

<< Complex Bibliography >>

1 Counter terrorism's New Tool : "MetaNetwork Analysis" .

Author John Bohannon

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- a) Geospatial Distribution of Significant Acts (in Bagdad)
- b) Succession of temporal and spatial Graph
- c) Permits the localization of center of command.
- d) Criteria of browsing : betweenness, closeness, centrality and eigenvector centrality , flux intensity.
- e) To define criteria a team should be formed : mathematician, an heuristic interpreter, and social specialists with knowledge of the actors thinking their habits, religion and moral.

2 "Scale-free Networks " A decade and beyond .

Author : Albert-László Barabási

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- a) Predicted by the random theory it was assumed that all network had a Poisson distribution . But ten years ago it was proved that the WWW had a power law distribution, $P(k) = k^{-\alpha}$.
- b) The birth of a *scale free network* A.L.Barabási, R.Albert, Science, 509 (1999) Nuclear network , 3 nodes and 3 arcs (triangle) .
Attachment Rule : prefer the nod of the set of the more connected nodes.
- c) The consequence is that a set of the more connected nodes will be transformed in *hubs* of the network.
- d) The degree of distribution of the networks follows the power law, k^3 .
- e) The building of networks starts with a small network (3 nodes for instance) , and accretes new members (nodes) which are attracted by the more powerful nodes (more connecting arcs) of the network.
- f) The observations made demands a *new theory of complexity*.

3 "Revisiting the Foundations of Network Analysis "

Author: Carter T.Butts

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- a) The appropriate use of network analysis depends on choosing the right network representation of the problem.
- b) The classical method is define the universal set of entities that intervene in the process and define the arcs (directed or not) connecting the nodes which have mutual connections. Some dynamic can be introduced time os space as external variables and building a succession of graphs .
- c) The above referred frame work is considered restrictive the connections between nodes are constantly changing and no justification is given.
- d) Some extensions and relaxations can be conceived :
 - . The information, mass and energy flowing in the connecting can change and is not a simple yes/no state.
 - . The nodes of the graph are graphs themselves and this construction can be applied successively creating a multilevel graph.
 - . Creating time series .
- e) A *node* can represent : a potential feeding site, each specie is a nod,

an isolated tree, bark, trunk and leaves, an human, a family, a community, an army, individual publications, etc. etc.. The problems are to define the initial universal set of intervening entities, UE, and to permit the emigration and immigration of entities, to choose good partitions of the successive. UE, and use a set of *merit functions* to extract some useful information of the network.

- f) An *arc* should represent fluxes of information, matter and energy between nodes in accordance with the evolution of the network.
- g) The basic idea is to construct the network in a stepwise mode. Time is the ordering variable. The information is received and archived and processed and eventually the universal set at time t is different from that of $t-1$, $UE(t) \sim UE(t-1)$. Some cases the evolution of the network is based on increasing dimension of the space occupied or quantity of nodes.
- h) Many new *merit functions* have been tested : betweenness centralization, degree of centralization, connectedness, transitivity.
The above referred *merit functions* as functions of the level of aggregation are represented as elongated islands and the centralized value conforms a generally a power law distribution.
- i) The methods presented are based on a priori assumptions.

4 "Disentangling The Web of Life

Author: Jordi Bascompte

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- a) Entities can be distinguished by being or not endowed with *life* .
Life implies creating new living beings but also destroying them.
Specie Y eats specie Z and is eaten by specie X.
Usually the eating process implies killing.
- b) Now a days biodiversity research is focused on species richness.
Exceptionally pairs of species are studied .
The suggestion is two study many interacting species.
- c) Web life is a powerful representation encapsulating ecological connectivity among species. Typical examples are : plant animal mutualism network.
a network of spatial genetic variation across habitat patches .
- d) The basic building blocks of ecological networks are $(a > b > c)$ and the triangle $((a > b) (a > c) (b > c))$. With these blocks by accretion of more nodes it is possible to build networks with many nodes.
- e) Some advantages of these networks is the possibility to introduce heterogeneity, networks thinking can provide a means to assess to problems like : how *over fishing* can cause trophic cascades , how the disruption of mutualism may reduce the entire pollination service, etc.

4 "A General Framework for Analyzing Sustainability of Social-Ecological Systems.

Author: Elinor Ostrom

Science 24 July 2009 page 419 ..422

- a) The major problem is the potential loss of fisheries forests and water resources
A framework is presented, involving social, economic and political settings.
- b) The main net work is portioned in 4 subsets : resources system, RS,
governance system, GS, resource units, RU, and users, U.
All 4 subsets are considered macro nodes that are connected and describe the

respective interactions, I .

The outcome, O, is the principal output of the network.

- c) Each subset is characterized by circa 9 variables and the outcome, O, are for instance the following performance measures :
 - social (efficiency, equity, accountability, sustainability)
 - ecological (overharvested, reliance, bio-diversity, sustainability)
 - externalities (other systems inputs and outputs.)

5 “Economic Networks : The New Challenges

Author: Frank Schweitzer and 5 others

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- a) **Economic Crises** illustrates a critical need for new and fundamental understanding of the structure and dynamics of economic networks. The systemic complexity of economic networks must be approached to reduce conflicts between individual interests and global efficiency.
- b) The network equilibrium depends on the conditions under which *myopic* agents can establish links. Network efficiency is measured by the aggregate centrality of the agents. The environment volatility measures the risk that any one agent is exposed to an exogenous shock implies the deletion of a link.
- c) An international financial network is given in fig.2 to show the dimension and the complexity of the aggregate.
- d) The authors have different specialties : Econometric, Complex Network, Economic Theory, Physics, Polcy, Contacts and Careers etc. The specialties are still to much connected.

6 “Predicting Behavior of Techno-Social Systems

Author: Alessandro Vespignani

Science 24 July 2009 page 425 ...428

- a) The World Wide Web , WiFi are very good examples of immense networks and can be used to clarify assumptions and methods. Three studies are presented : Continental US Airlines, Continental US county commuting and Local mobility (mobile phones).
- b) The report gives the probability distribution of traffic, $P(s)$, in all three cases. Vide fig.2
- c) The epidemic invasion tree build from the simulations of pandemic origin in Hanoi. Vide Fig.3
- d) Taking advantage of multi scale networks . The principal distinction is to start the construction of the network by study small networks of humans and find out what is the reaction to various actions. Then increase the dimension of the networks to find if new types of reactions do occur . The process is increasingly more complex but eventually some reactions are can be explained by some actions and eventually some knowledge can be extracted experimentally .
- e) Prediction of the future is the main objective of all these efforts. A very important distinction must be made : nonliving beings react and are not dependant of opinions or predictions but living beings react to predictions Humans are very influenced by information regarding the future and opinions of *sages* and *well informed* people and act upon these secret information. Humans copy their leaders and create catastrophic situation.