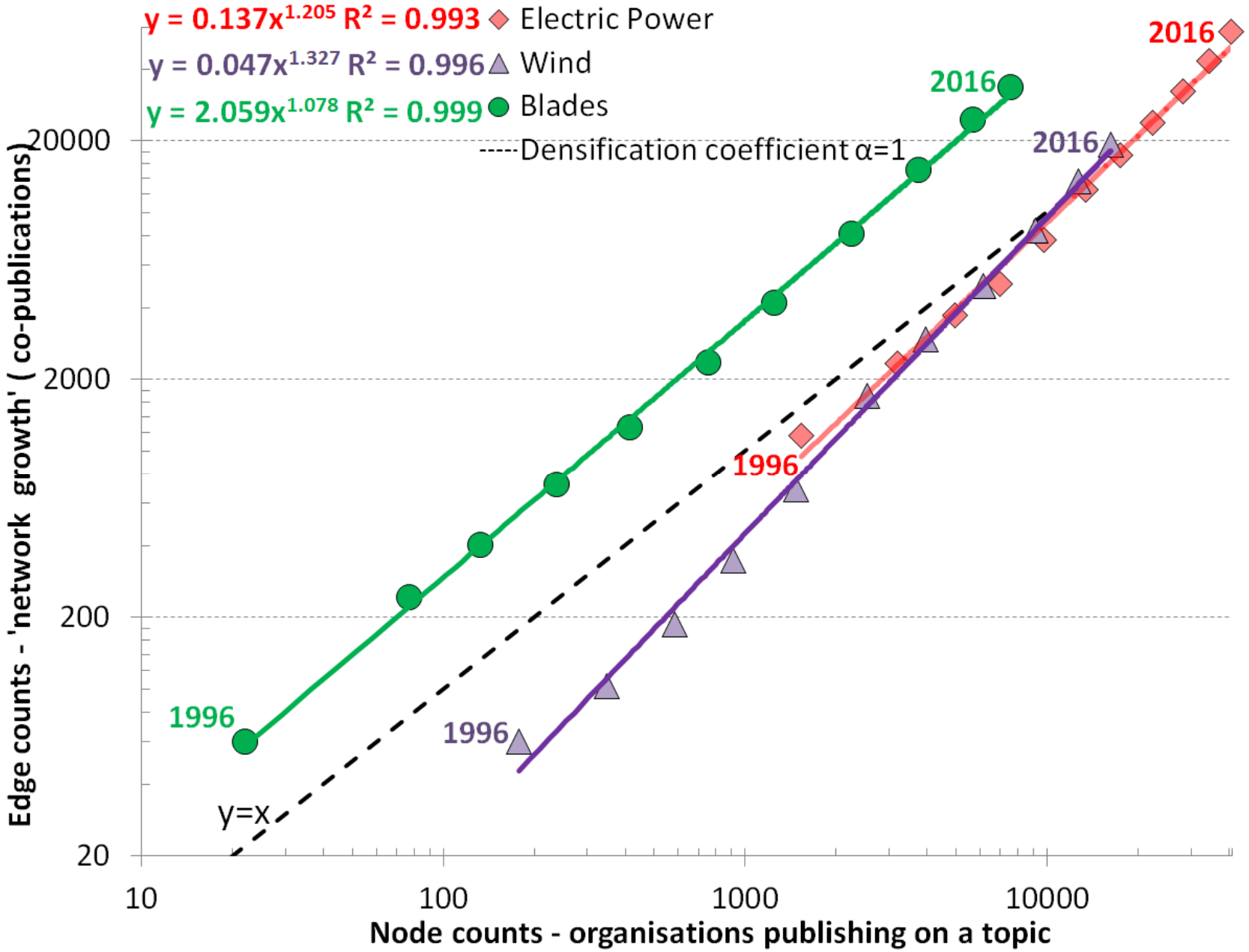
Blades

author keywords and organisations (co)authoring scientific articles,1996-2016



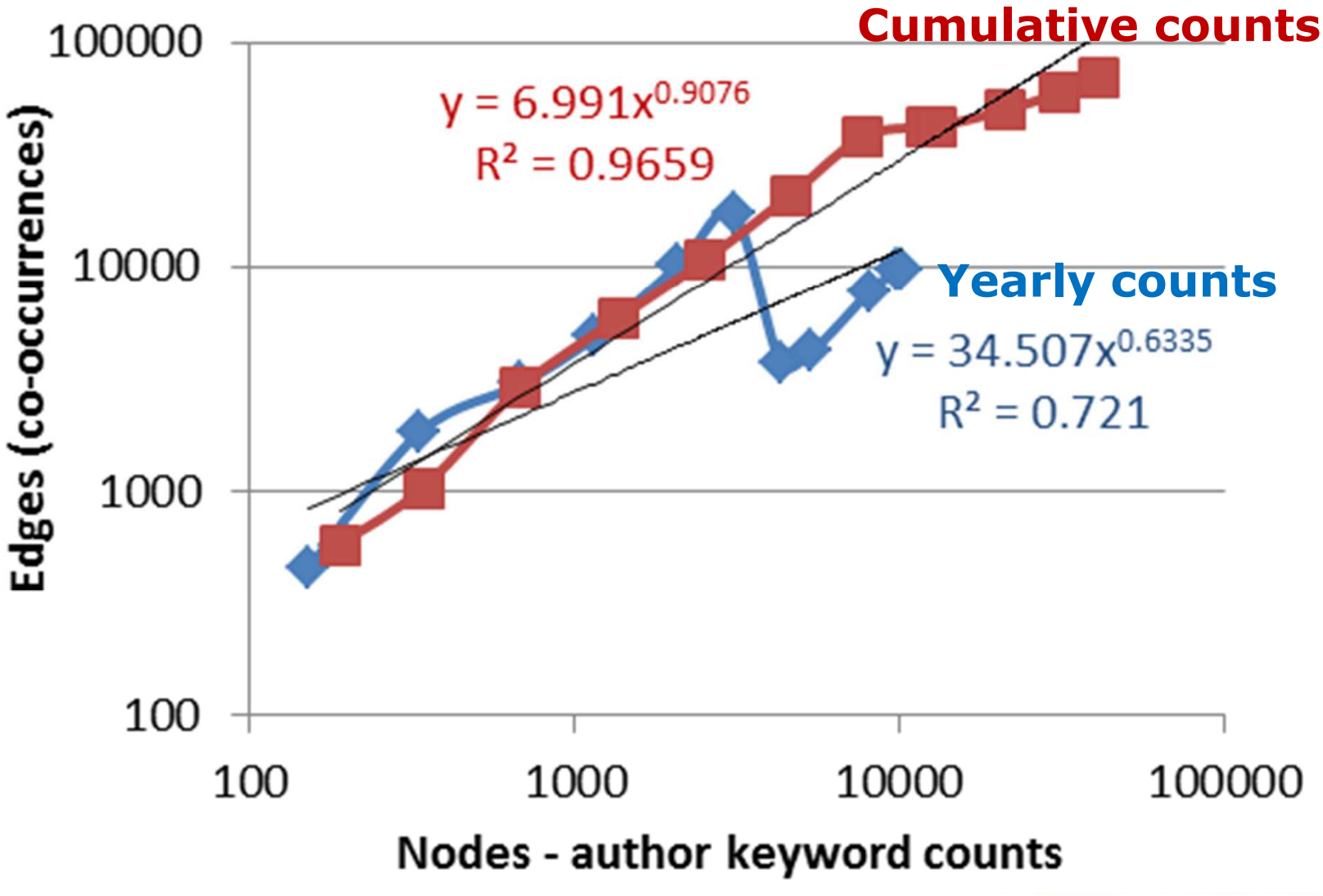
Bibliometric network: growth, scope

organisations (co)authoring scientific articles, 1996-2016



Bibliometric network densification

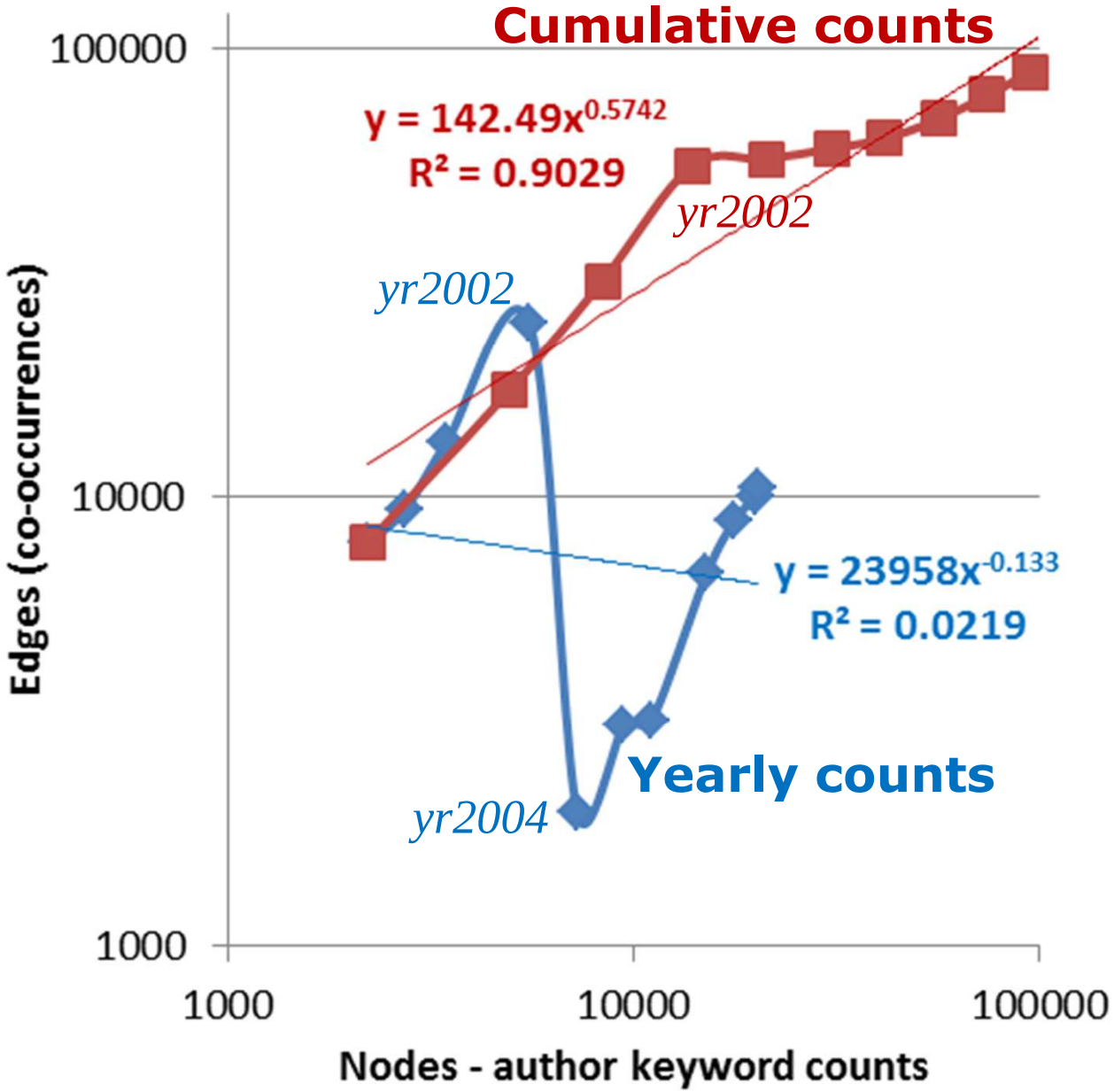
Wind



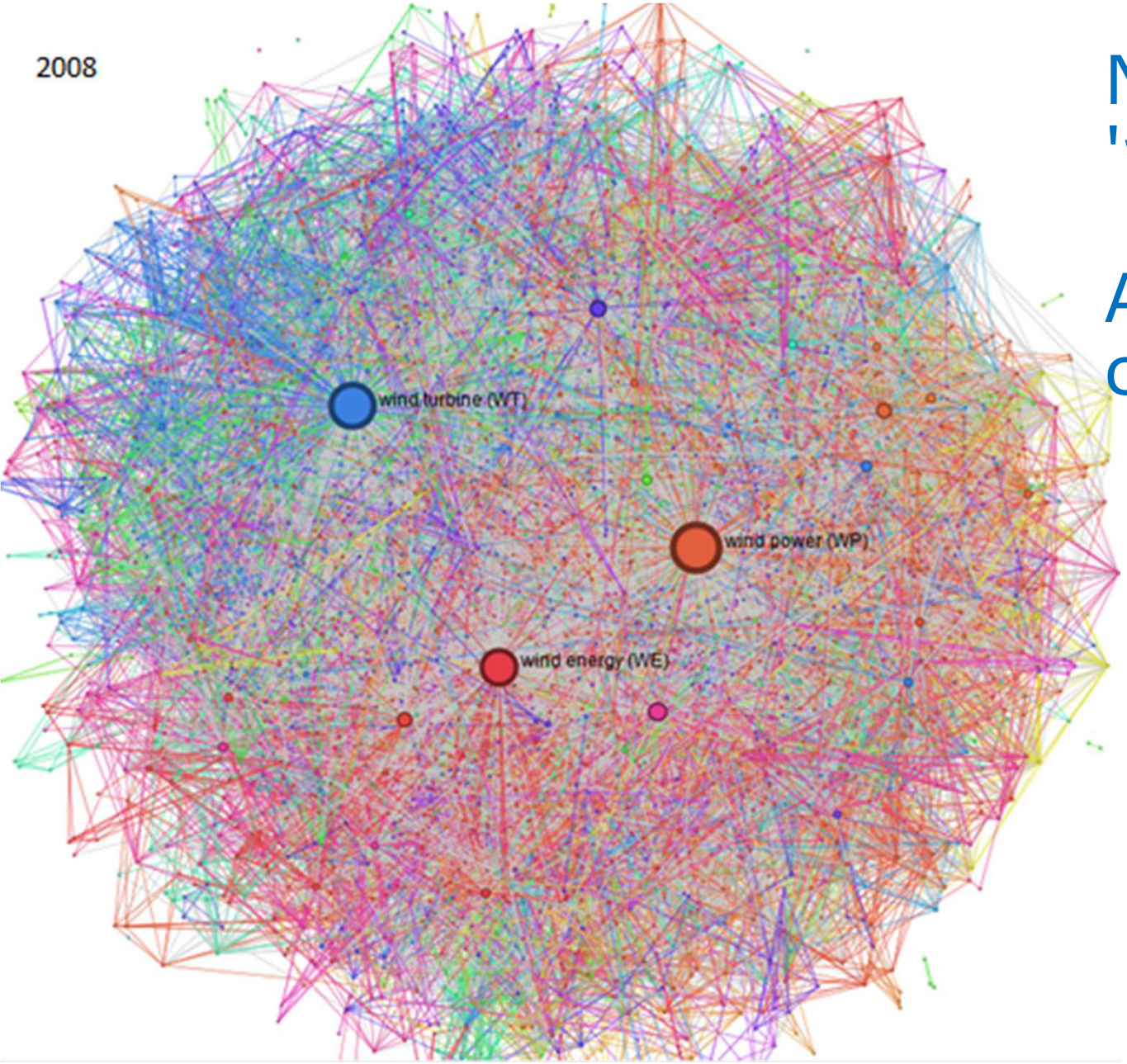
author keywords, 1996-2016

Bibliometric network densification

Electric power



author keywords,1996-2016



Network topology 'wind energy'

Author-keyword co-occurrences, 2008

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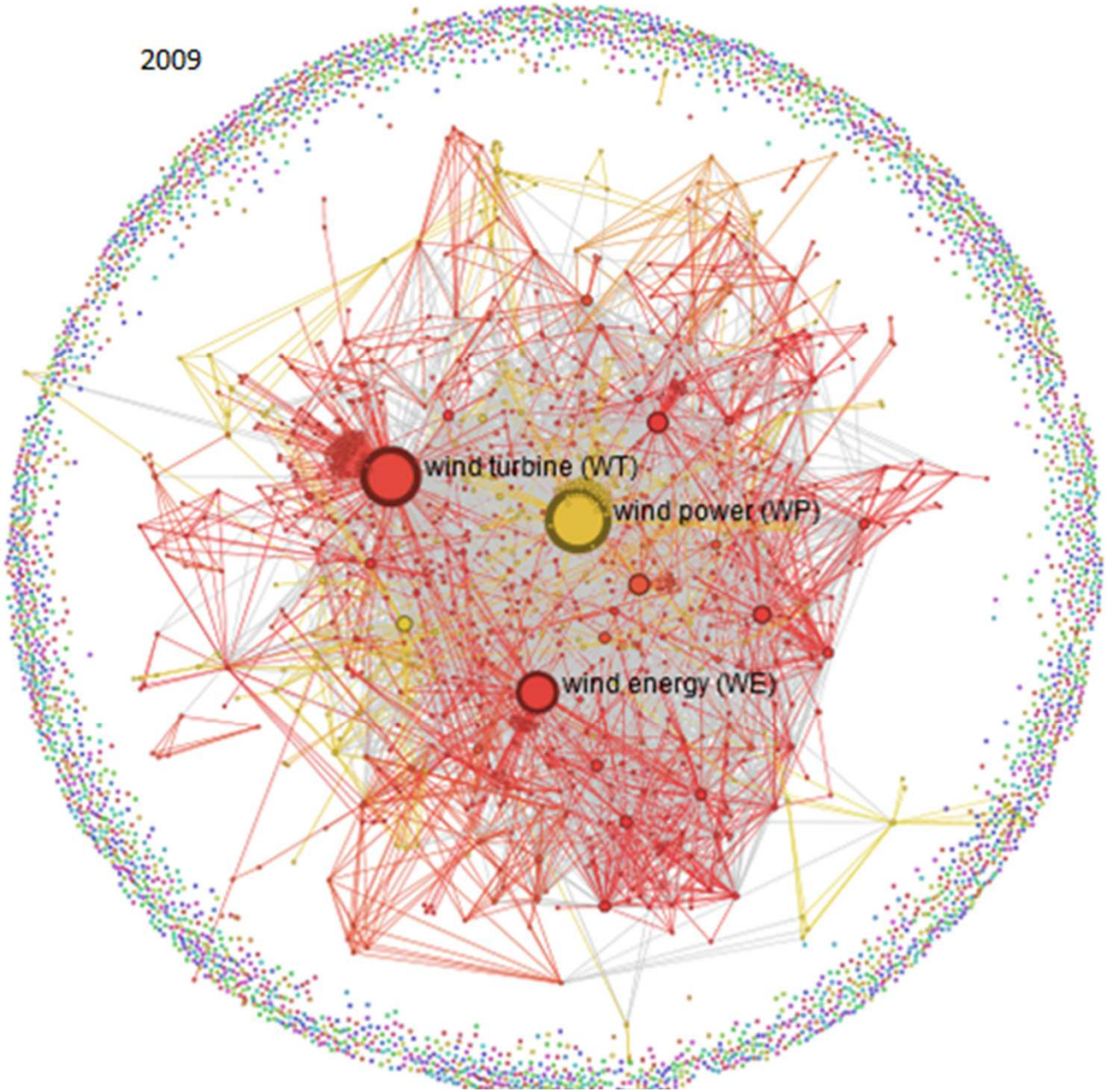

Network topology 'wind energy'

Author-keyword co-occurrences, 2009

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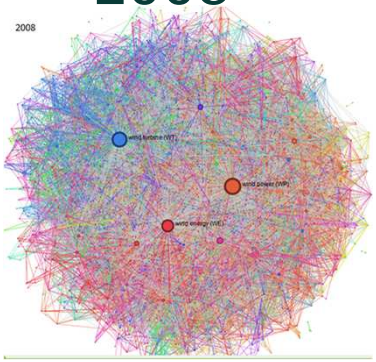
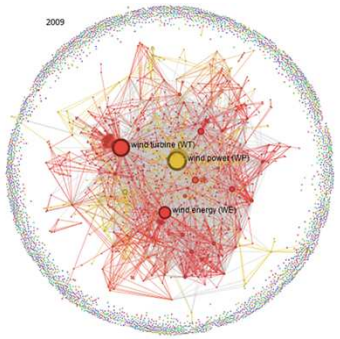
Network topology
author keywords

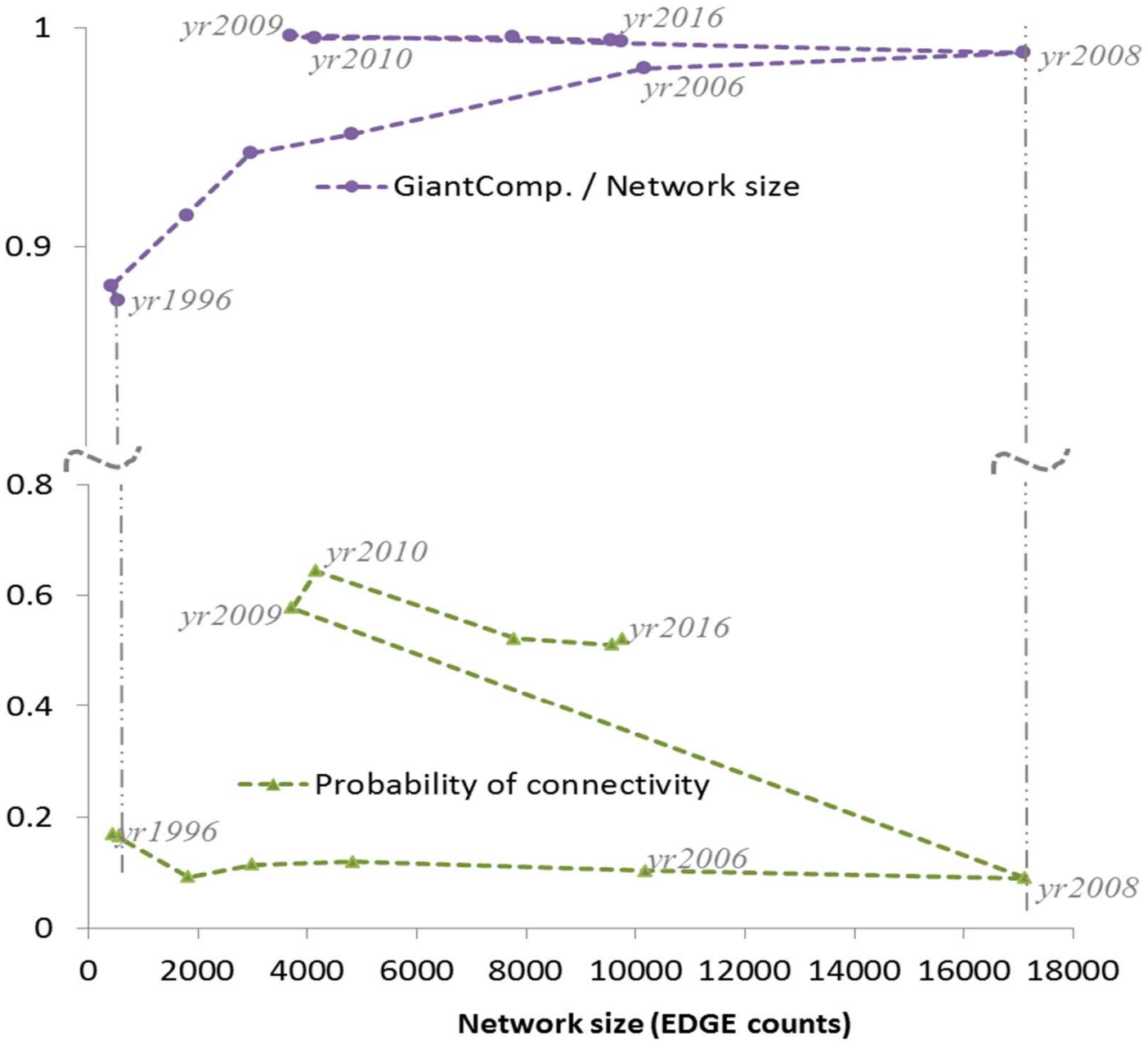
edges

2008



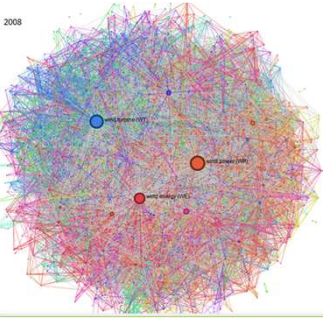
2009



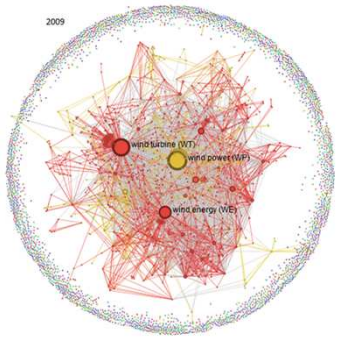


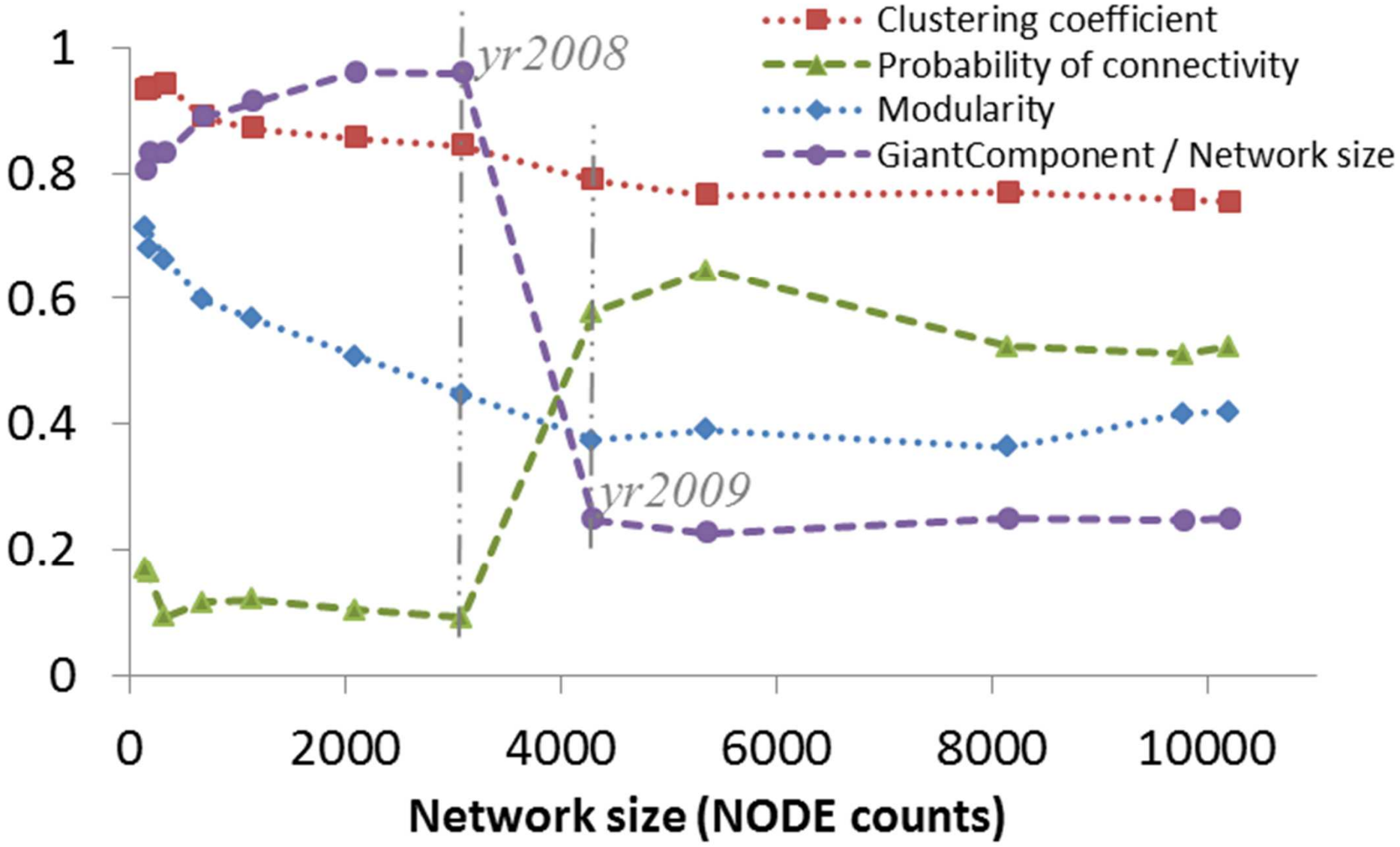
Network topology author keywords – nodes

2008

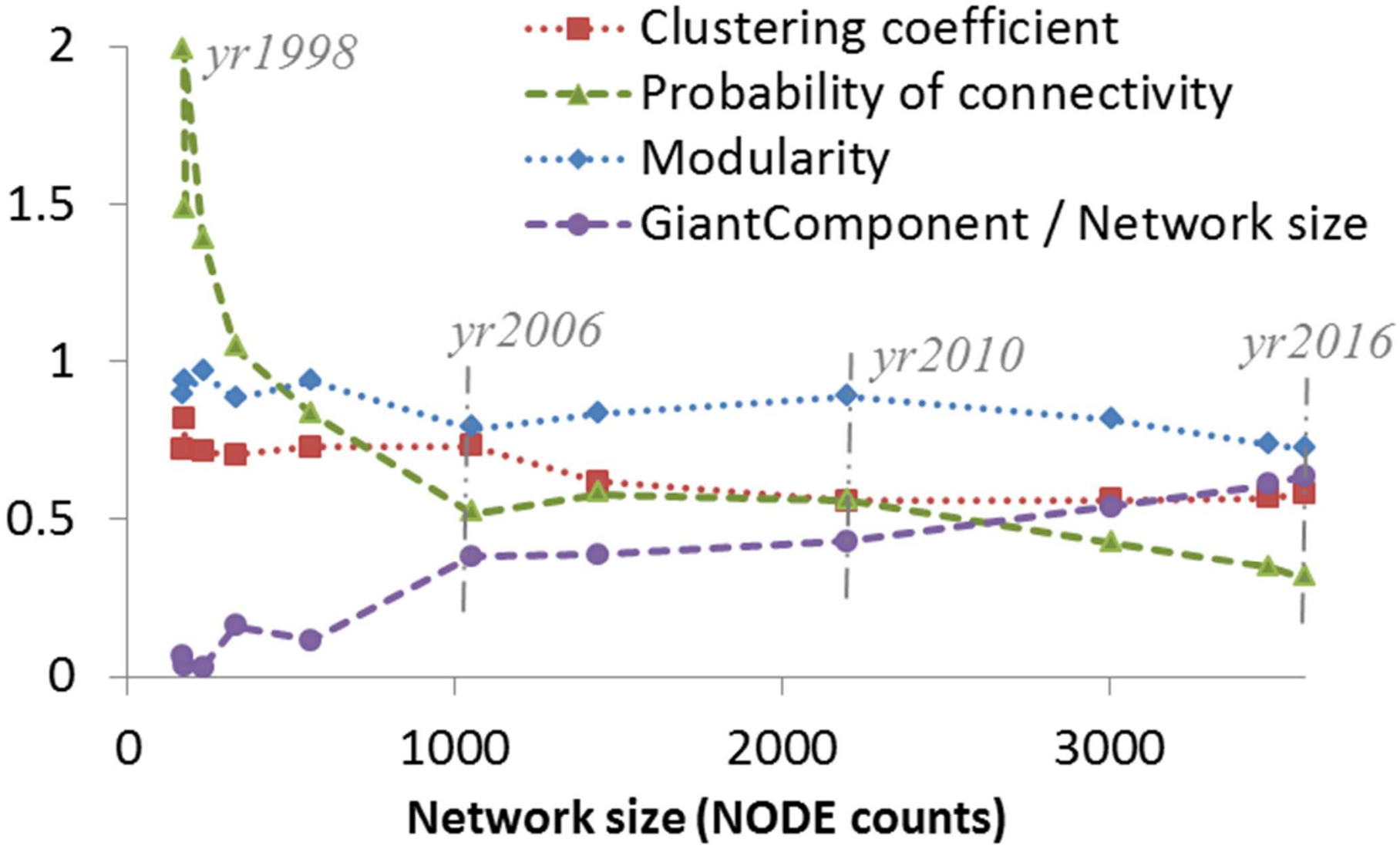


2009

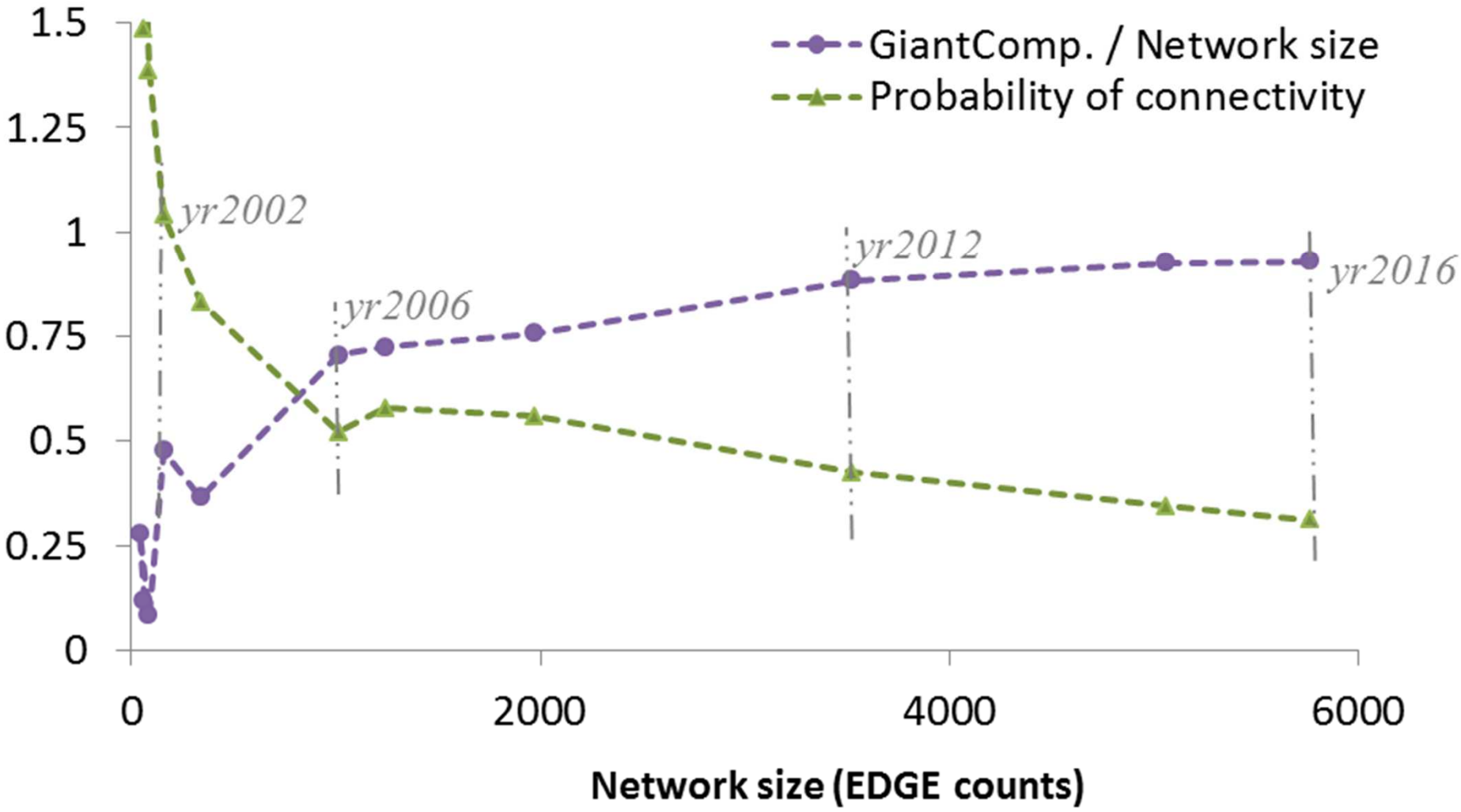




Network topology organisations – nodes



Network topology organisations – edges



Final remarks

- Potential relevance of bibliometric-network metrics
  - for mapping technologies
    at similar & complementary granularity levels
  - for comparing their developmental stages.

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Further analysis needed

- Results and potential implications:
  - network properties and metrics,
  - historic evolution of the technologies analysed,
  - search string design

Thank you

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