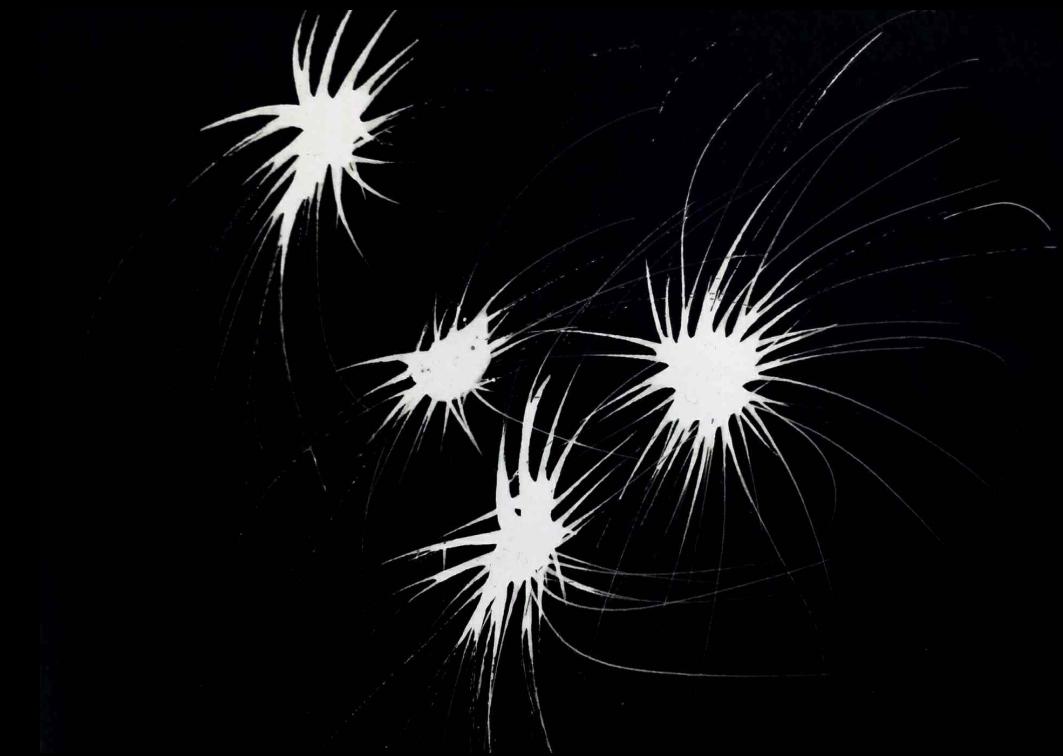
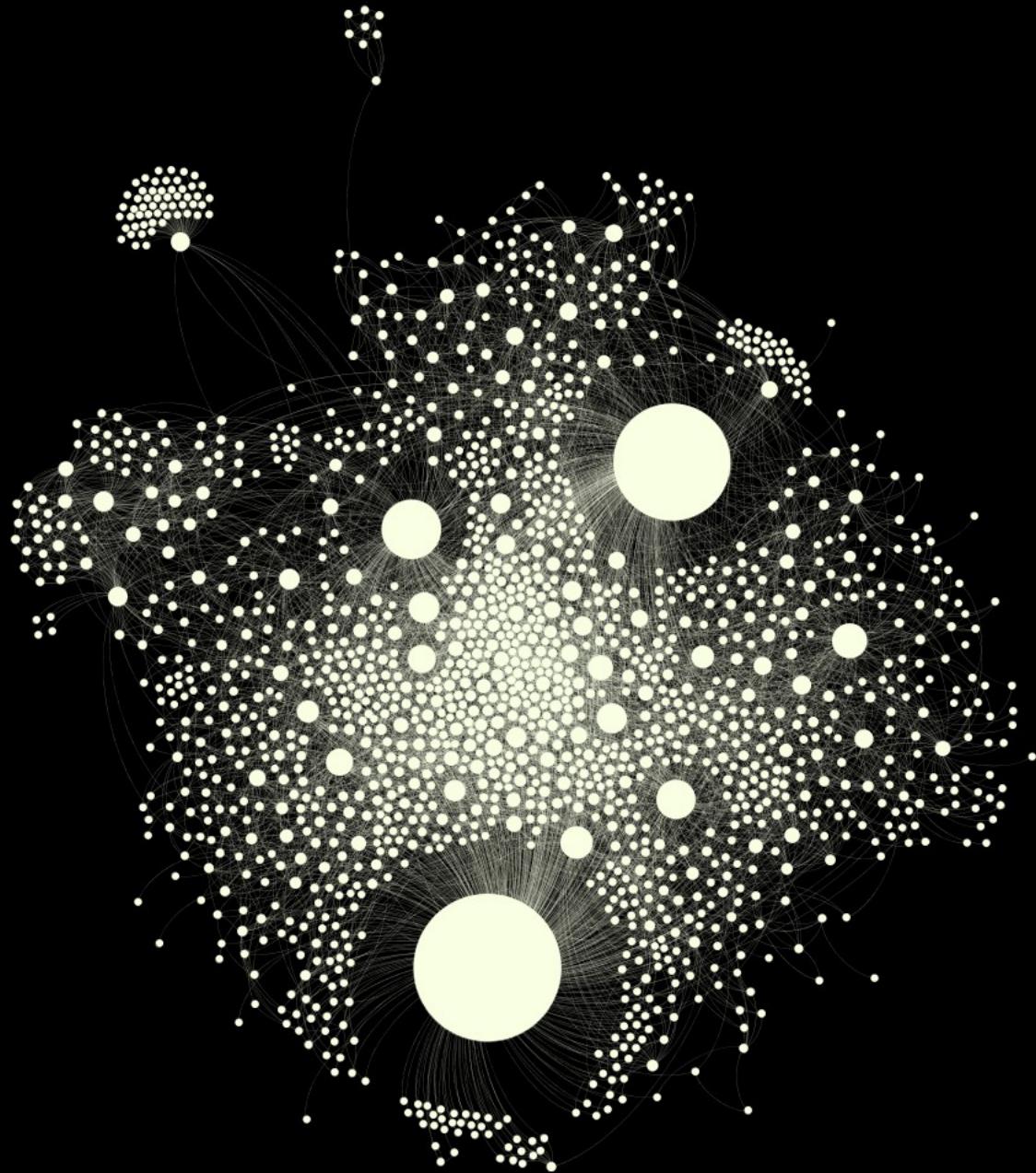


Marc Santolini, Liubov Tupikina, Marina Saburova,
Roberto Toro, Katja Heuer, CRI
ISCPiF ARTEX event
October 12th, 2019

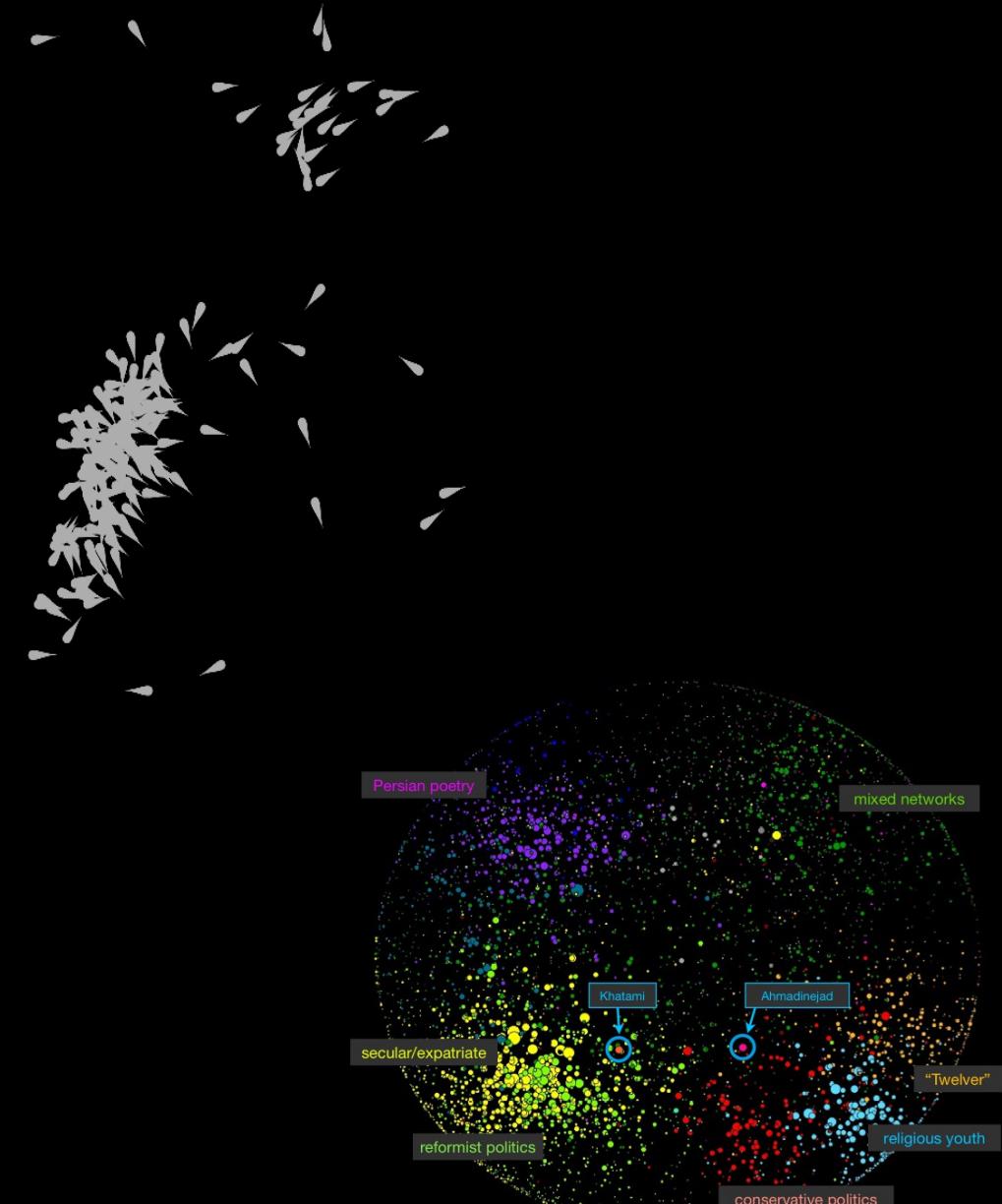


"I think the next century will be the century of complexity."
Stephen Hawking, 2000

Workshops:

I Collective phenomena

II Random networks



<https://journals.sagepub.com/doi/full/10.1177/2056305117691545>

Collective phenomena:
photo of Ornitography National Geographic photographer



Collective phenomena:



In physics:

“In order to understand dynamics of a physical system we need to focus on the macro level and not on its parts: we look at flocking birds as one organism to understand its dynamics.”

Japanese art:

“In order to draw flocking birds or schools of fishes, one should not concentrate on each small part but instead to concentrate on the movement and depiction of one element which can express the whole”

Photo credit from wikipedia bird flakes

Collective phenomena:



Examples of numerical simulations:

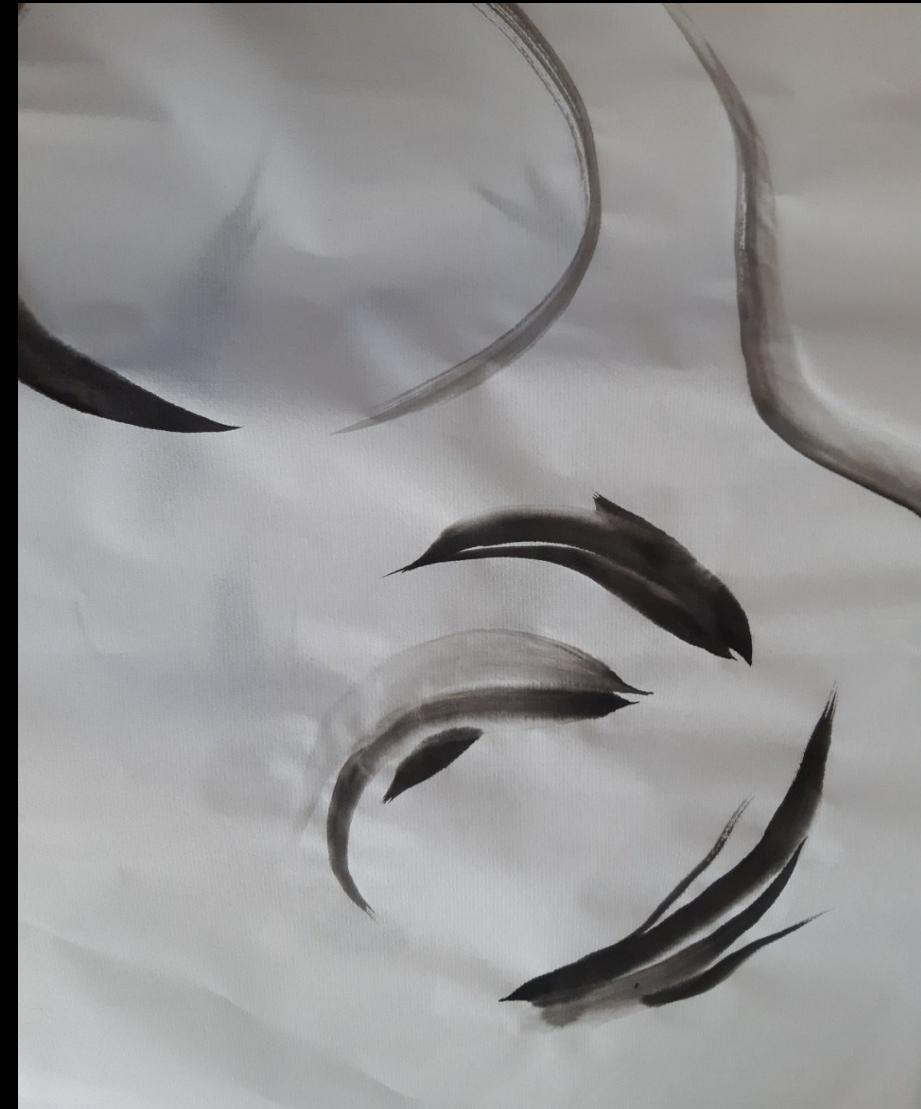
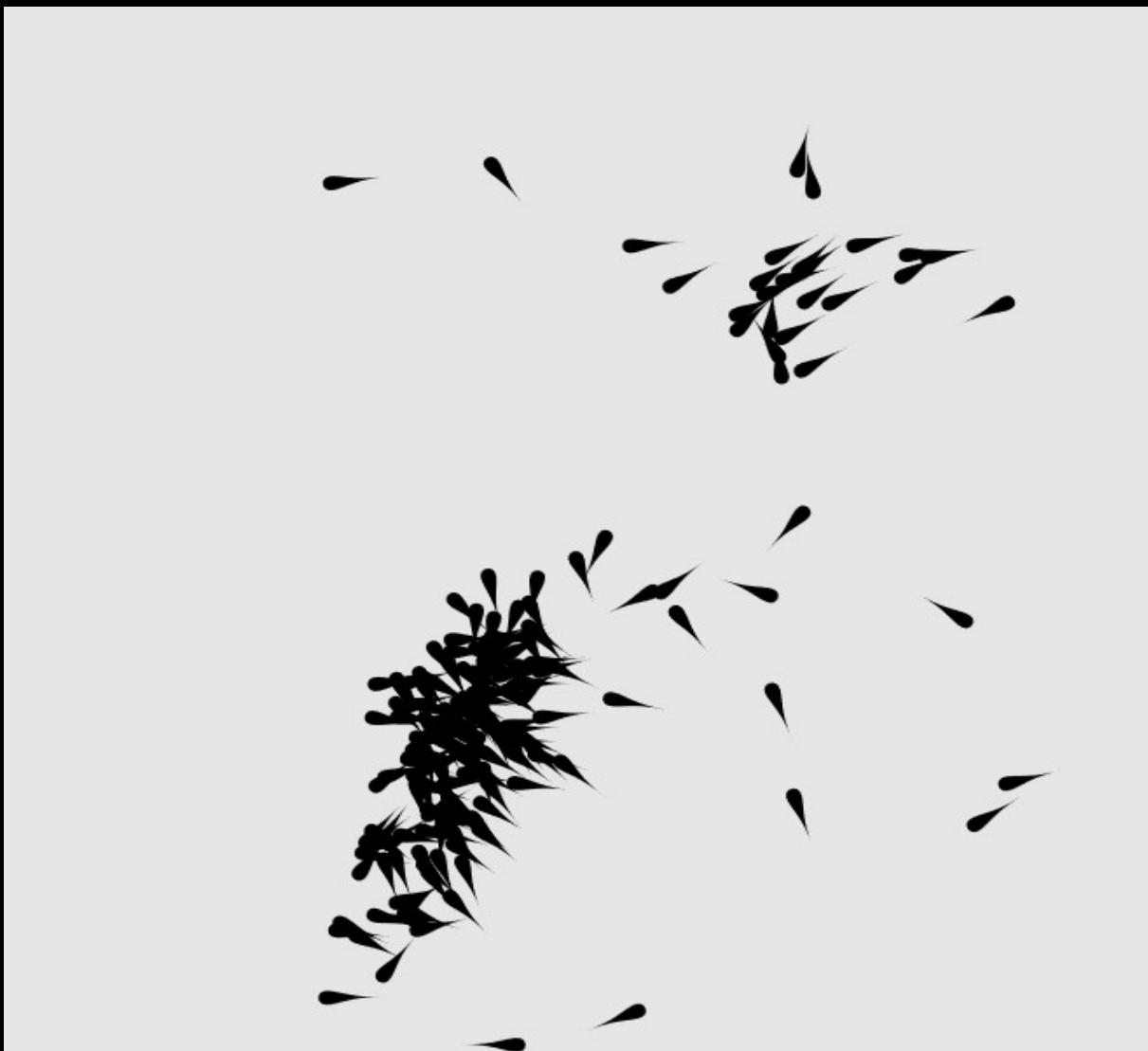
Complexity explorer from Pr.Brockman group <http://rocs.hu-berlin.de/>

<http://www.complexity-explorables.org/explorables/thrilling-milling-schelling-herings/>

<https://www.sciencedirect.com/science/article/pii/S0022519302930651?via%3Dihub>

Flocking birds behaviour <http://www.xavibou.com/index.php/project/ornitographies/>

Collective phenomena:



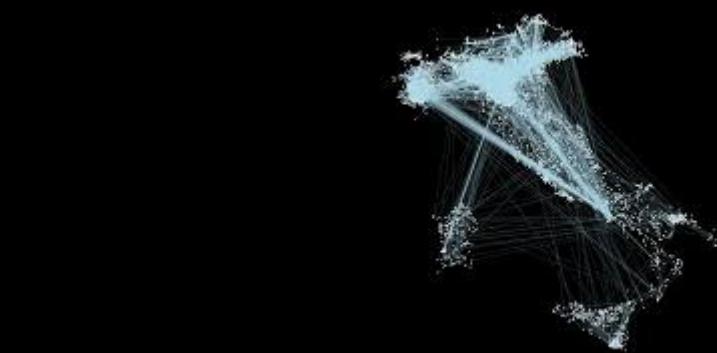
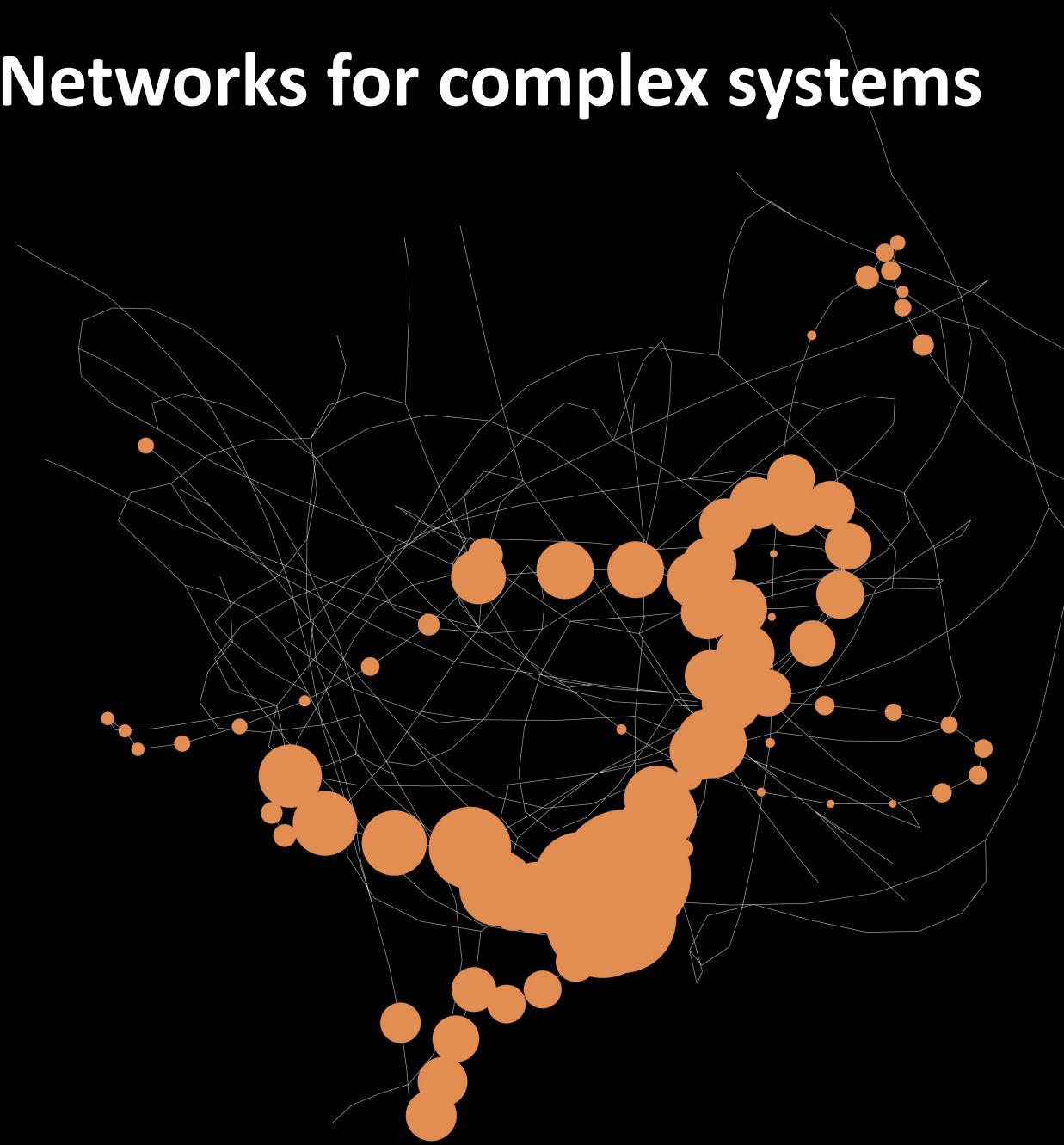
Collective phenomena:



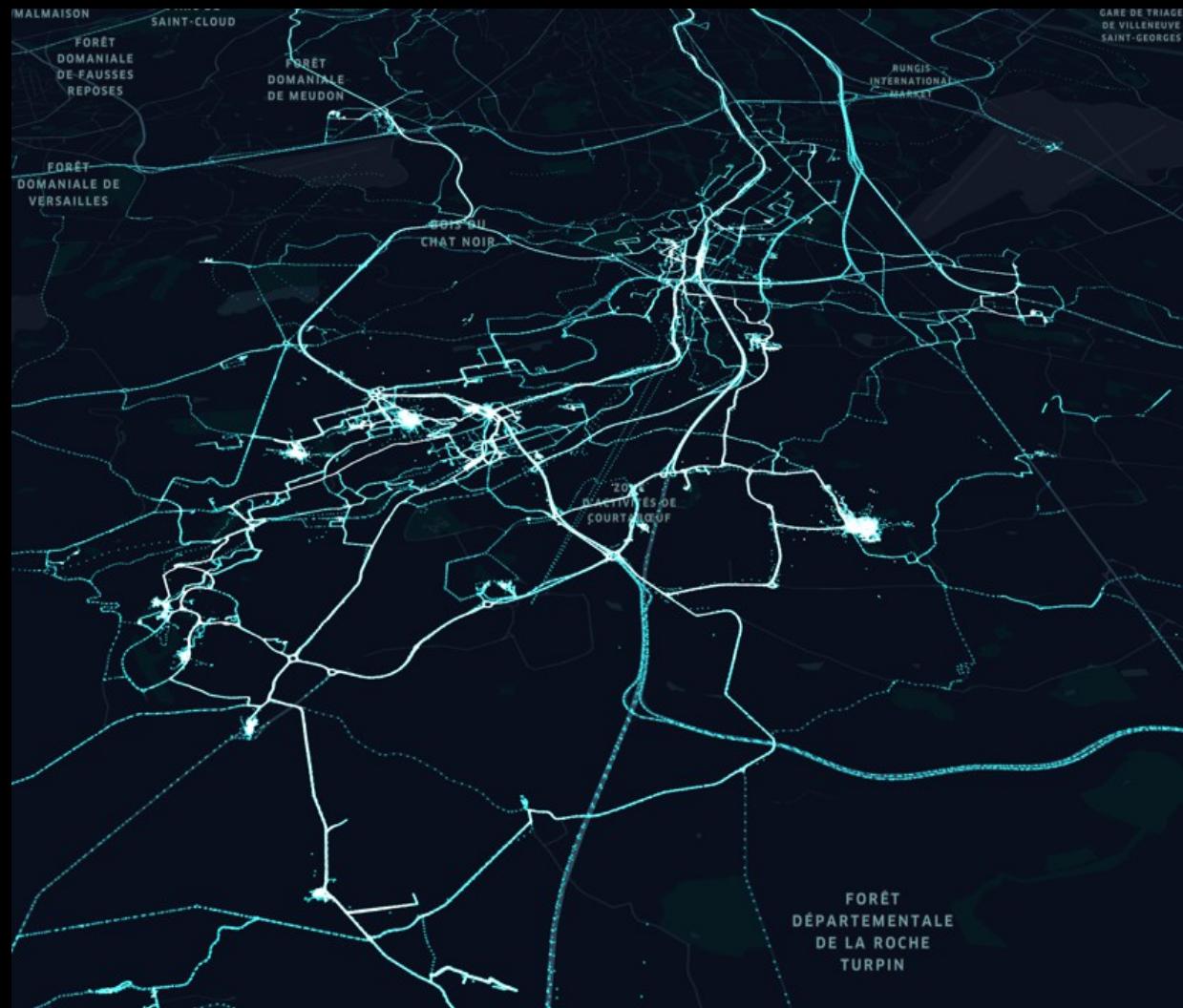
Networks science



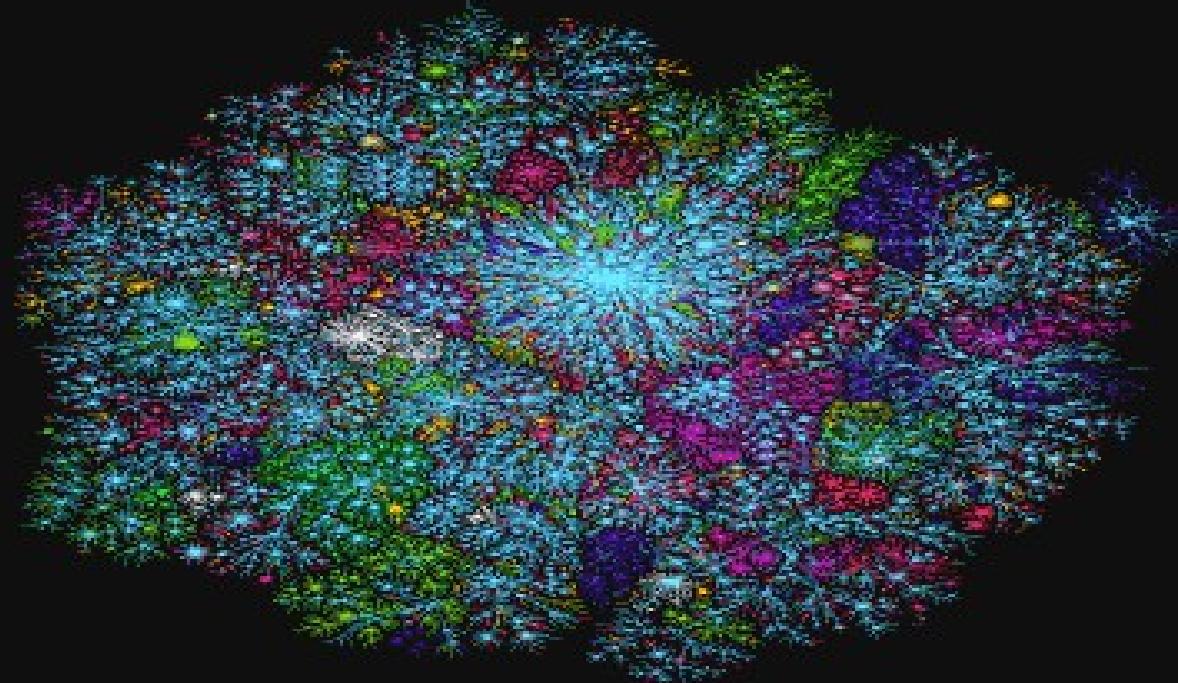
Networks for complex systems



Networks for complex systems

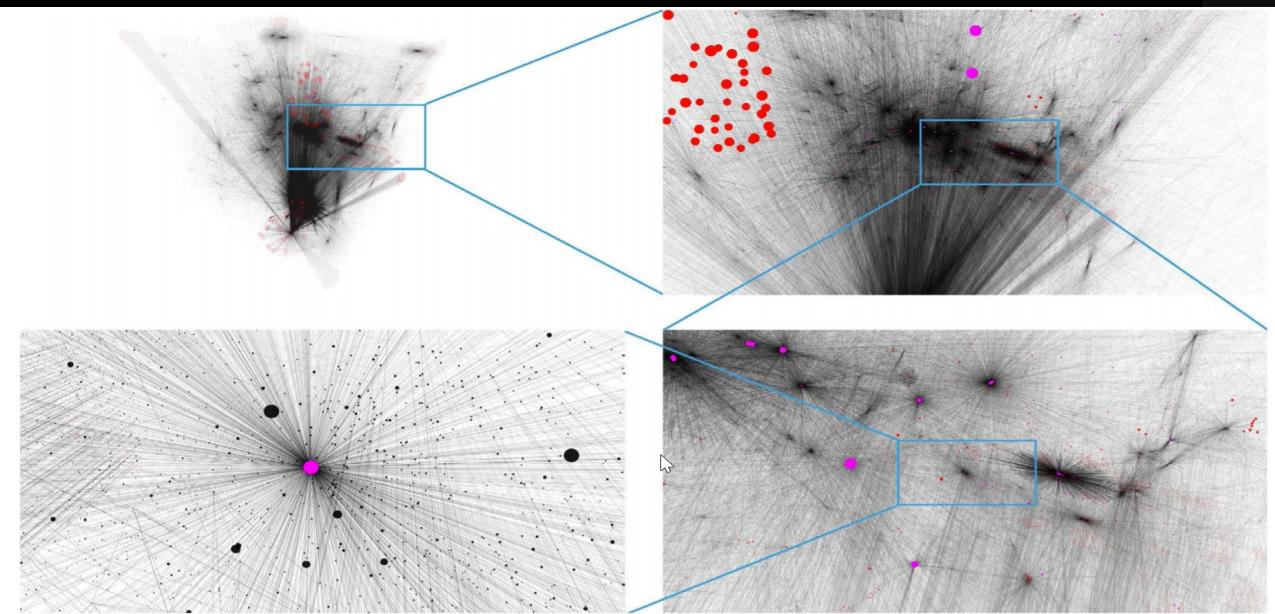
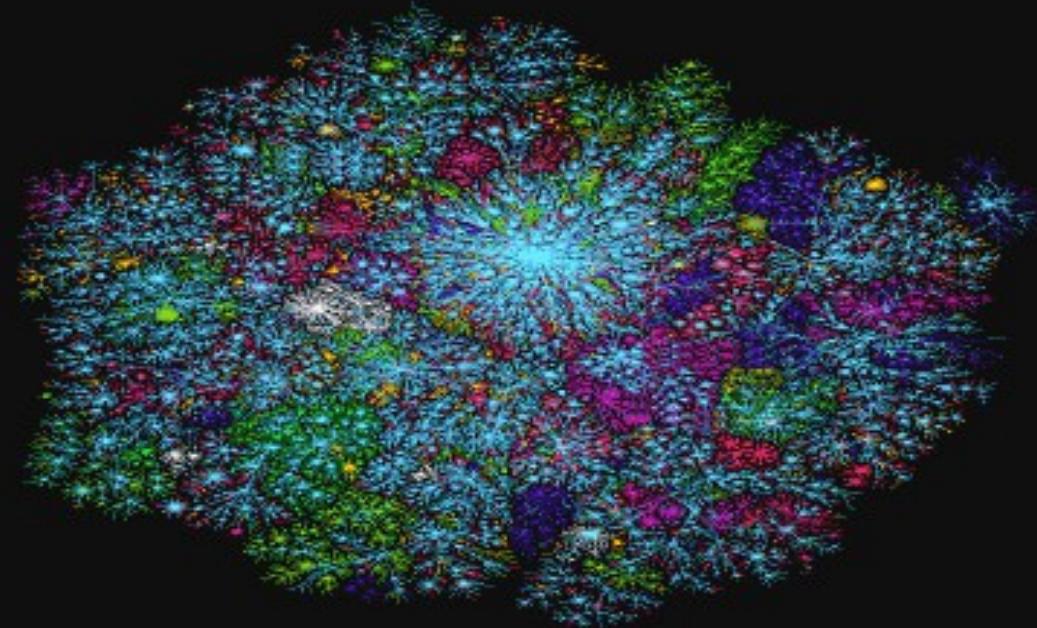


T H E W H O L E I N T E R N E T



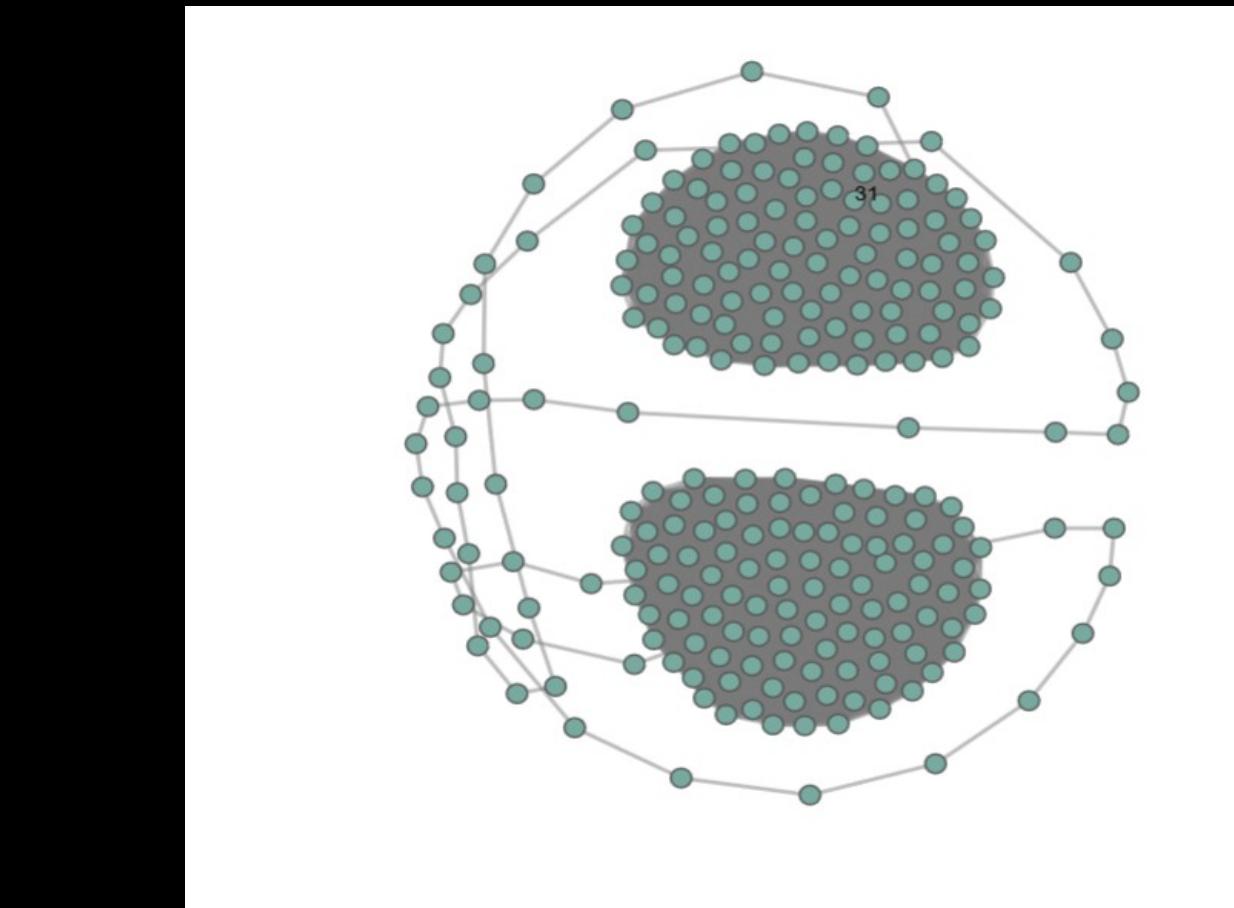
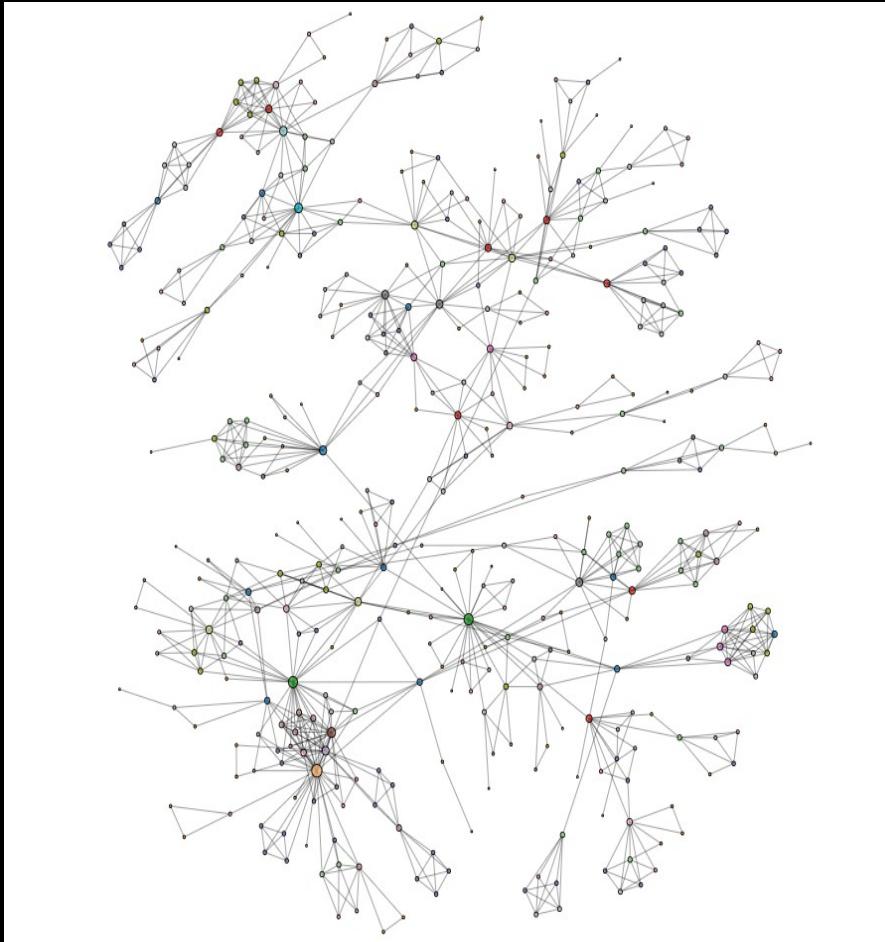
Network resources

THE WHOLE INTERNET



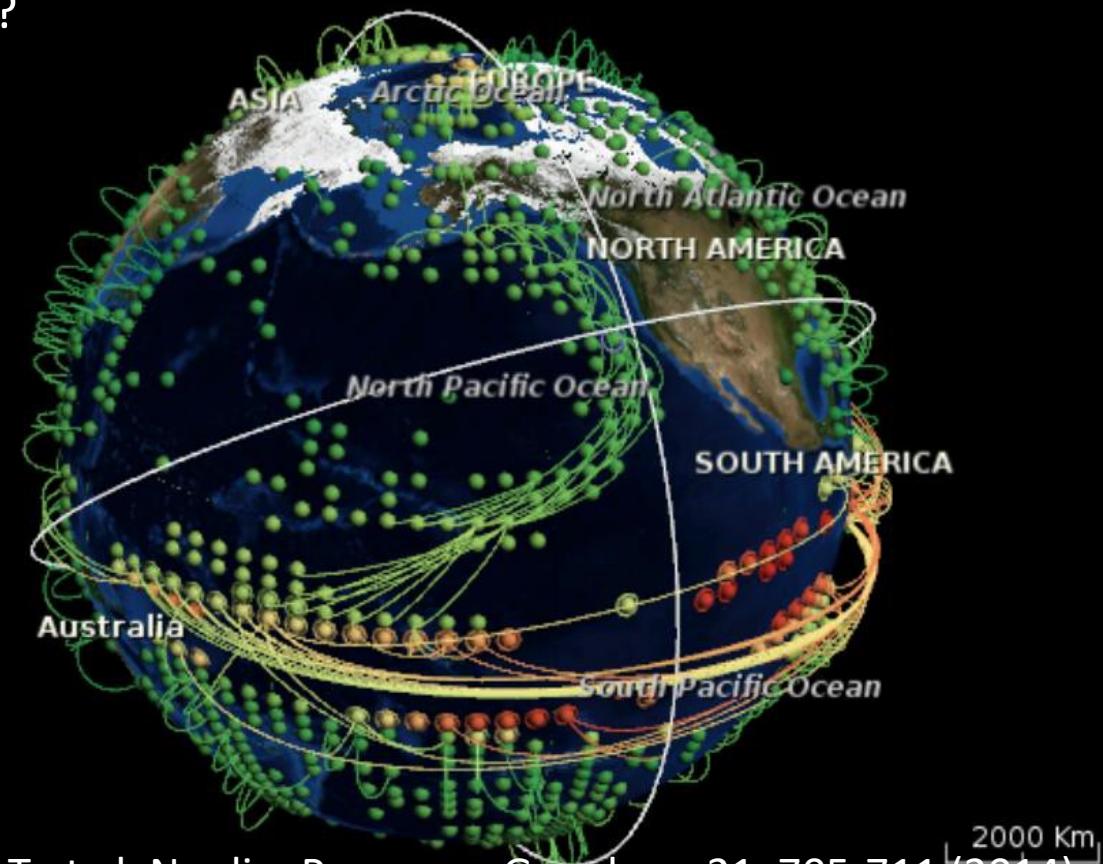
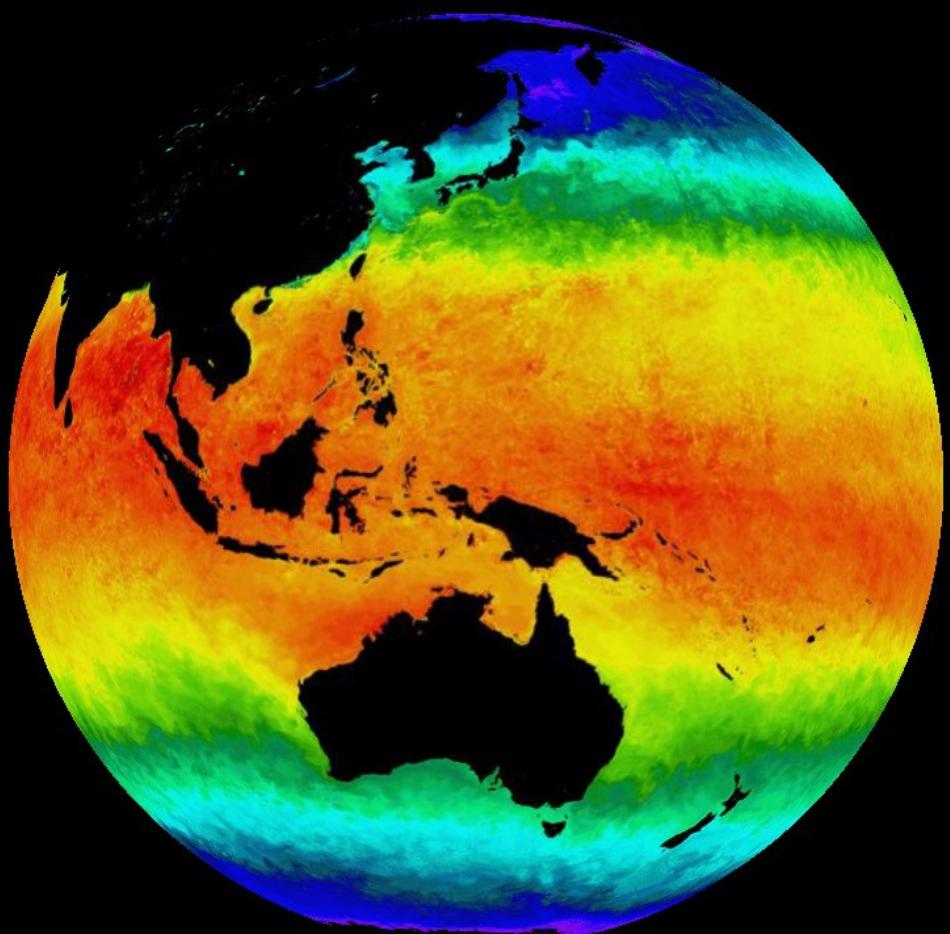
Network visualisations platforms

<http://networkrepository.com/graph-vis.php>



Questions from physics and climatology:

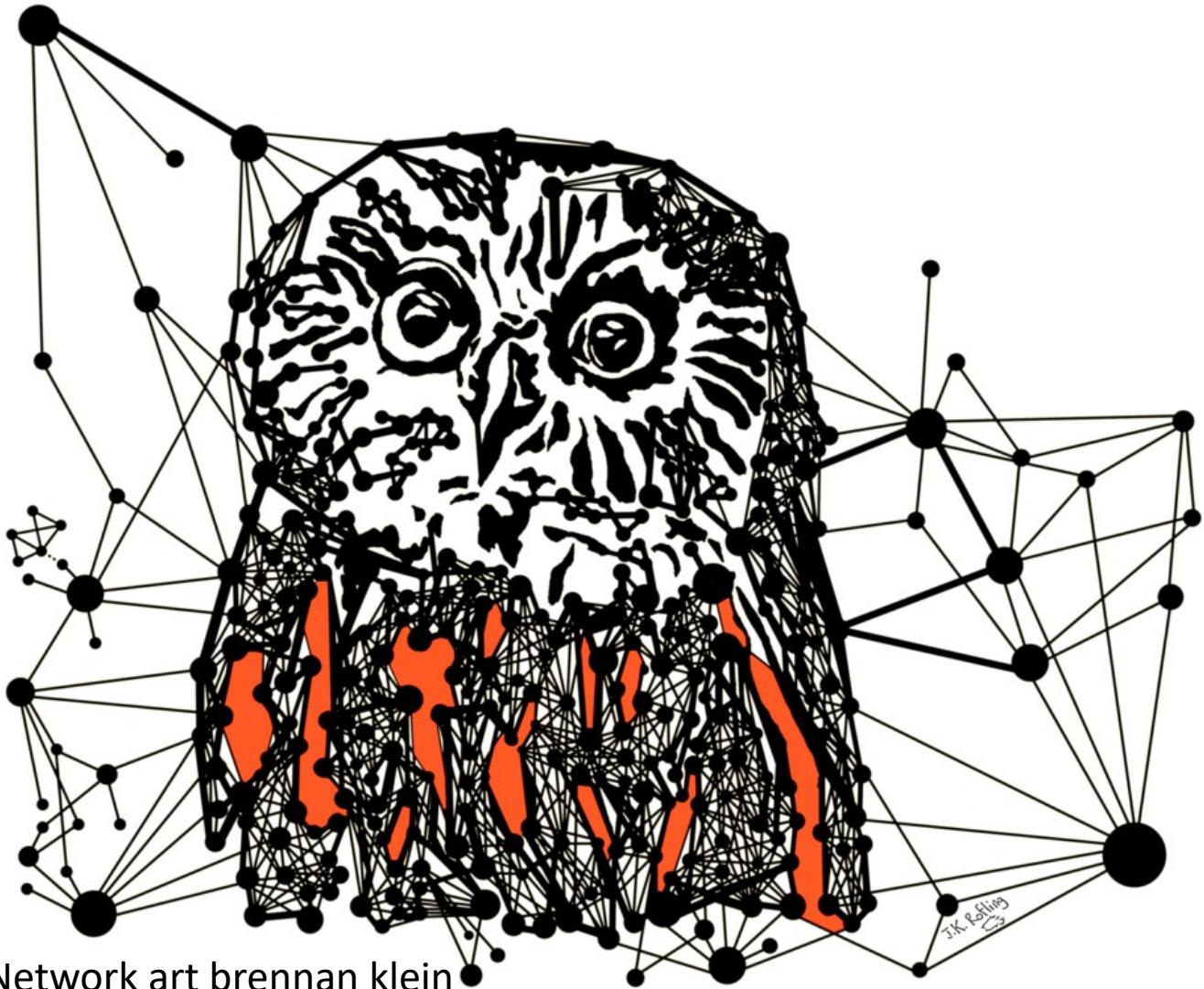
What is the meaning of correlations patterns in data structures?

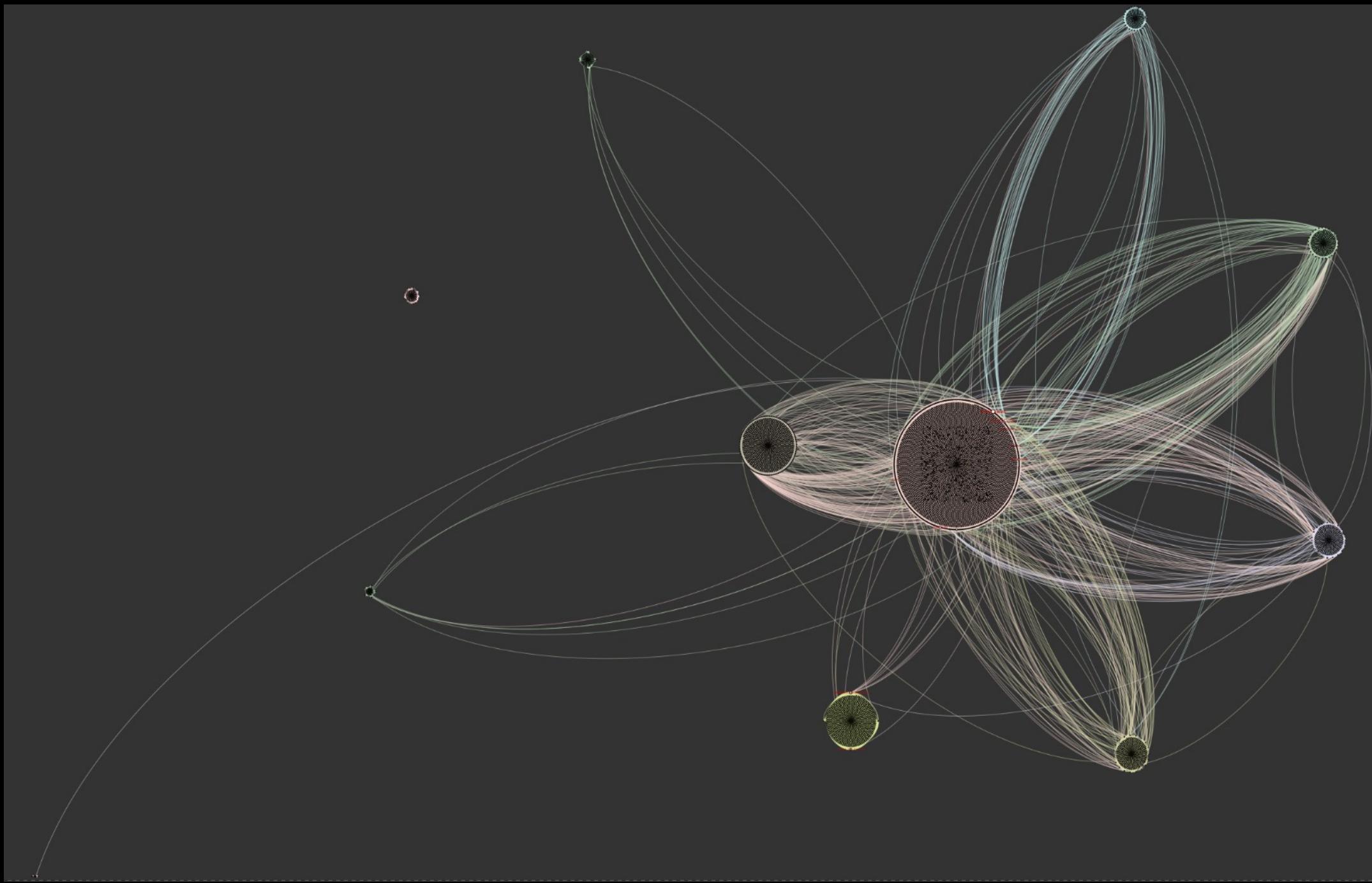


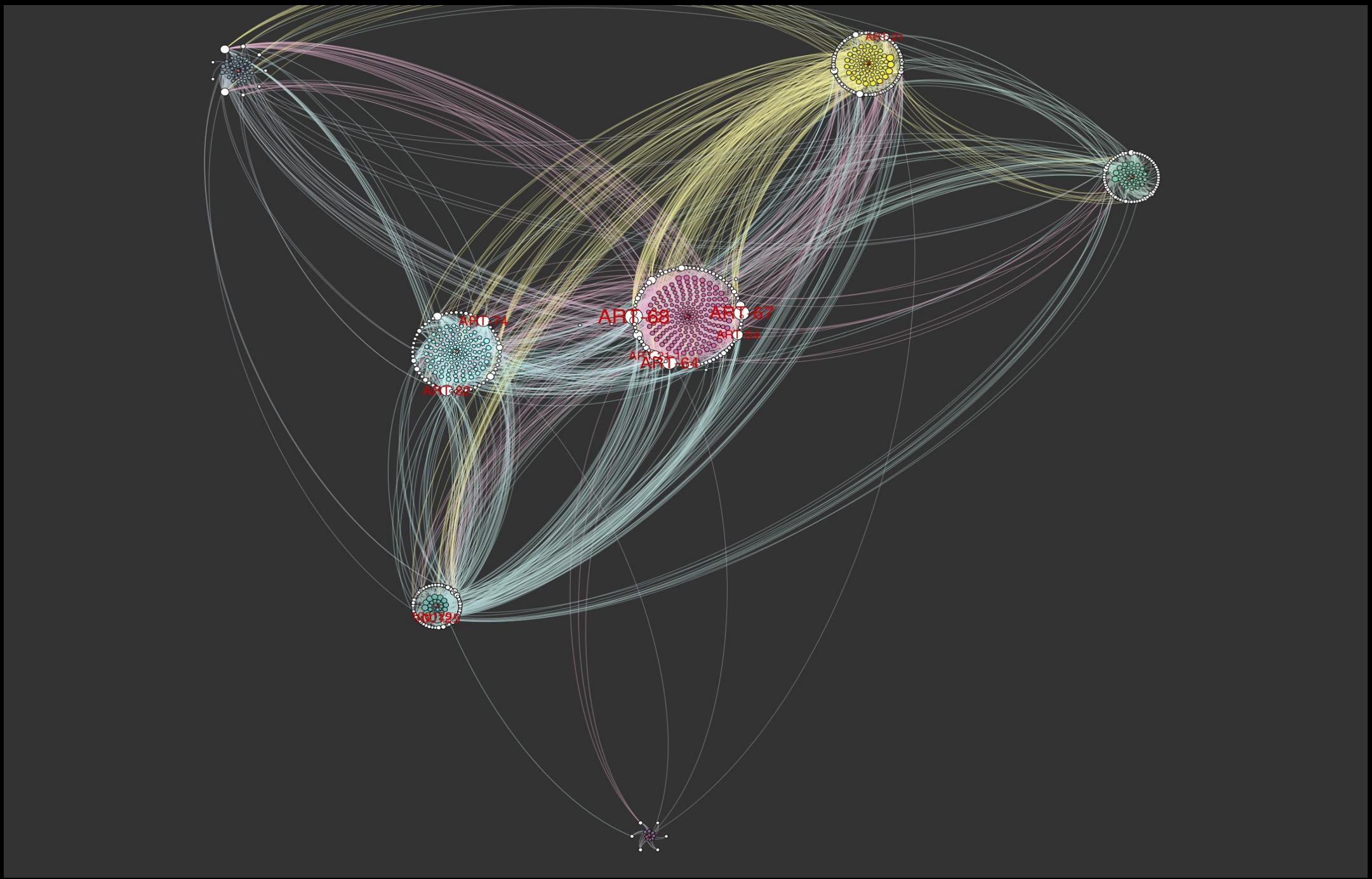
LT et al. Nonlin. Processes Geophys., 21, 705-711 (2014)

J.F. Donges et al. Chaos 25, 113101-1-25 (2015)

<http://www.pik-potsdam.de/~donges/pyunicorn/>



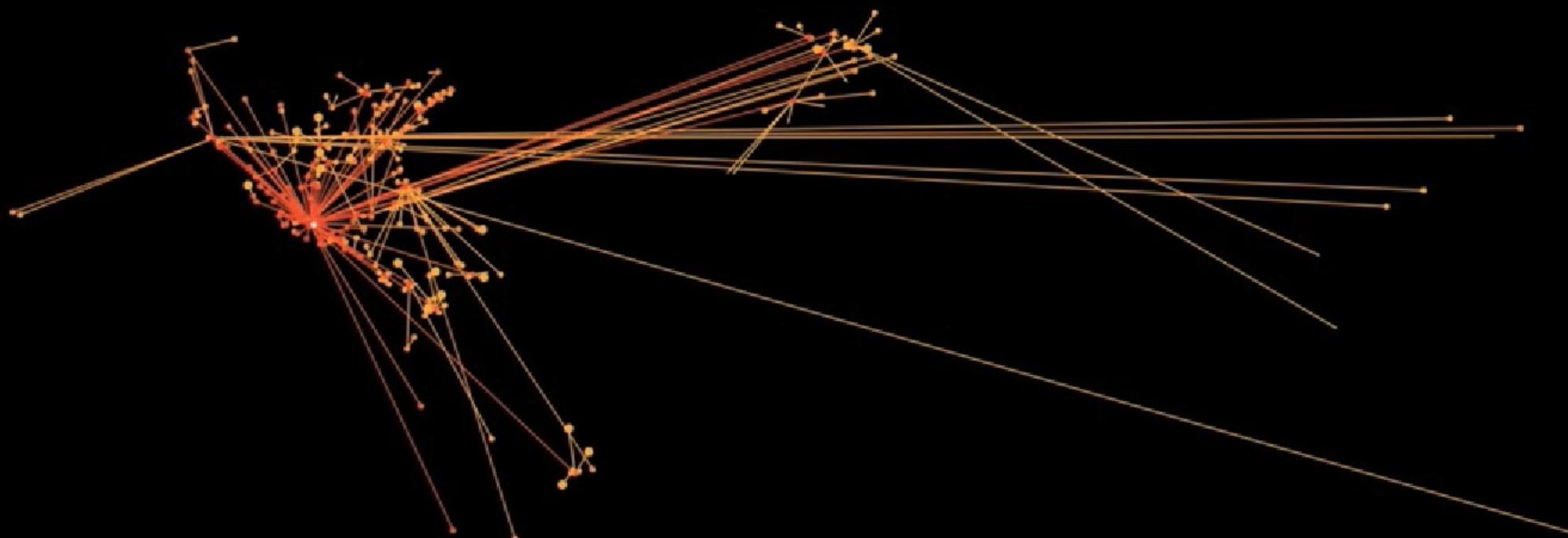




Network visualisations platforms

<http://www.bleamviz.org> Vespignani GLEAM group

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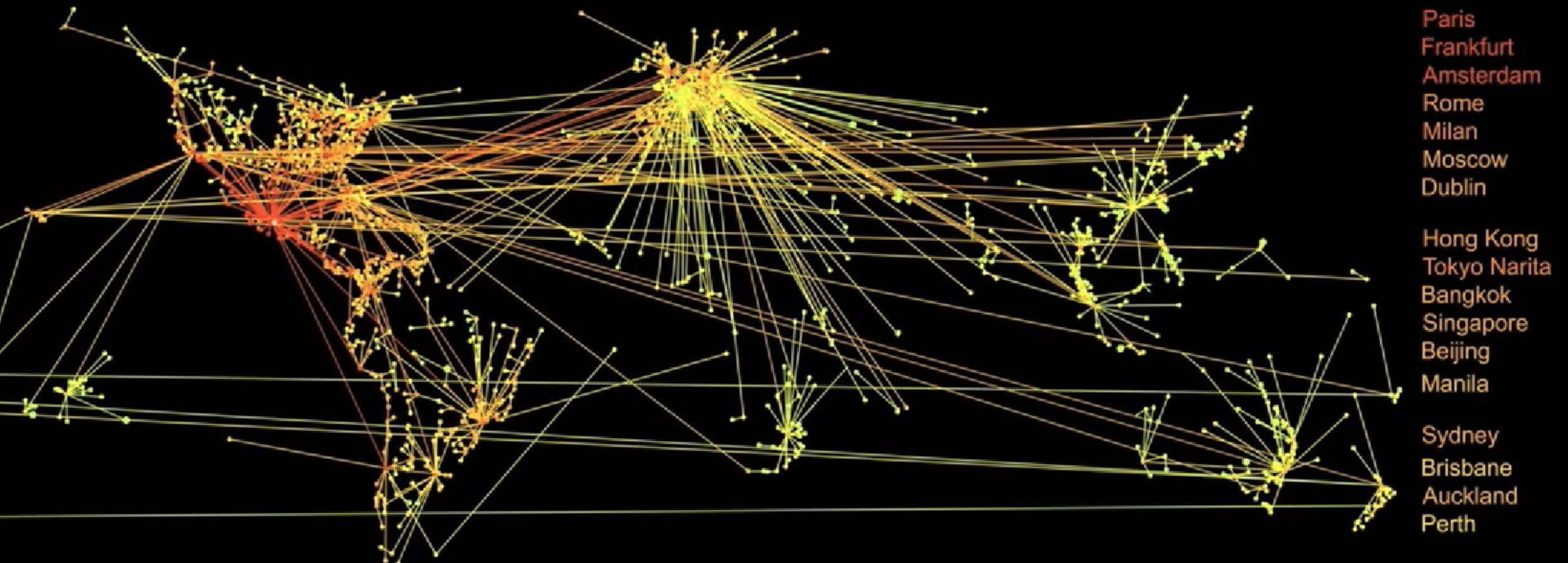
Auckland

Perth

Network visualisations platforms

<http://www.gleamviz.org>

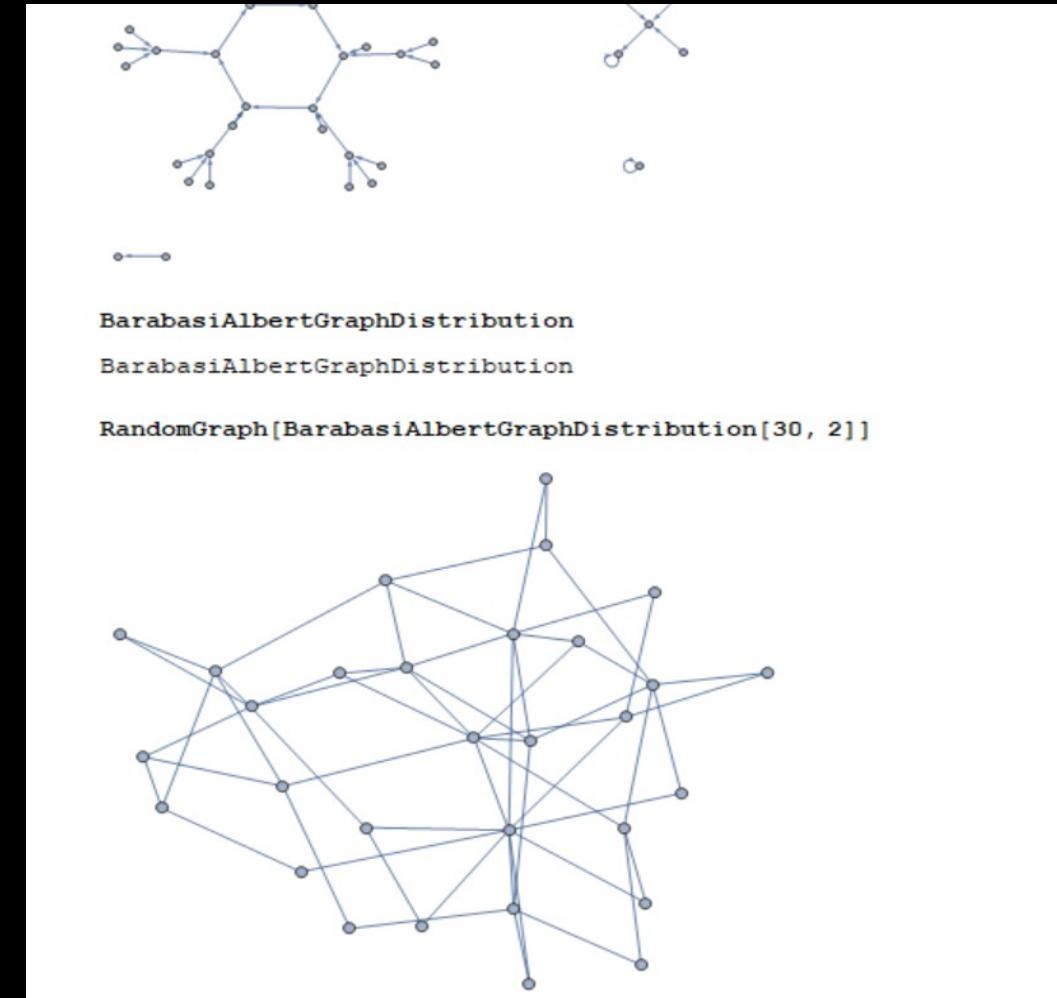
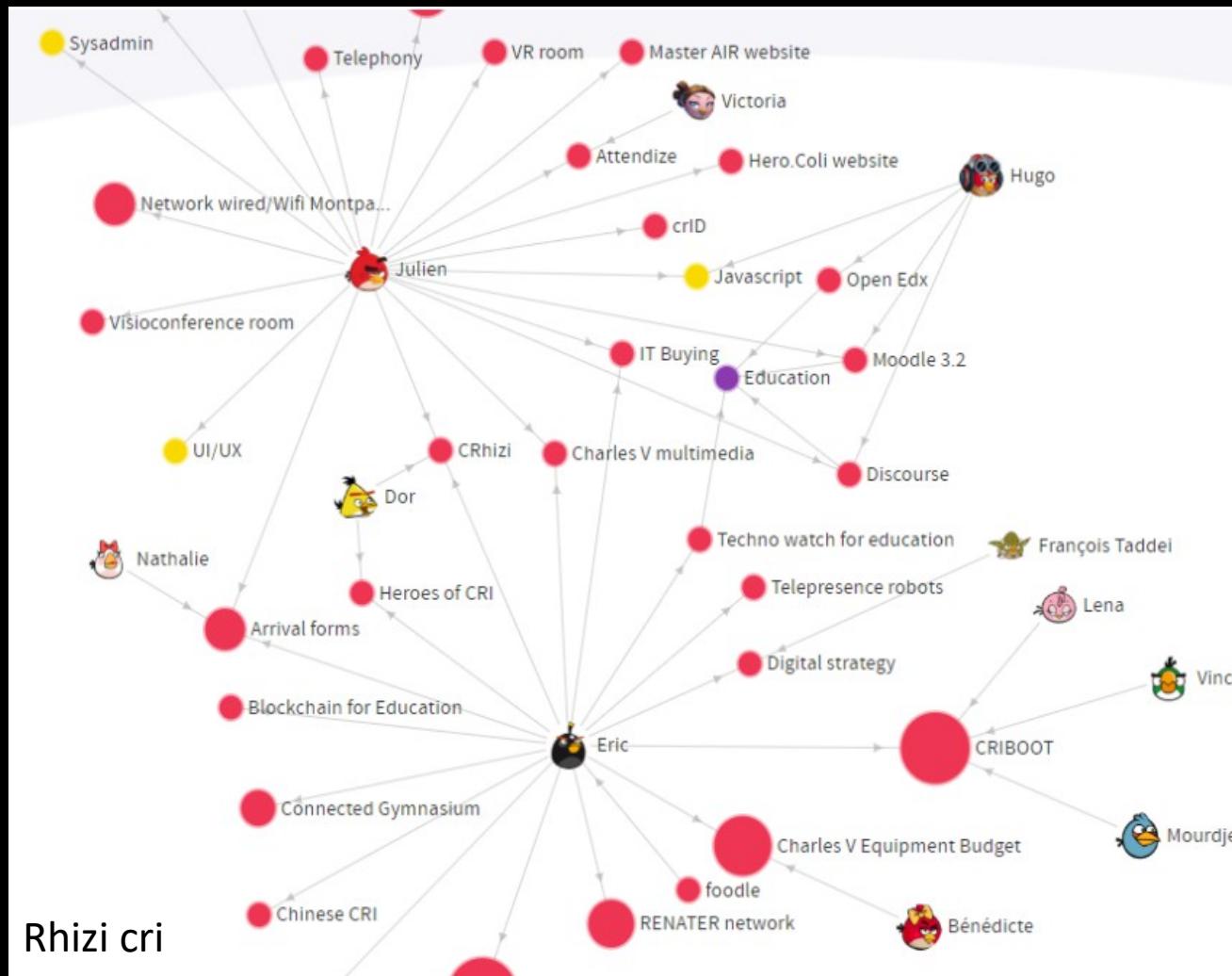
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