

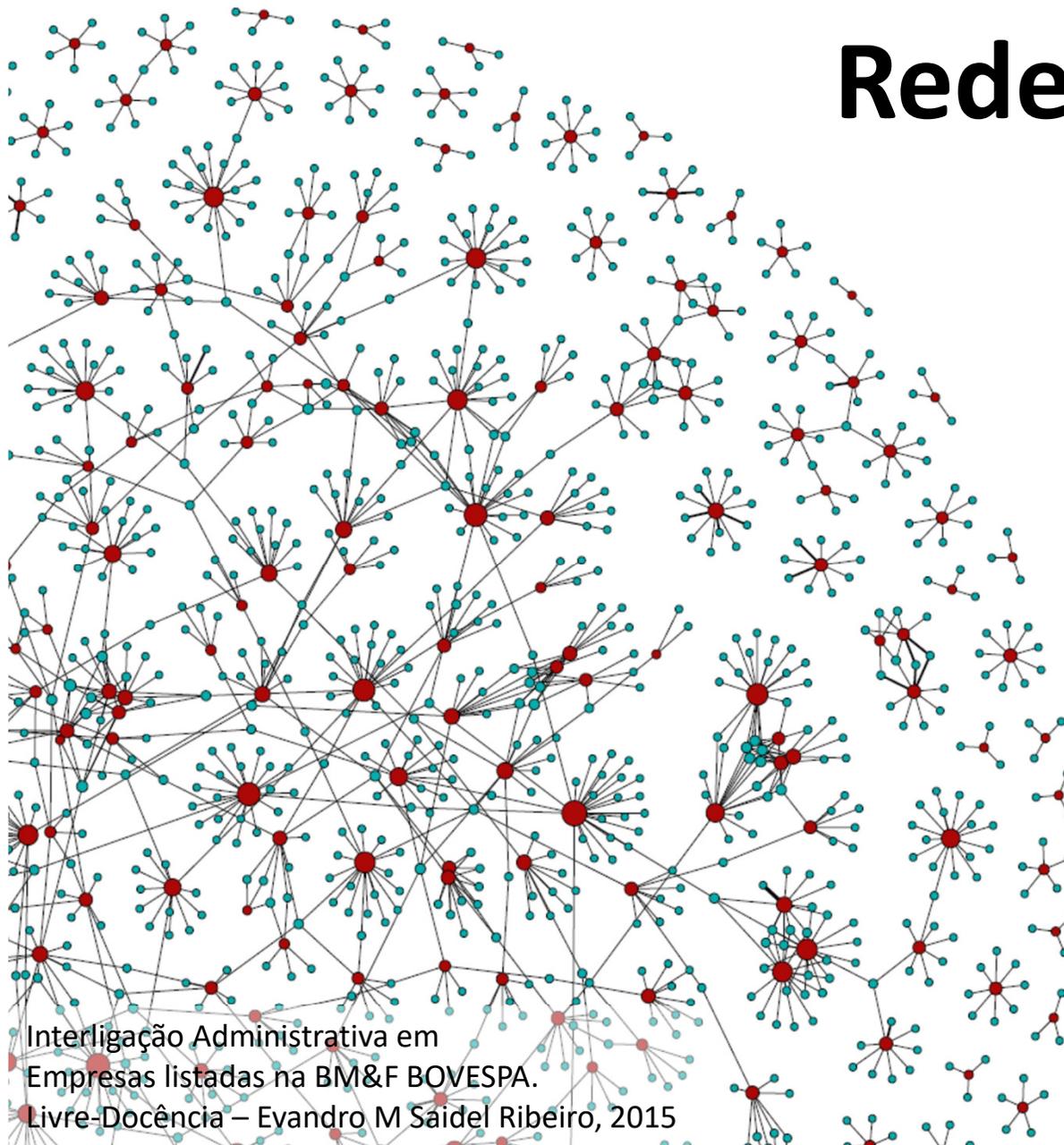
Redes Econômicas e Sociais: Teoria e Aplicações

Introdução

1 - Histórico

Prof. Evandro Saidel

RAD5056 – PPGA0



Apresentação da disciplina RAD5056

- **O cronograma e material apresentado em aula**

Todo o material apresentado durante o semestre estão disponibilizados no site STOA USP da disciplina

<http://disciplinas.stoa.usp.br/>

Nome Completo:

RAD5056-Redes Econômicas e Sociais: Teoria e Aplicações (2018)

Nome Breve: **RAD5056-2018**

Turma USP: **RAD5056.1.3**

Cronograma RAD5056 para 2018

Data	Aula	Conteúdo	Entregas	
05/mar	1	Apres. da Disciplina, Cronograma, STOA, Teoria A		
12/mar	2	Teoria B: Conceitos Básicos e Softwares (Gephi, R)		
19/mar	3	Teoria C: Estrutura de Redes	Lista 1	
26/mar		Não haverá aula (semana santa)		
02/abr	4	Teoria D: Redes Dinâmicas; Teoria E: Graph Database	Lista 2	
09/abr	5	Apresentação de Artigos	Lista 3	AA – Apres. de Artigo
16/abr	6	Apresentação de Artigos (continuação, se necessário)		
23/abr	7	Trabalho Prático: Resumo sobre o que será feito	Lista 4	TP - Prévia
30/abr		Não haverá aula (ponto facultativo)		
07/mai	8	Aplicações: Possíveis estudos, Artigos, Produtos, ...	Lista 5	
14/mai	9	Trabalho Prático: Apresentações Finais		TP - Conclusão

Forma de Avaliação: RAD5056

Código	Nome	Atividade	Peso
LE	Listas de Exercícios	Cinco listas de exercícios. Entregas em word ou pdf.	30
TP	Trabalho Prático	Aplicação de análise de redes. Entrega na forma de artigo.	40
AA	Apresentação de Artigo	Análise e apresentação de artigo sobre redes. Entrega em pdf ou power point	30

Forma de Avaliação: RAD5056 - 2015

M.LE	Média em cinco listas. Nota máxima em cada lista: 10,0.
N.TP	Nota do Trabalho Prático. Nota máxima no trabalho: 10,0.
M.AA	Nota da Apresentação de Artigo. Nota máxima: 10,0.
NF	Nota Final = $(30 \text{ M.LE} + 40 \text{ N.TP} + 30 \text{ M.AA}) / 100$

Faixa de notas		Conceito	Situação
8,5	10,0	A	Aprovado
6,5	8,4	B	Aprovado
5,0	6,4	C	Aprovado
0,0	4,9	R	Reprovado

Conteúdo da disciplina RAD5056

Introdução

1. Desenvolvimentos Históricos
2. Visualização de Redes
3. Fundamentos Matemáticos
4. Estrutura de Redes Econômicas e Sociais
5. Dinâmica de Redes

Livro Barabasi: <http://barabasi.com/networksciencebook/>

Introdução: um contexto pessoal – pesquisa científica

Economia, Econofísica, Sistemas Complexos, Data Science, Big Data, Redes...

Evandro Saidel Ribeiro | Linha do Tempo | 2011 | Destaques

Viena 2011 (ECCS'11)

Adicionar outro acontecimento de 2011

FOTOS · 2011

+12

Escreva um comentário...

Felipe L'or ▸ Evandro Saidel Ribeiro
14 de setembro de 2011 ·

Ae Evandrão, só gente da melhor aí hein! Gell-Mann, Bouchaud, Somette e Stanley! Caracas. Lembrei desse vídeo do Gell-Mann, não sei se você já viu!

Murray Gell-Mann: Beauty and truth in physics
<http://www.ted.com> Armed with a sense of humor and laypeople's terms, Nobel winner Murray Gell-Mann drops some knowledge on TEDsters about particle...
 YOUTUBE.COM

Curtir
 Comentar
 Compartilhar

Você curtiu isso.

Introdução: A fronteira da ciência

"Today, we know more about the universe than about our society. It's time to use the power of information to explore social and economic life on Earth and discover options for a sustainable future. Together, we can manage the challenges of the 21st century, combining the best of all knowledge."

<http://www.futurict.eu/>

Dirk Helbing

How we can predict the next financial crisis?

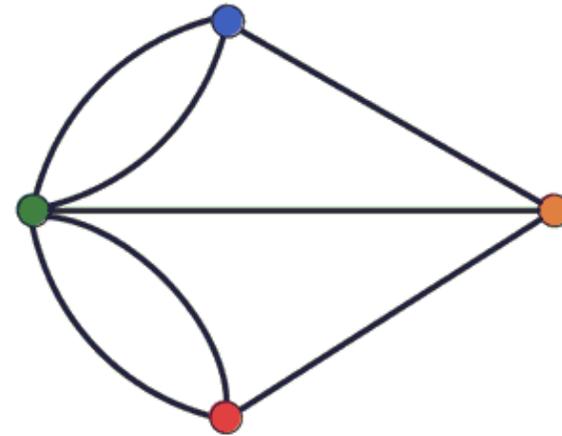
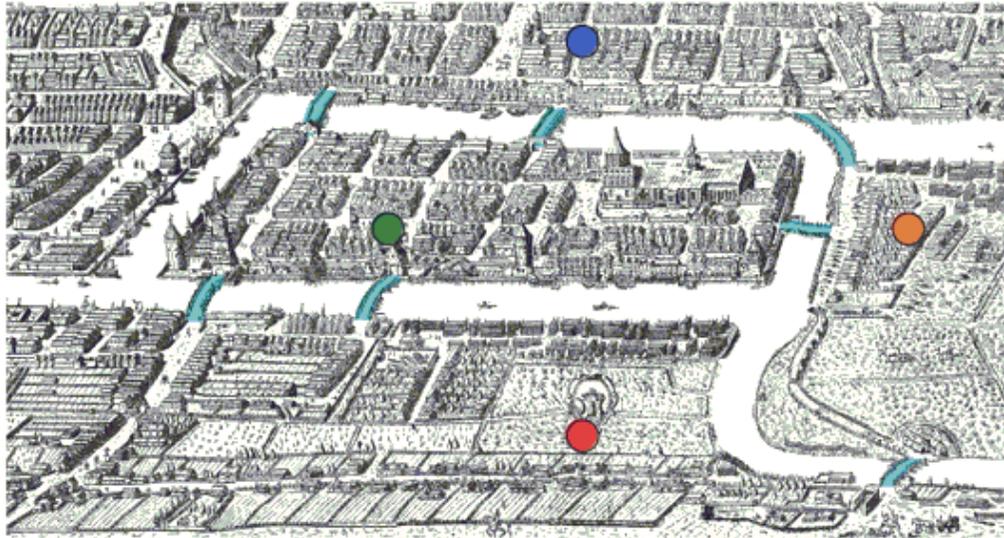
http://www.ted.com/talks/didier_sornette_how_we_can_predict_the_next_financial_crisis?language=en

Didier Sornette

17min.₈

1. Desenvolvimentos Históricos

As sete pontes de Königsberg, Prússia, 1735



É possível andar pela cidade de forma a passar por todas as pontes apenas uma vez? As pessoas passavam horas pensando se era possível.

Solução: Estudos de Leonard Euler - Teoria de grafos

<http://mathforum.org/isaac/problems/bridges2.html>

1. Desenvolvimentos Históricos

Teoria de grafos 1736-1936, Biggs, Lloyd, Wilson, 1976

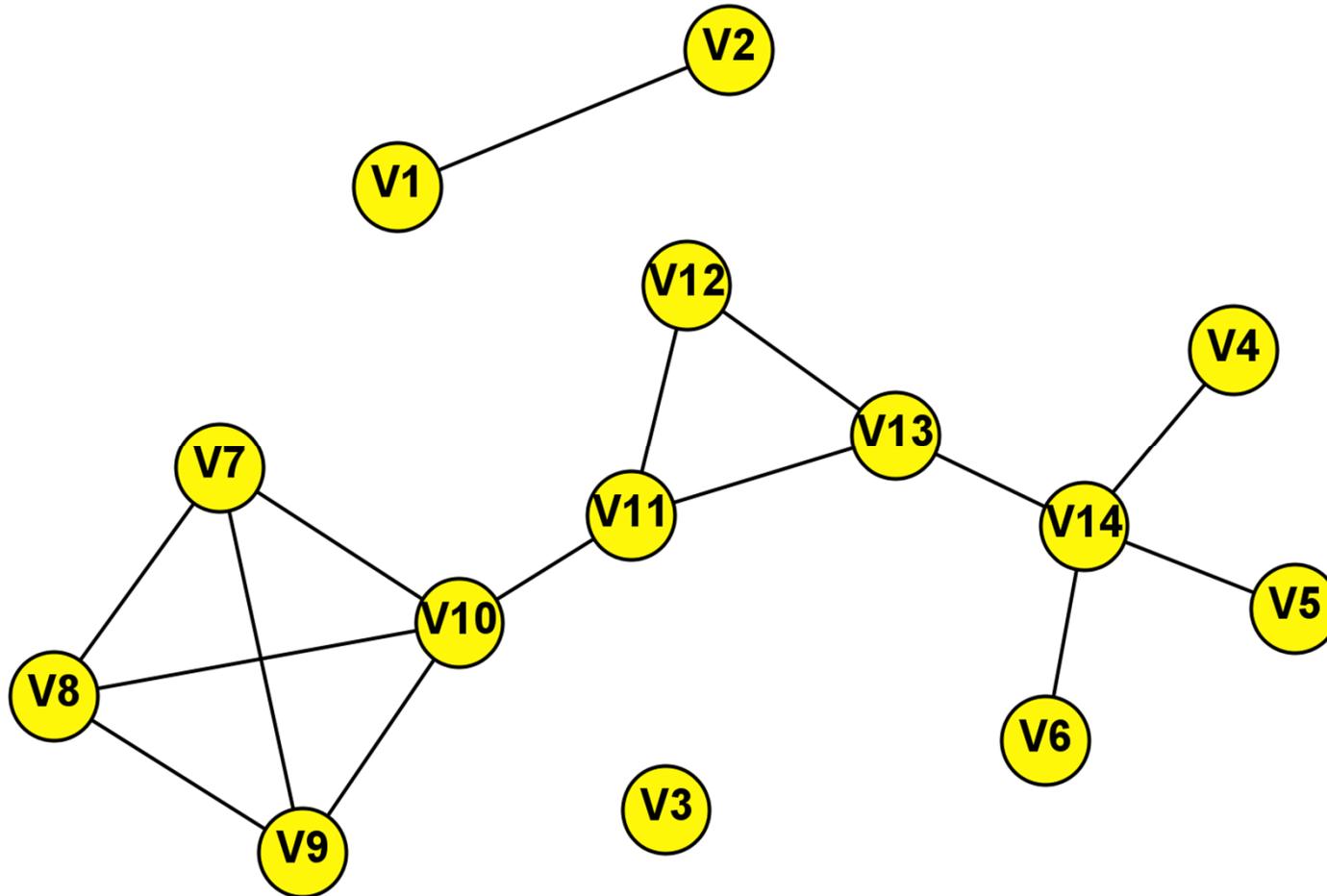


Fig. Rede com 14 vértice e 15 arestas

1. Desenvolvimentos Históricos: (a) – Seleção pré WS.

----- "Texto do escritor húngaro Frigyes Karinthy de 1929" -----

 (Text.00) Frigyes Karinthy. Chain-Links: Everything is Different. 1929.

----- "Referências anteriores ao trabalho de Watts e Strogatz" -----

 (A01) Paul Erdős, Alfréd Rényi. On the evolution of random graphs. Publications of the Mathematical Institute of the Hungarian Academy of Sciences, v. 5, p. 17-61, 1960.

 (A02) Paul Baran. On distributed communication: 1 - Introduction to distributed communication networks. United States Air Force Project RAND, 1964.

 (A03) Derek J de Solla Price. Networks of scientific papers. Science, v. 149, n. 3683, p. 510-515, 1965.

 (A04) Stanley Milgram. The small-world problem. Psychology Today, v. 1, n. 1, p. 61-67, 1967.

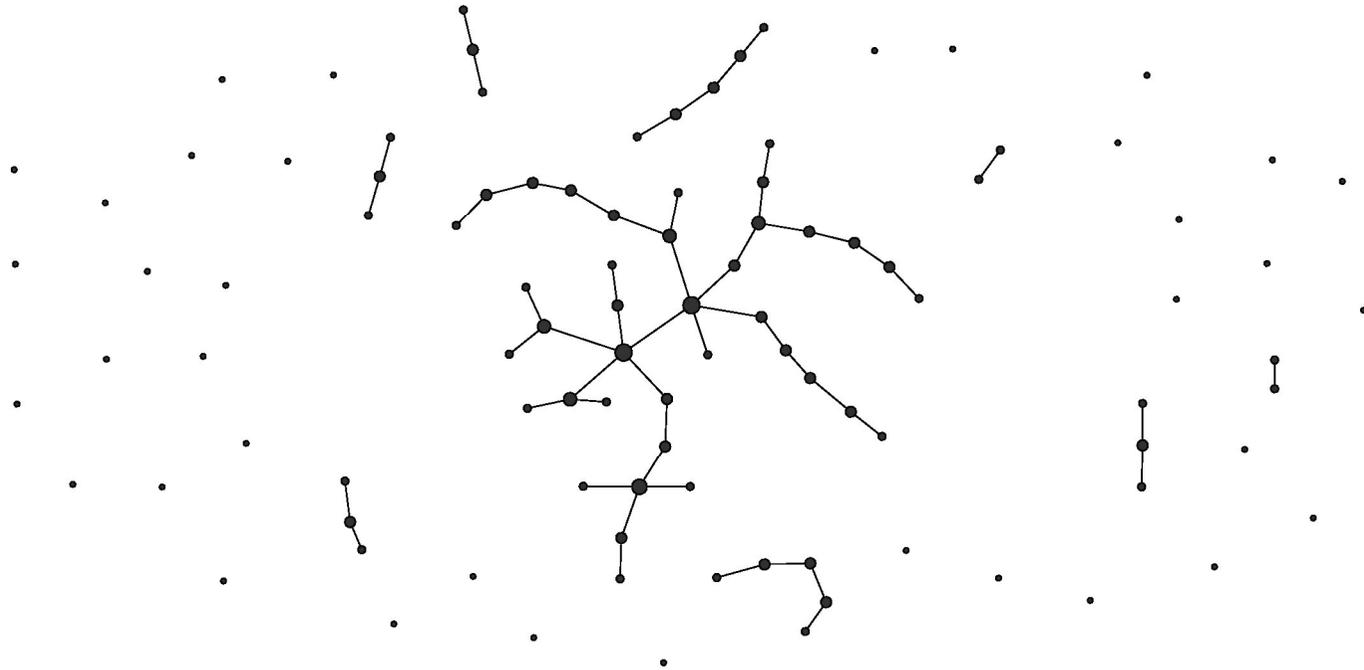
 (A05) Mark S Granovetter. The strength of weak ties. American Journal of Sociology, v. 78, p. 1360-1380, 1973.

1. Desenvolvimentos Históricos (a)

Paul Erdős, Alfréd Rényi

On the evolution of random graphs, 1960

Propriedades de grafos (redes) construídos a partir de conexões aleatórias.



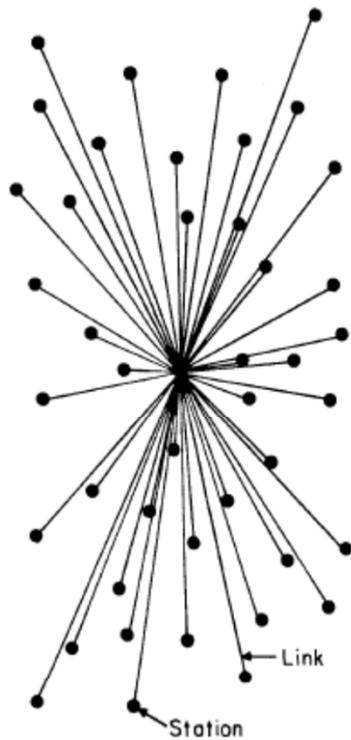
"Erdos generated network-p0.01" by Vonfrisch at the English language Wikipedia. Licensed under CC BY-SA 3.0 via Commons - https://commons.wikimedia.org/wiki/File:Erdos_generated_network-p0.01.jpg#/media/File:Erdos_generated_network-p0.01.jpg

1. Desenvolvimentos Históricos (a)

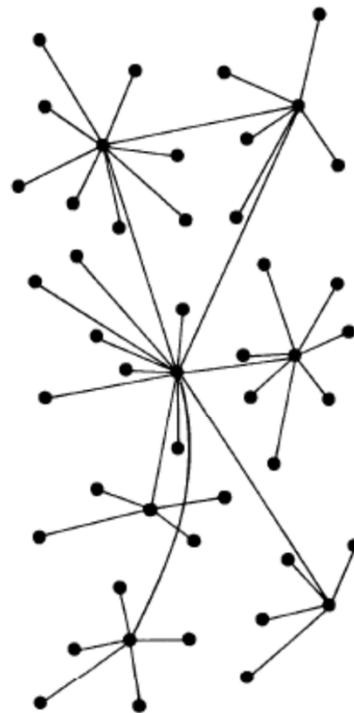
Paul Baran

On distributed communications, 1964

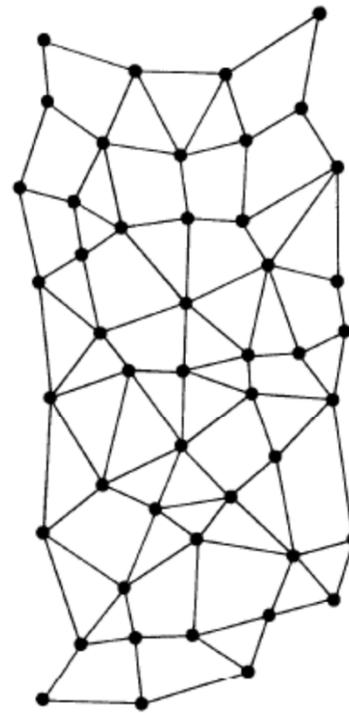
Desenvolvimento de redes de computadores.



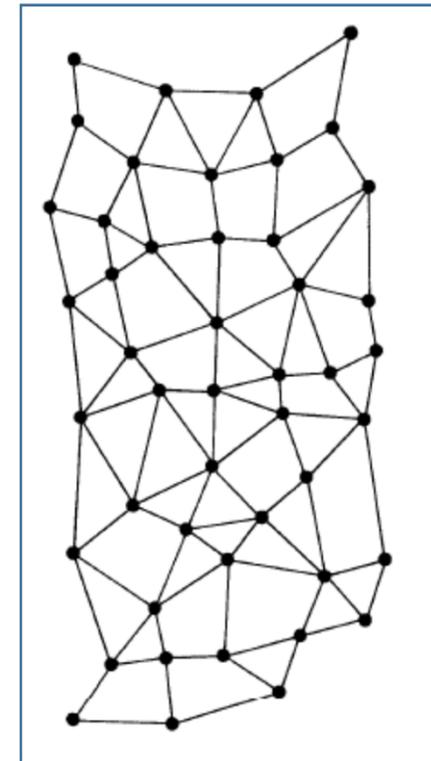
CENTRALIZED
(A)



DECENTRALIZED
(B)



DISTRIBUTED
(C)

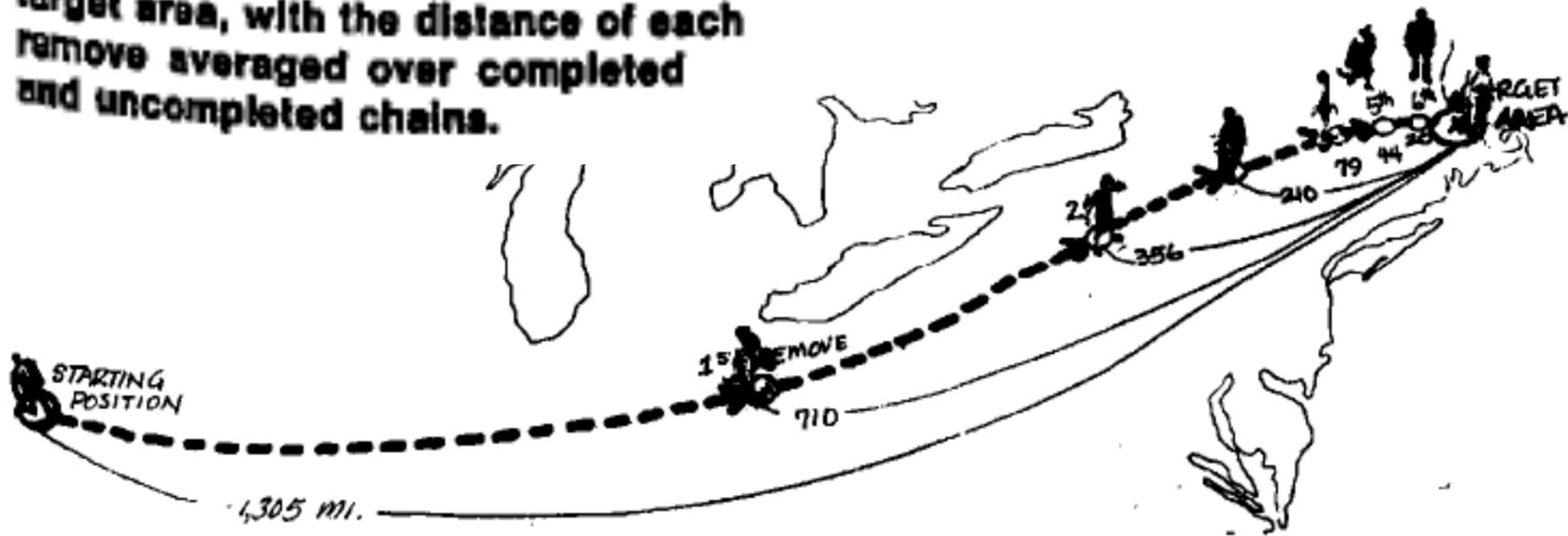


1. Desenvolvimentos Históricos (a)

Stanley Milgram

The small-world problem, 1967

The chains progress from the starting position (Omaha) to the target area (Boston) with each remove. Diagram shows the number of miles from the target area, with the distance of each remove averaged over completed and uncompleted chains.



1. Desenvolvimentos Históricos (a)

Derek de Solla Price

Networks of scientific papers

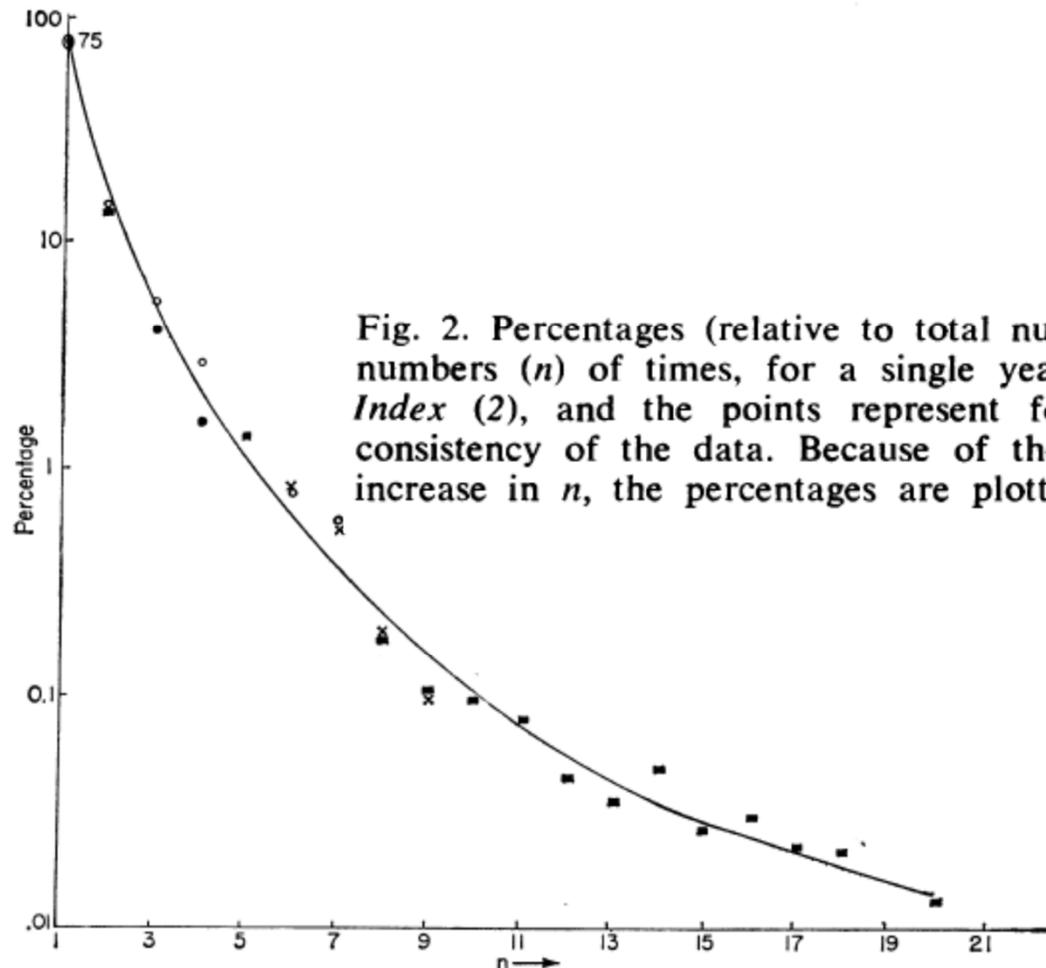


Fig. 2. Percentages (relative to total number of cited papers) of papers cited various numbers (n) of times, for a single year (1961). The data are from Garfield's 1961 *Index* (2), and the points represent four different samples conflated to show the consistency of the data. Because of the rapid decline in frequency of citation with increase in n , the percentages are plotted on a logarithmic scale.

1. Desenvolvimentos Históricos (a)

Mark S Granovetter

The strength of weak ties, 1973

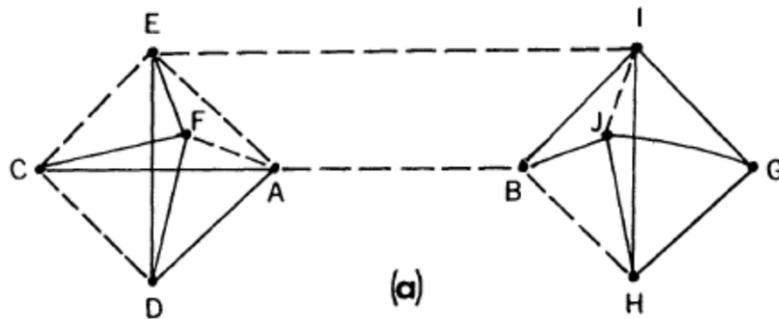
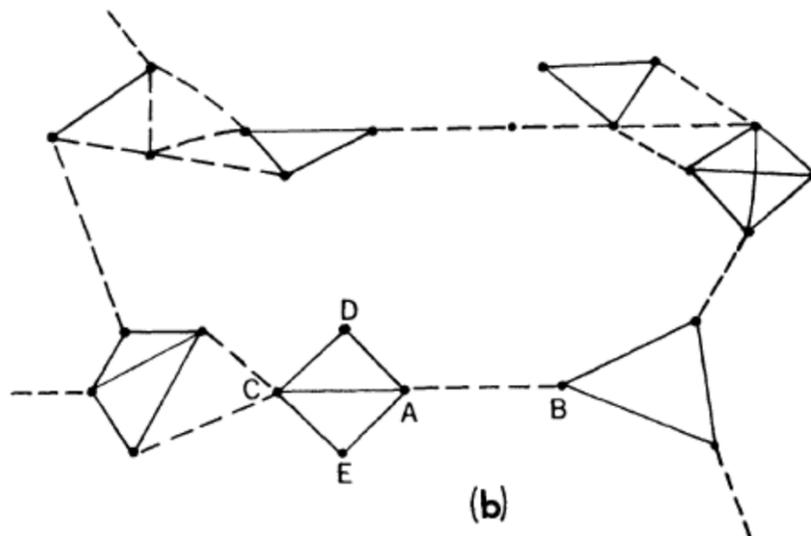


FIG. 2.—Local bridges. *a*, Degree 3; *b*, Degree 13.

—— = strong tie;

---- = weak tie.



1. Desenvolv. históricos: The new Science of networks

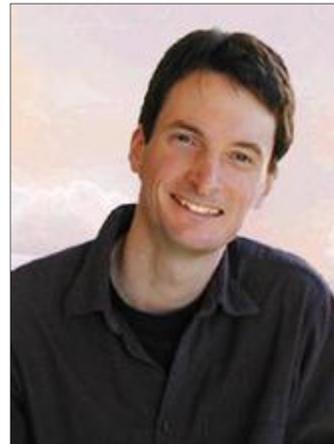
Pesquisadores: Social and Economic Network Analysis



Steven Henry Strogatz is an American **mathematician** and the Jacob Gould Schurman Professor of Applied Mathematics at Cornell University.



Duncan James Watts is a principal researcher at Microsoft Research, New York City known for his work on small-world networks.



Mark Newman is Professor of **Physics** at the University of Michigan, as well as an external faculty member of the Santa Fe Institute



Albert-László Barabási is a Hungarian-American **physicist**, best known for his work in the research of network theory.



Réka Albert is a Romanian scientist. She is professor of **physics** and adjunct professor of biology at Pennsylvania State University and is noted for the Barabási–Albert model.

Strogatz

Watts

Newman

Barabási

Albert

1. Desenvolvimentos Históricos: (b) – Seleção pós WS

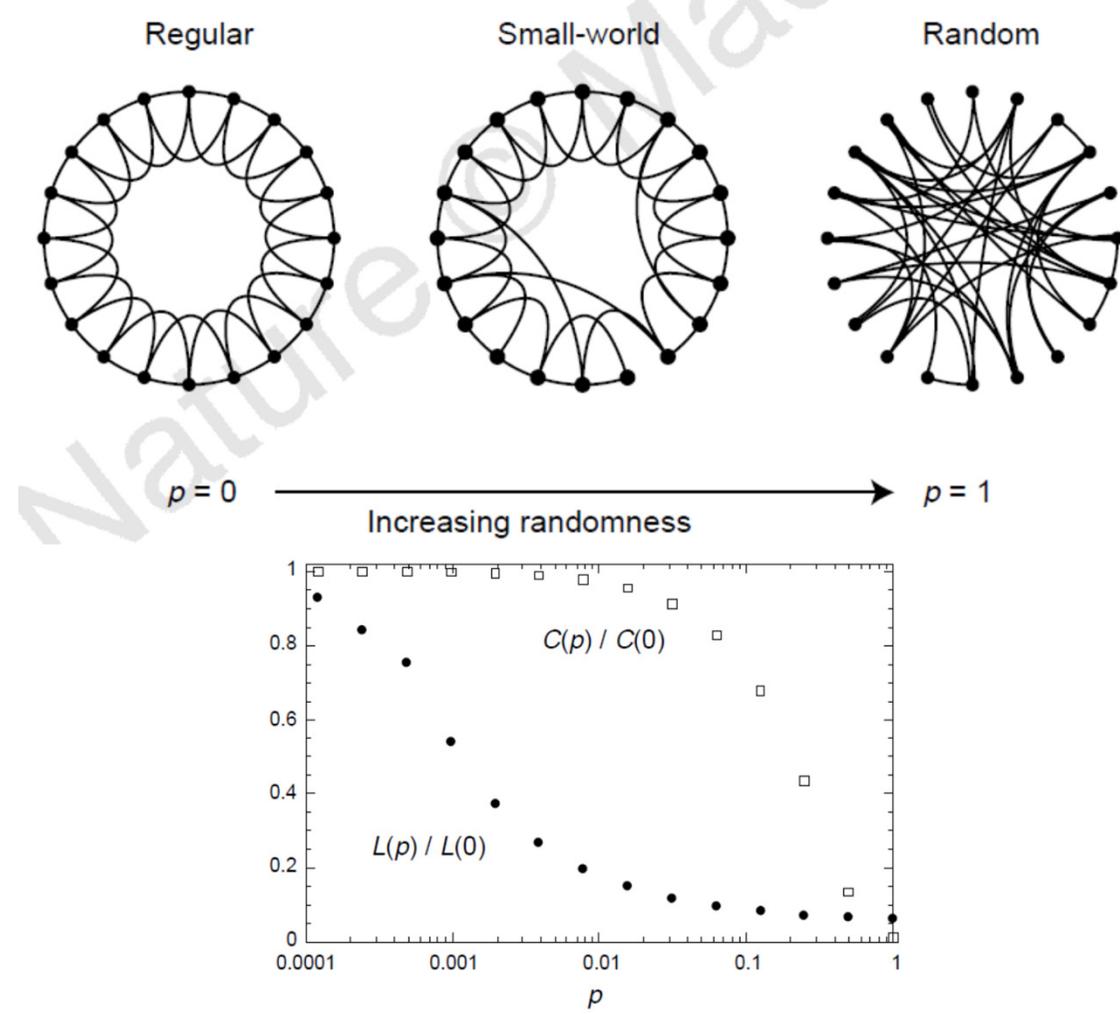
----- "The new science of network" -----

-  (A06) Duncan J Watts, Steven H Strogatz. Collective dynamics of “small-world” networks. *Nature*, v. 393, p. 440-442, 1998.
-  (A07) Albert-László Barabási, Réka Albert. Emergence of scaling in random networks. *Science*, v. 286, p. 509-512, 1999.
-  (A08) R.N. Mantegna, Hierarchical structure in financial markets, *The European Physical Journal B*, 1999.
-  (A09) Steven H Strogatz. Exploring complex networks. *Nature*, 2001.
-  (A10) G. Bianconi e A.-L. Barabási. Competition and multiscaling in evolving networks, *Europhys. Lett.*, 2001.
-  (A11) Lothar Krempel, Thomas Plümpner, Exploring the Dynamics of International Trade by Combining the Comparative Advantages of Multivariate Statistics and Network Visualizations. *Journal of Social Structure*, v. 4, 2003.
-  (A12) Aaron Clauset, M. E. J. Newman e Cristopher Moore. Finding community structure in very large networks, arXiv:cond-mat/0408187, 2004
-  (A13) Nader Salman e Anne-Laure Saives. Indirect networks: an intangible resource for biotechnology innovation. *R&D Management*, 2005.
-  (A14) G. Palla, I. Derényi, I. Farkas, T. Vicsek. Uncovering the overlapping community structure of complex networks in nature and society, *Nature*, v.435, 2005.

•••

1. Desenvolvimentos Históricos (b)

Watts, Strogatz SH,
Collective dynamics of “small-world” networks, 1998



1. Desenvolvimentos Históricos (b)

Barabási A-L, Albert R,

Emergence of scaling in random networks, 1999

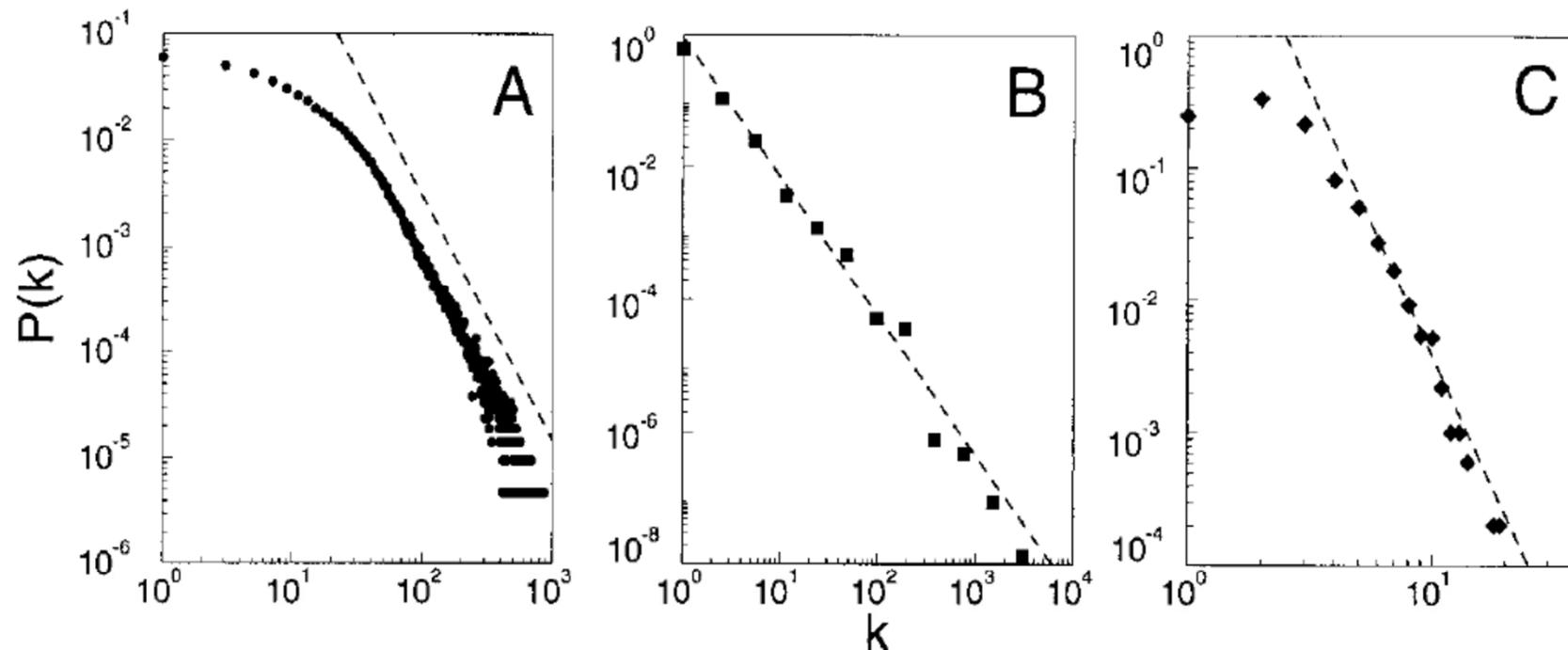
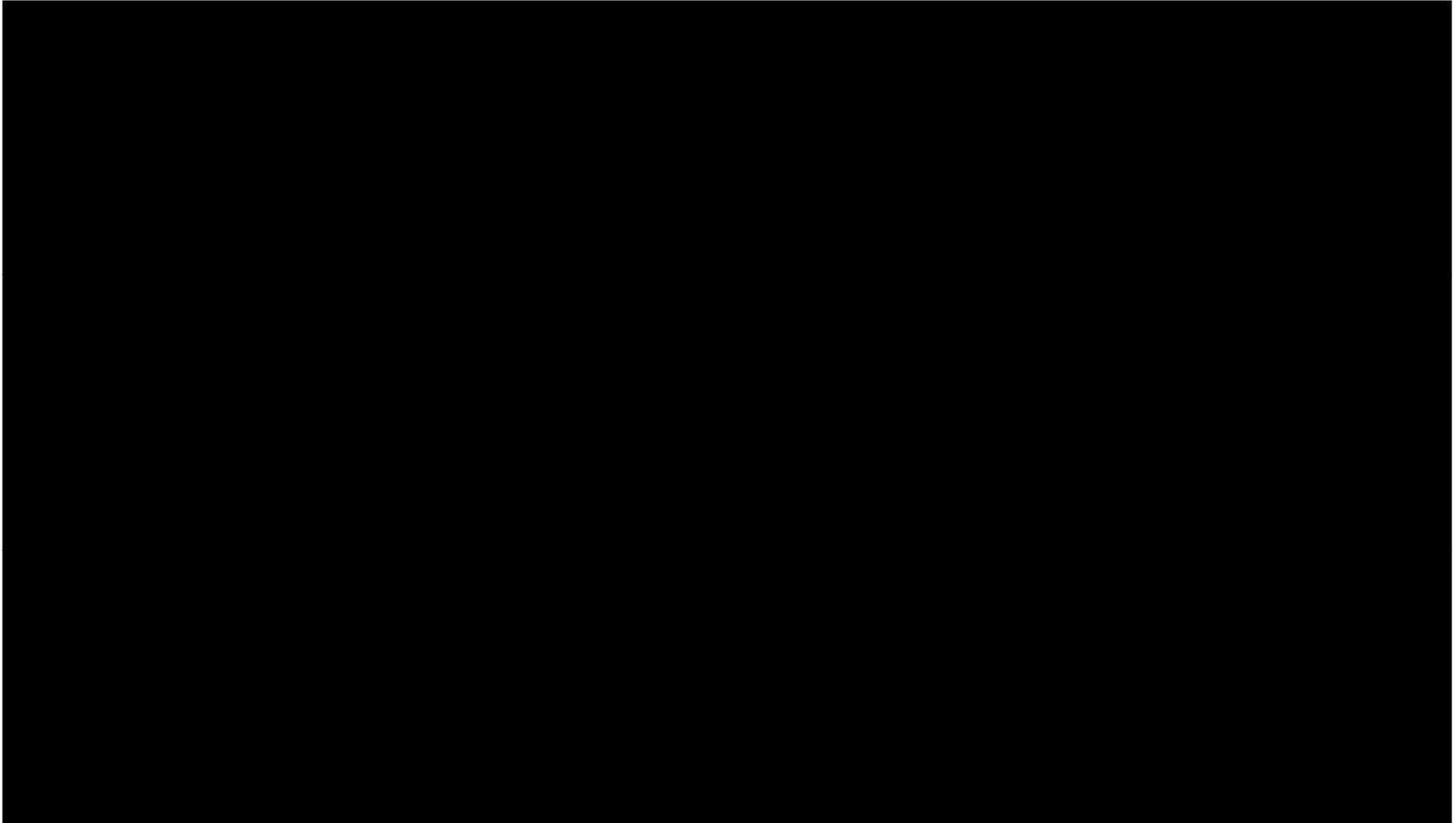


Fig. 1. The distribution function of connectivities for various large networks. (A) Actor collaboration graph with $N = 212,250$ vertices and average connectivity $\langle k \rangle = 28.78$. (B) WWW, $N = 325,729$, $\langle k \rangle = 5.46$ (6). (C) Power grid data, $N = 4941$, $\langle k \rangle = 2.67$. The dashed lines have slopes (A) $\gamma_{actor} = 2.3$, (B) $\gamma_{www} = 2.1$ and (C) $\gamma_{power} = 4$.

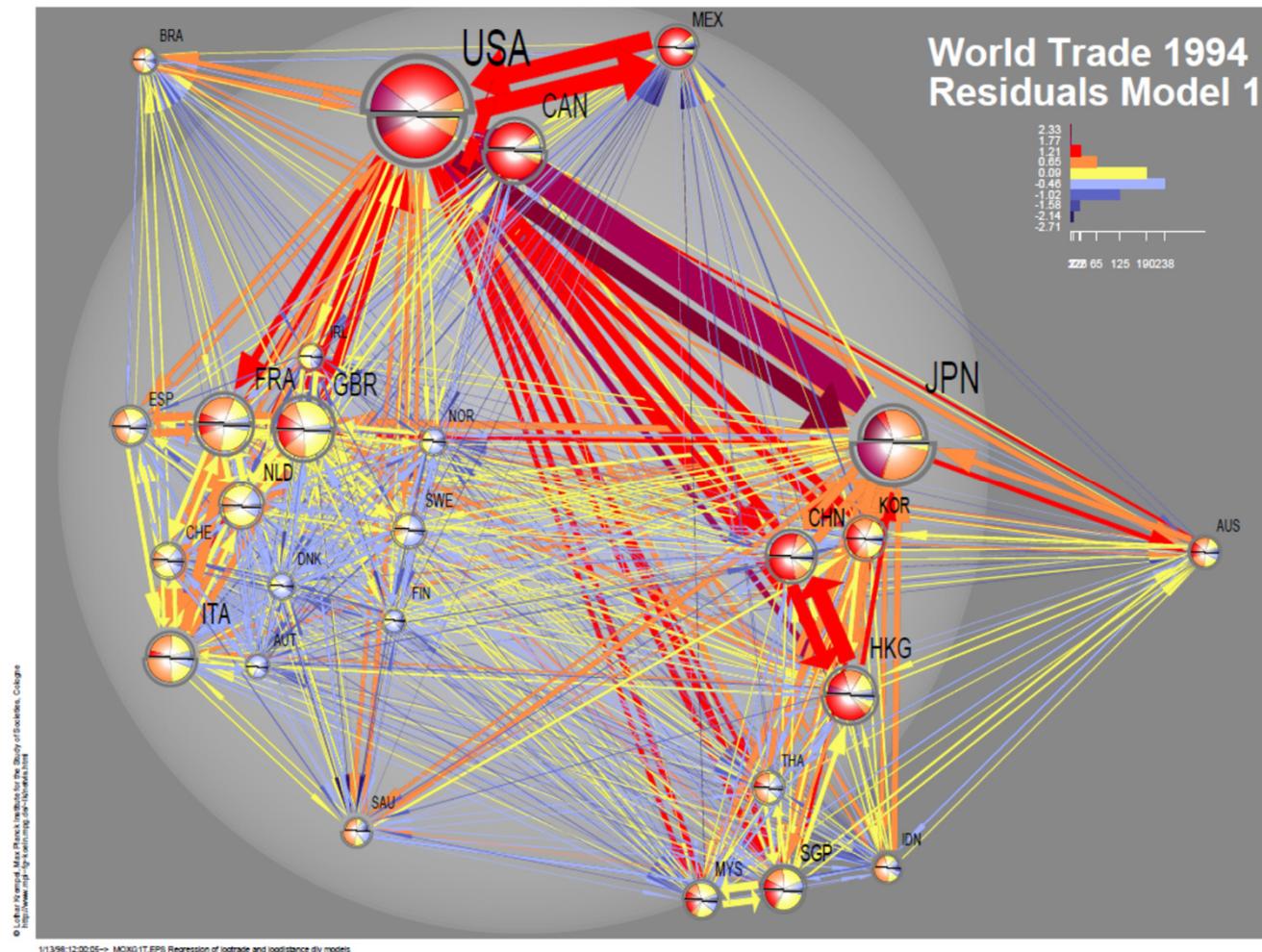
Seis graus de separação (BBC – Legendado) 47min



<https://www.youtube.com/watch?v=RHXbB66lOrY>

1. Desenvolvimentos Históricos (b)

Lothar Krempel, Thomas Plümpner,
Exploring the Dynamics of Int. Trade, 2003.



© Lothar Krempel, Max Planck Institute for the Study of Societies, Cologne
http://www.mpg.de/kuhn/teaching/2003/03/01/01.html

1/13/98:12:00:05--> MEXUS IT, EP8 Regression of logtrade and logdistance div models

1. Desenvolvimentos Históricos (b)

Jackson, Rogers, Zenou. 2014

The economic consequences of social network structure

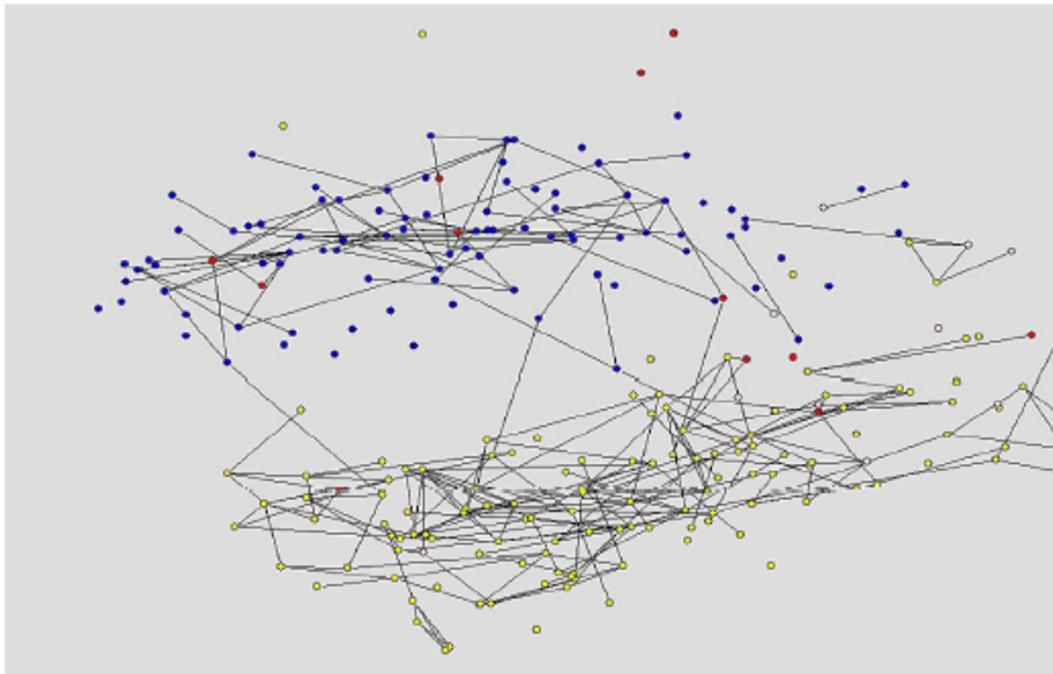
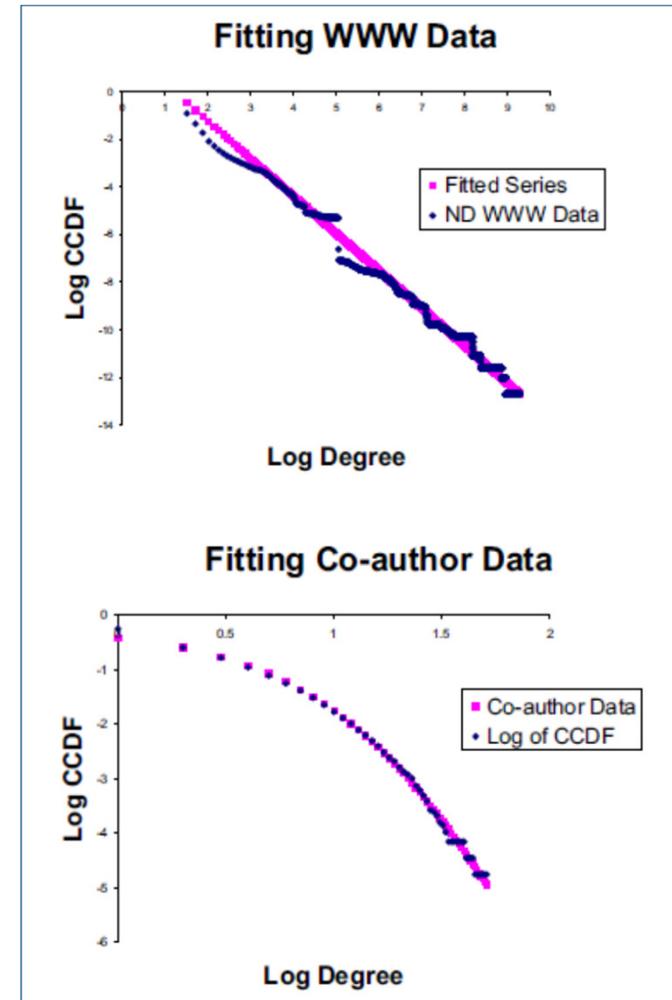


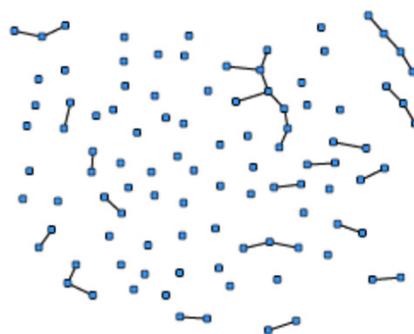
Figure 2: A Network of the Friendships in a High School



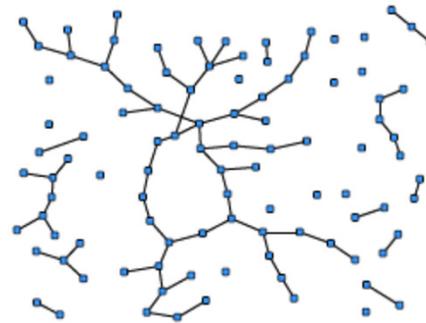
1. Desenvolvimentos Históricos (b)

Matthew Elliott, Benjamin Golub, Matthew O Jackson.

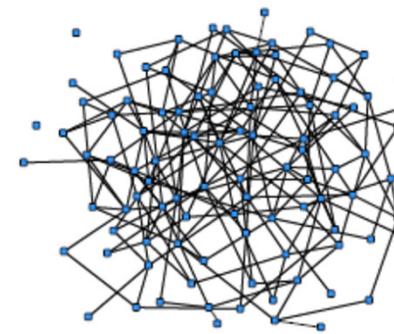
Financial Networks and Contagion, 2014.



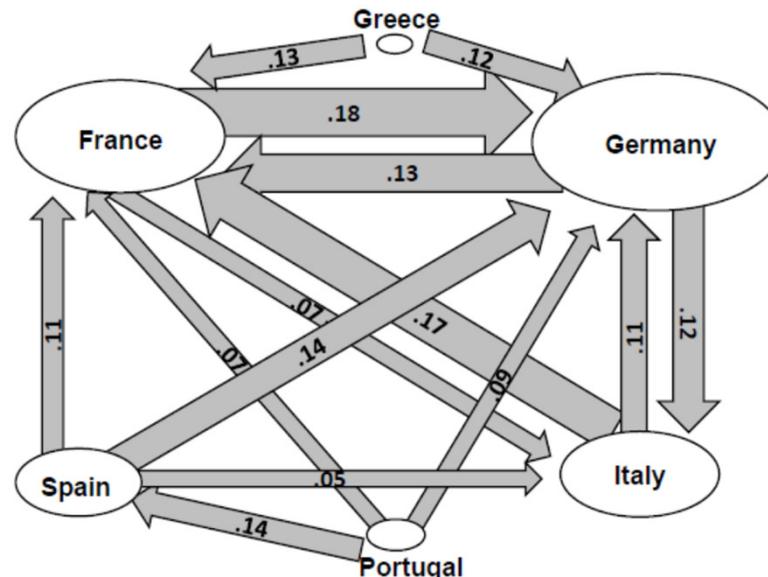
(a) Low diversification



(b) Medium diversification

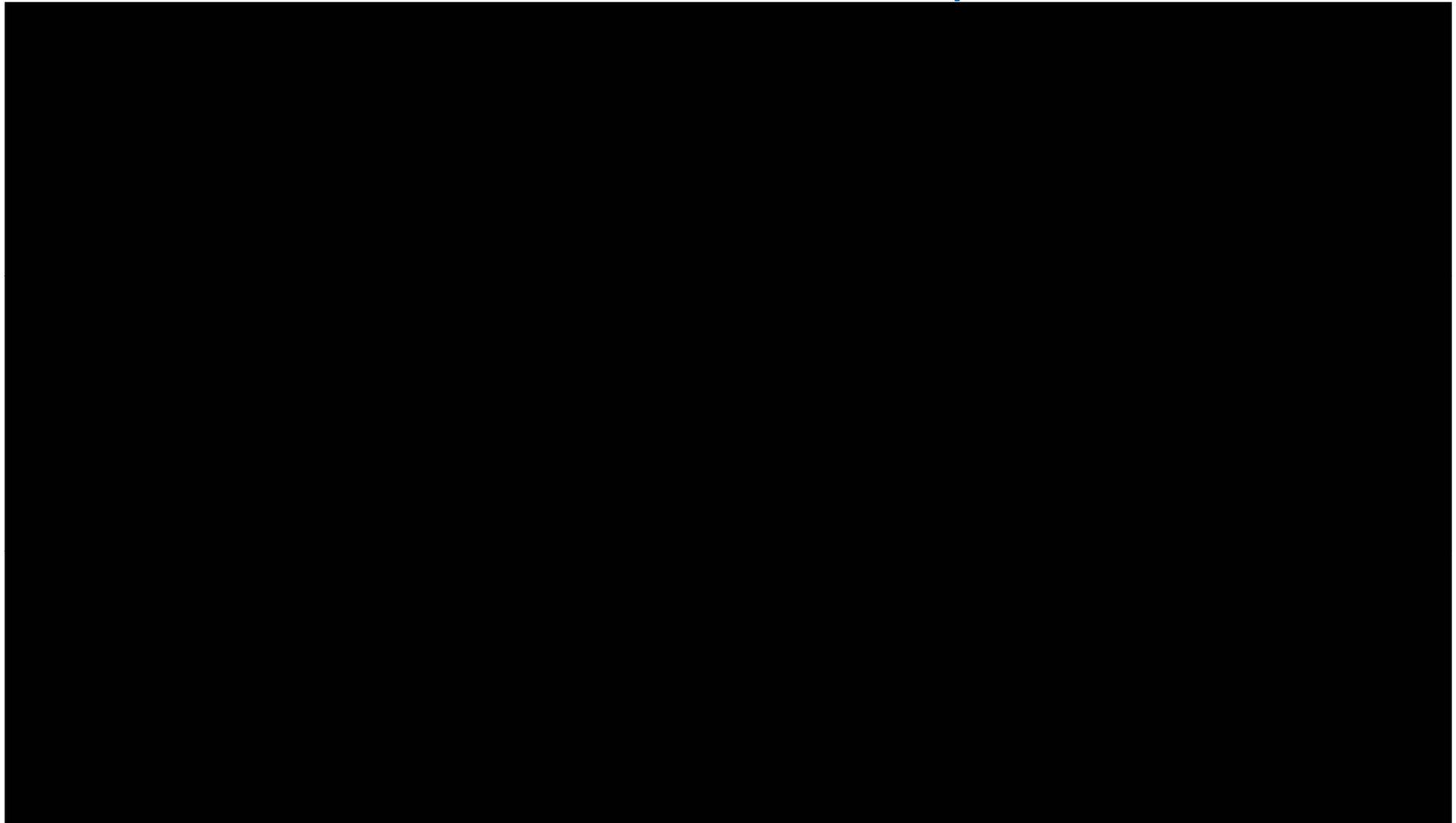


(c) High diversification



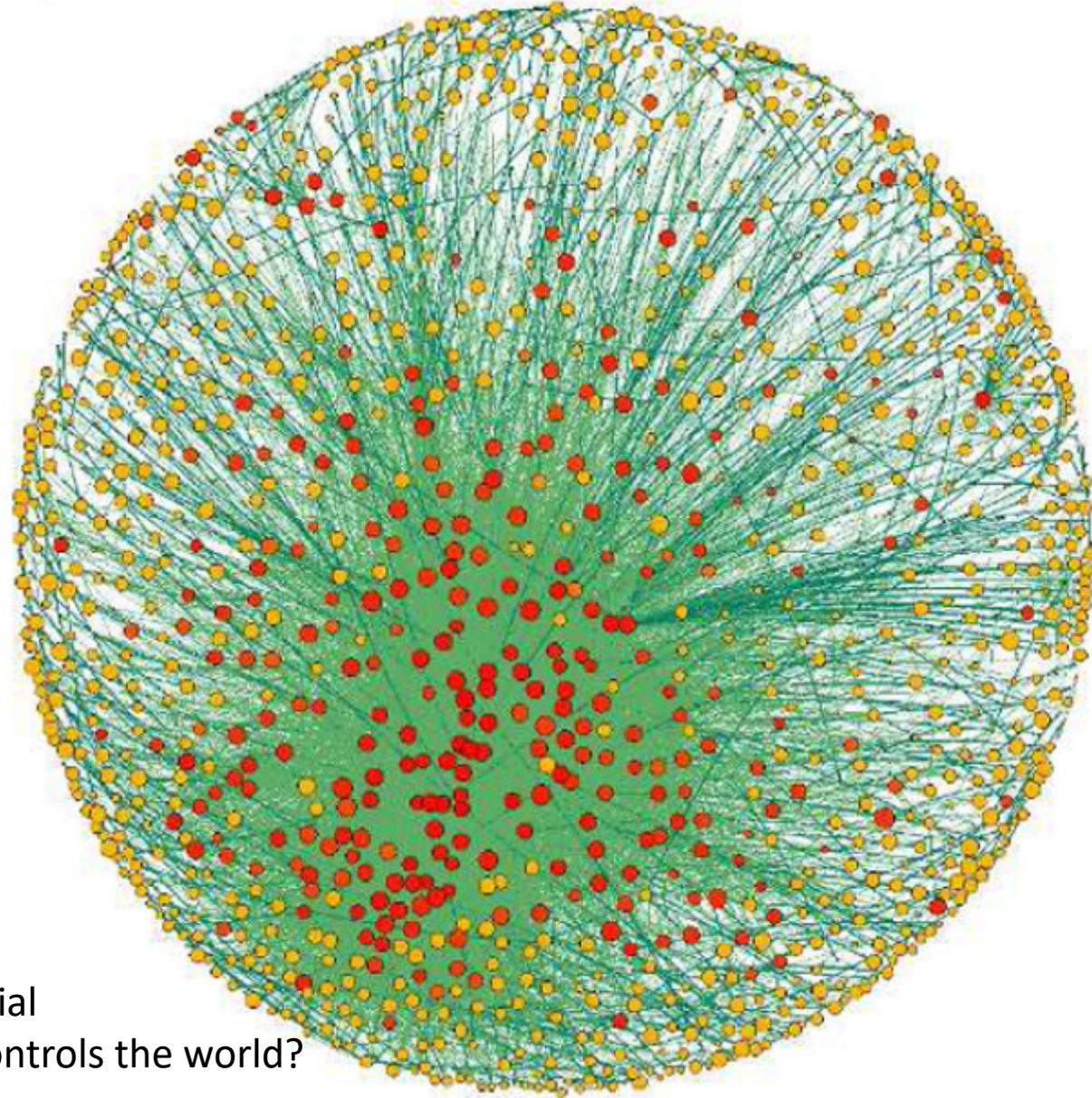


TED Talks - Nicholas Christakis: Epidemias 18min



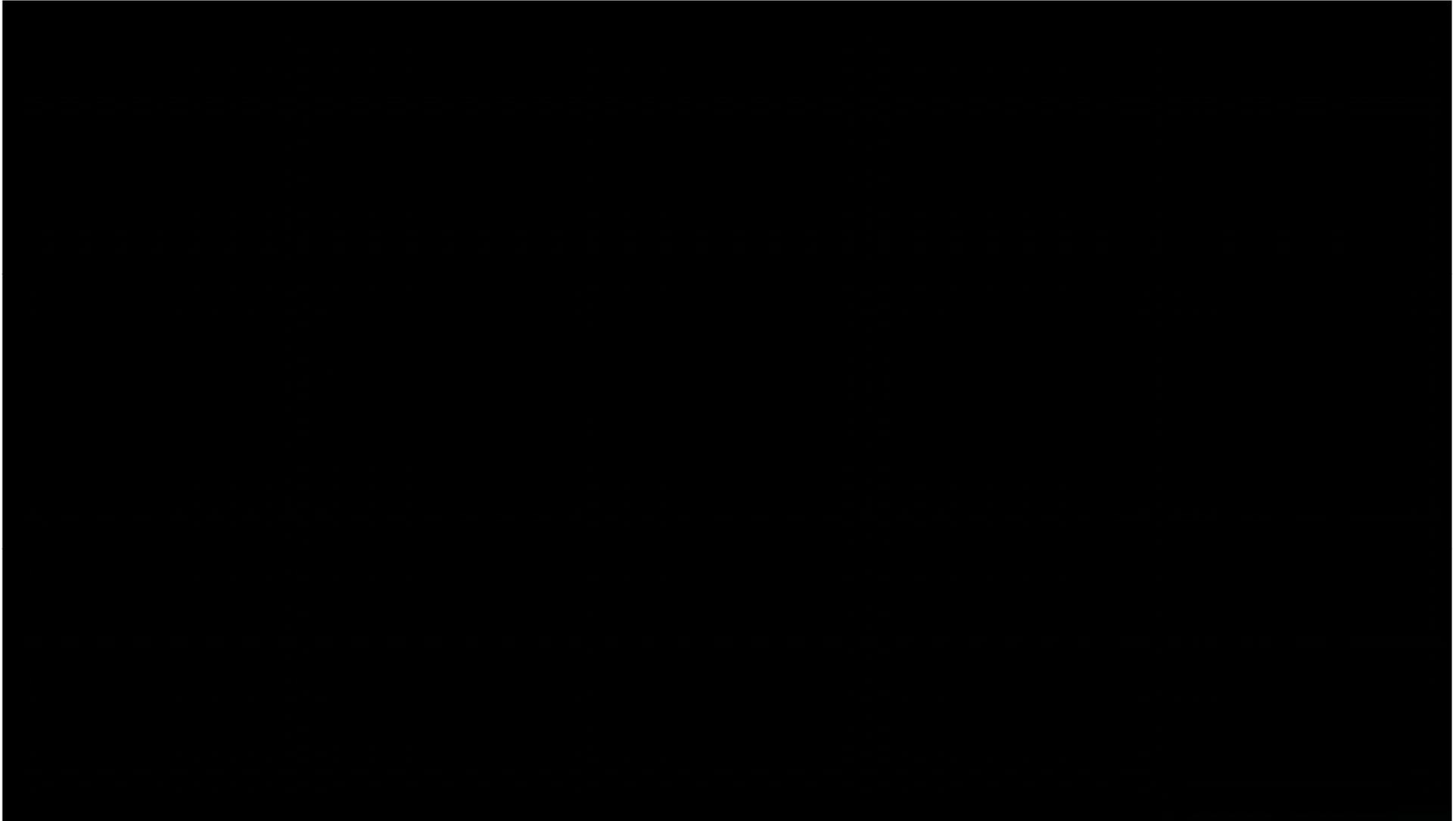
http://www.ted.com/talks/nicholas_christakis_how_social_networks_predict_epidemics?language=pt-br

James B. Glattfelder: Who controls the world?



As 1318
corporações que formam
o núcleo da economia mundial
James B. Glattfelder: Who controls the world?

TED Talks: James B. Glattfelder: Who controls the world?



https://www.ted.com/talks/james_b_glattfelder_who_controls_the_world#t-1580

14min