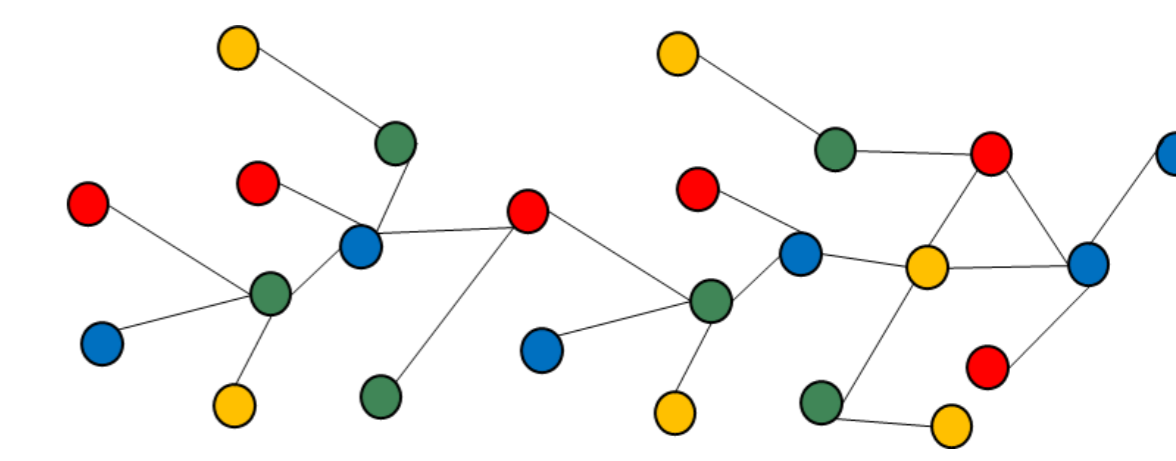


Network science investigates real-world complex networks

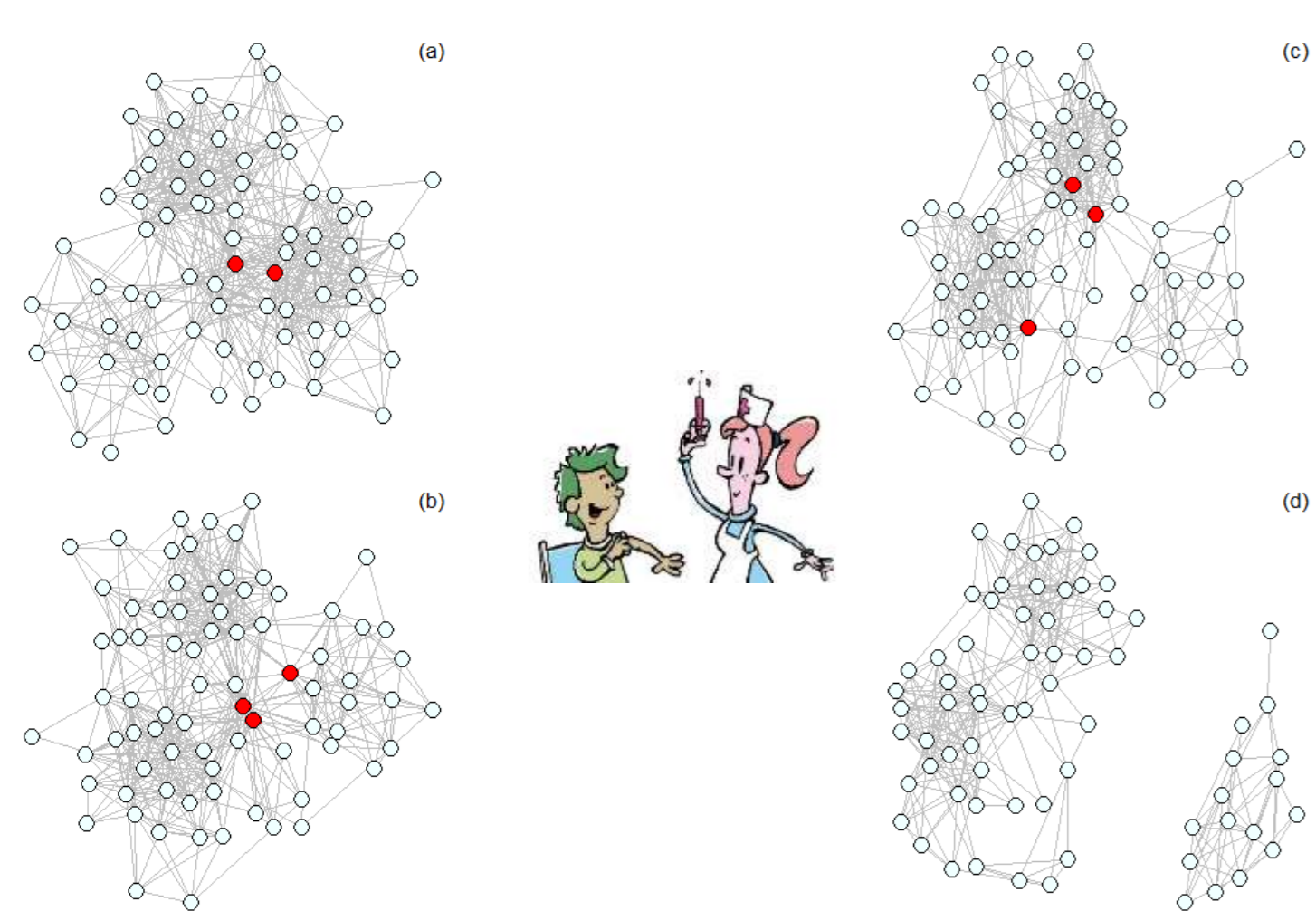
A **network** is made by:

nodes ● (object, persons, places, ...) connected by **links** ≡ (relationships, contacts, connections, ...)



The Networks Unit investigates networks using **analytical methods** combined with **High Performance Computing (HPC)**

SOCIAL NETWORKS Effective vaccination strategies



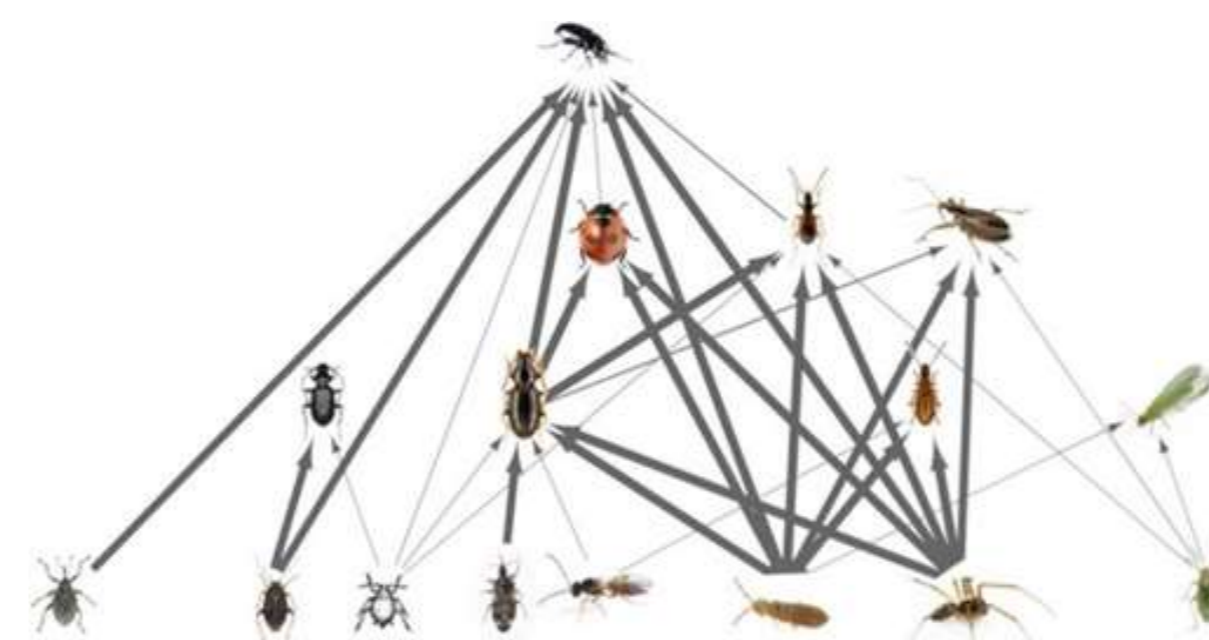
Which is the best vaccination strategies to halt epidemics?

Vaccinate nodes breaks the epidemic chains and halt spreading

A comparison of node vaccination strategies to halt SIR epidemic spreading in real-world complex networks
SCIENTIFIC REPORTS (2022)



ECOLOGICAL NETWORKS Finding keystone species in ecosystems



Food-webs describe who eats whom in ecosystems

Preserving biodiversity



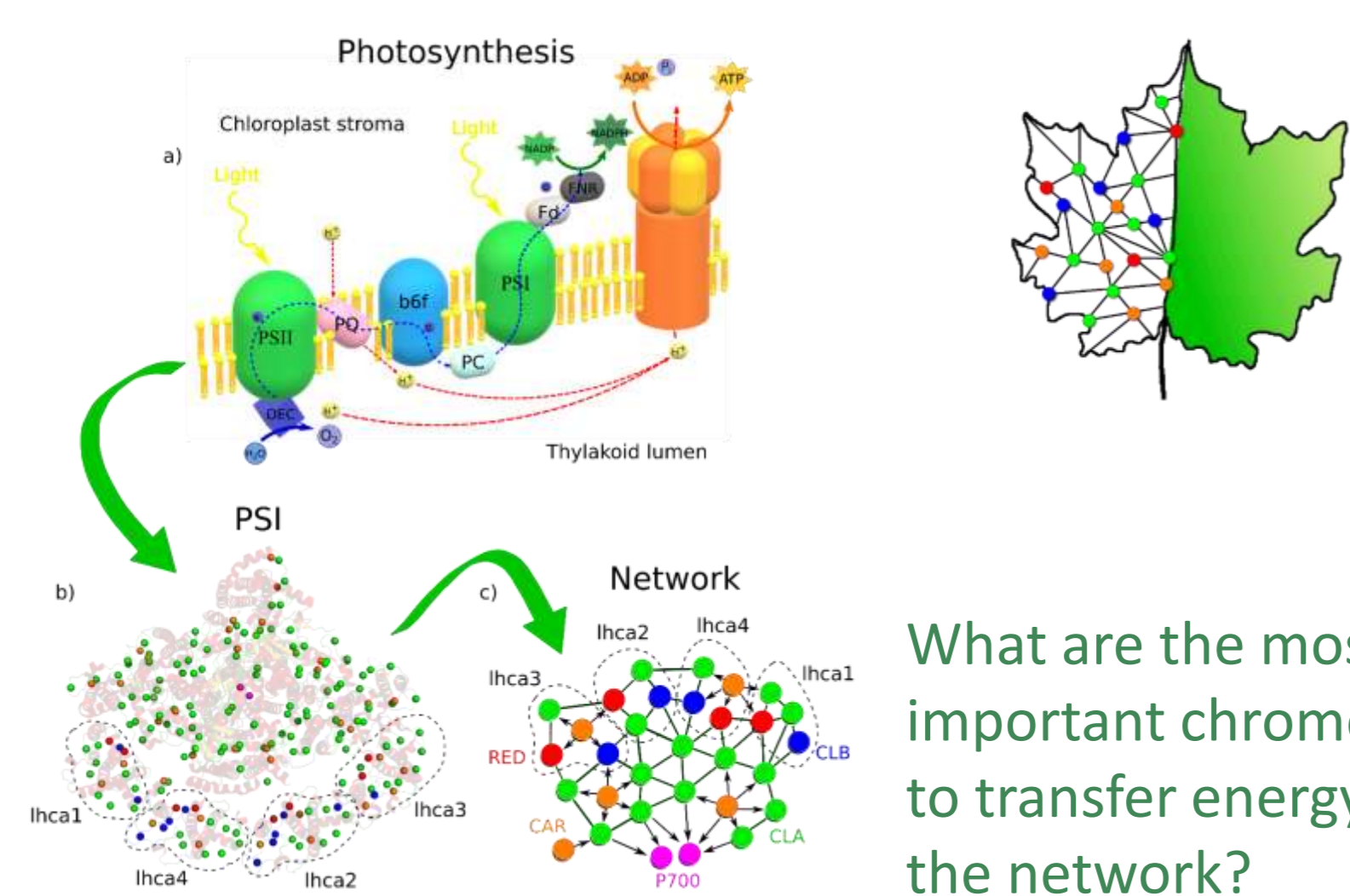
Figure: Food-webs of invertebrates species of an agricultural ecosystem.

Increasing the extinction risk of highly connected species causes a sharp robust-to-fragile transition in empirical food webs
ECOLOGICAL MODELLING (2013)



PHOTOSYNTHETIC NETWORKS

Topology affects network functioning



What are the most important chromophores to transfer energy into the network?

Modelling photosystem I as a complex interacting network
JOURNAL OF THE ROYAL SOCIETY INTERFACE (2020)



The Network Unit



Davide Cassi



Michele Bellingeri



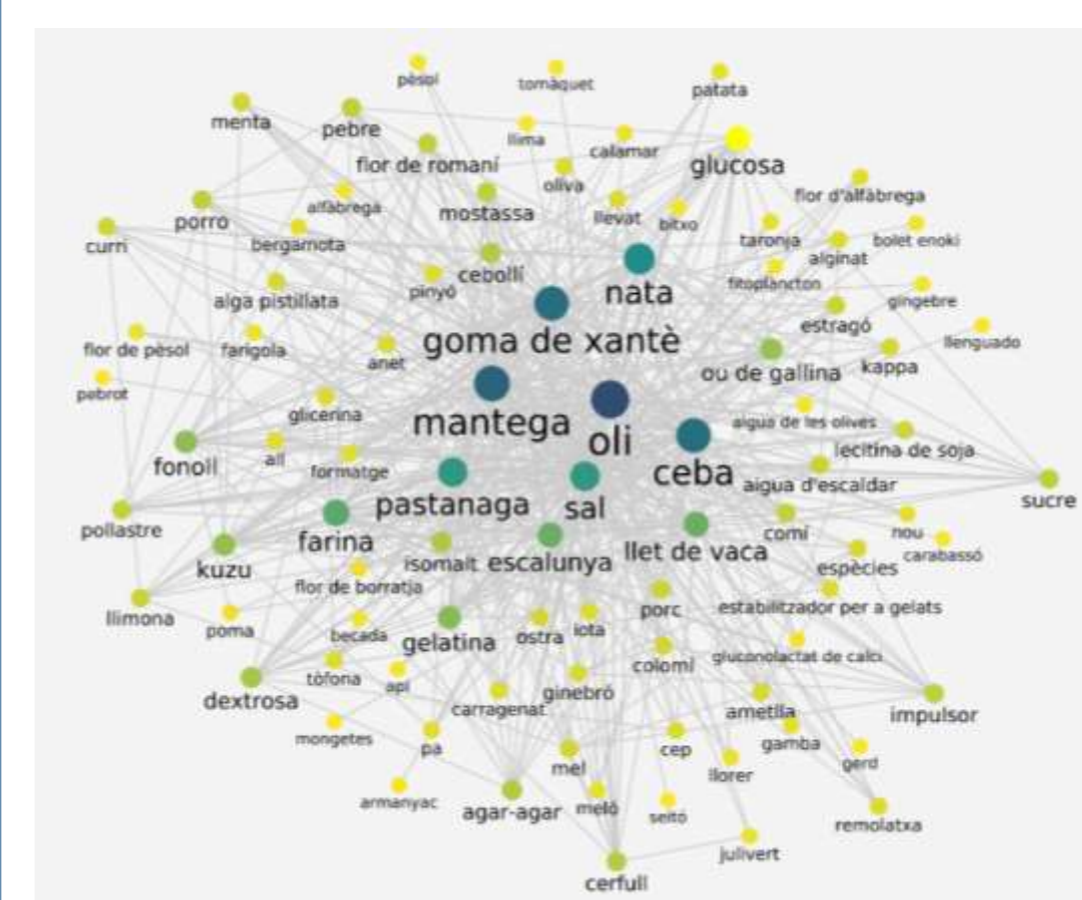
Roberto Alfieri



Massimiliano Turchetto

Cookbook networks

Network of gastronomical interactions

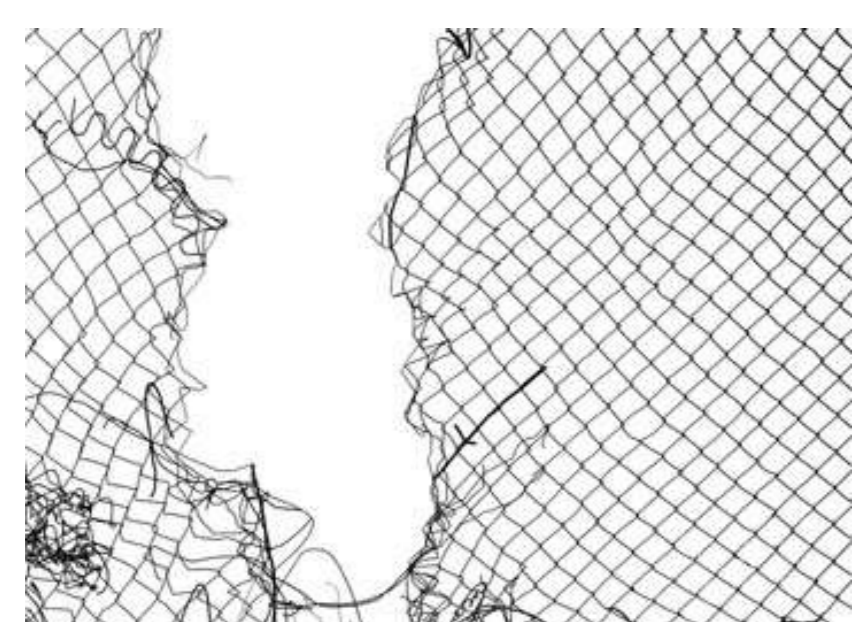


Which ingredients characterize a culinary tradition

Collaboration with Barcelona University (Spain)

NETWORKS ROBUSTNESS

Le reti reali sono resistenti alla rimozione di nodi e legami?



The heterogeneity in link weights may decrease the robustness of real-world complex networks
SCIENTIFIC REPORTS (2019)



Predict real-world networks robustness

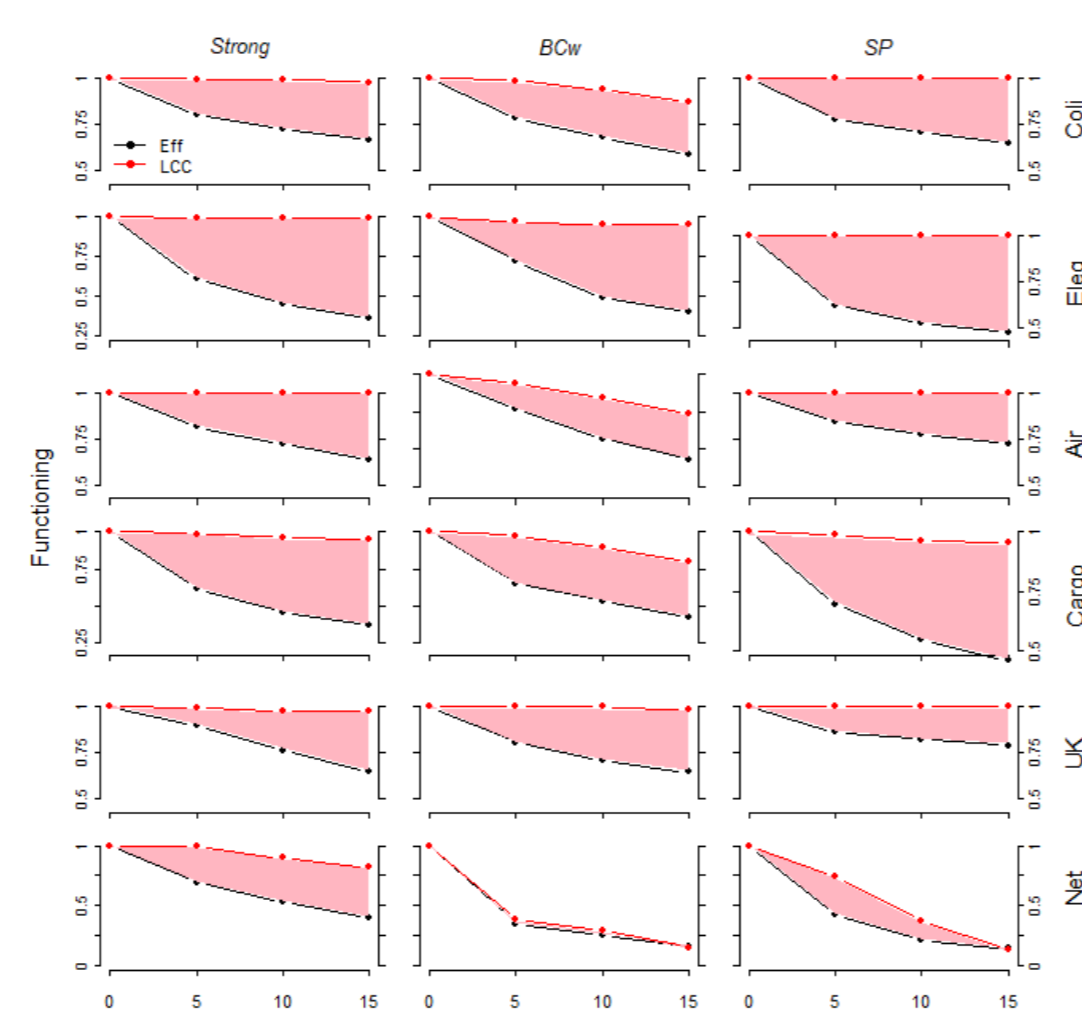
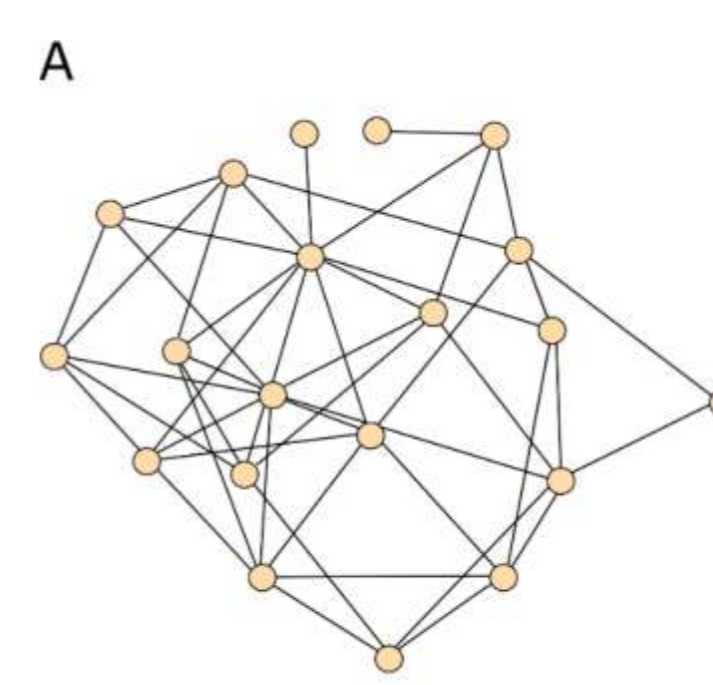


Figure: Real-world complex weighted networks functioning decrease (Eff & LCC) under 5, 10, 15% of links removed.

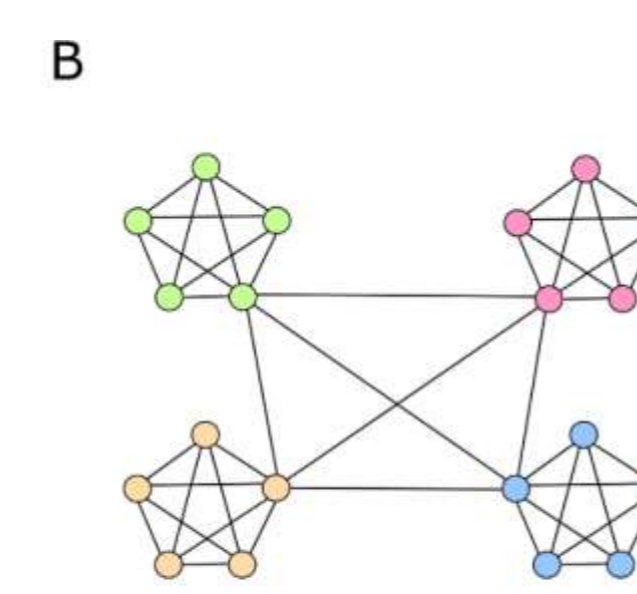
EPIDEMIC NETWORKS

Predict epidemic spreading pace

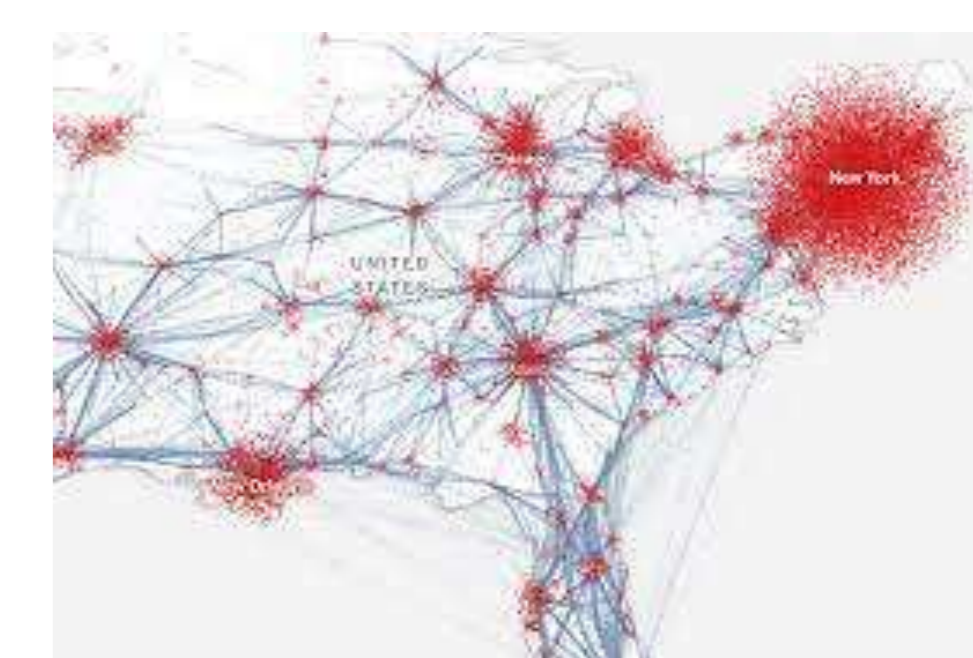
Structure affects epidemic spreading?



Random network



Communities network



Network structure indexes to forecast epidemic spreading in real-world complex networks
FRONTIERS IN PHYSICS (2021)



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