



نخستین کارسوق

پیچیدگی‌های طبیعت

عباس کریمی
گروه سیستم‌های پیچیده و علم شبکه دانشگاه شهید بهشتی

دیرستان علامه حلی تهران
مرداد ۱۳۹۶



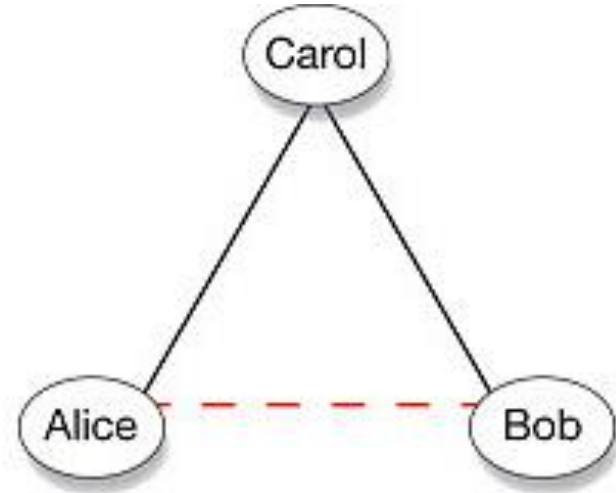
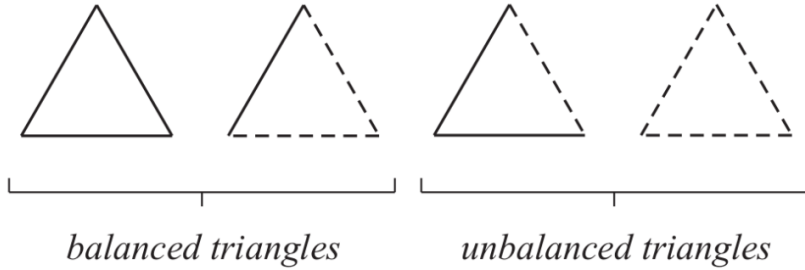
Sitpor.org
abbascarimi@gmail.com



شبکه ای از افراد

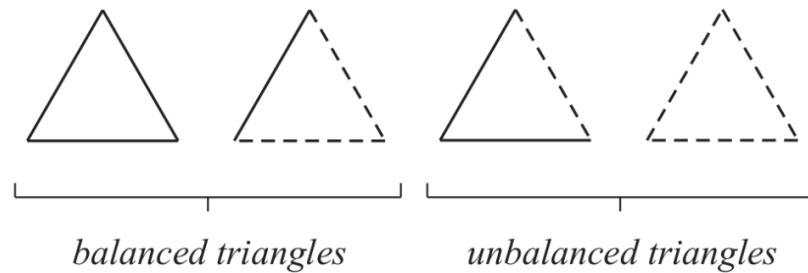
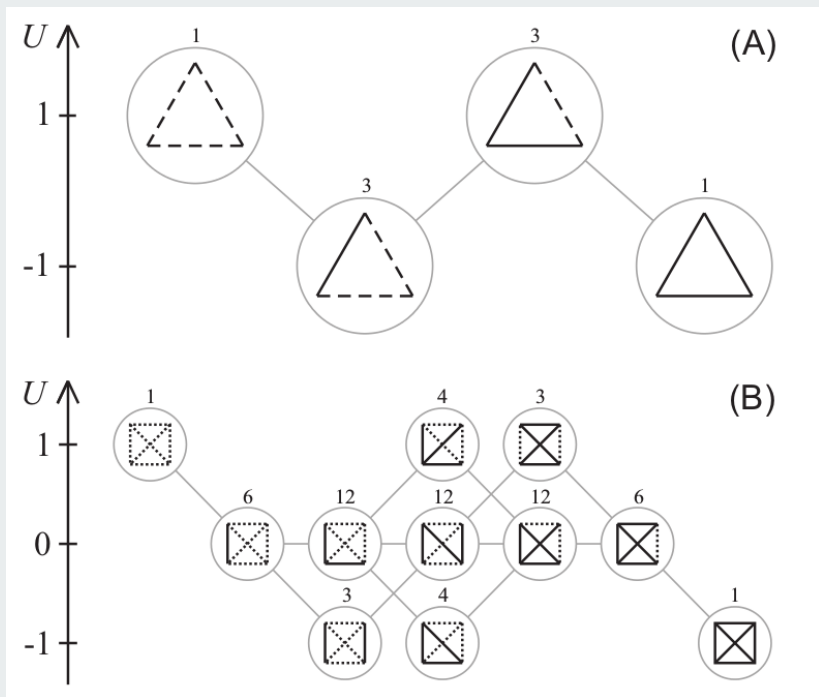
فیزیک و جامعه شناسی

فیزیک و جامعه: نظریه توازن هایدر



یک شبکه نامتوازن بین آلیس، باب و کرول. دوستی با فط و دشمنی با فطچین مشخص شده است.

فیزیک و جامعه: نظریه توازن هایدر

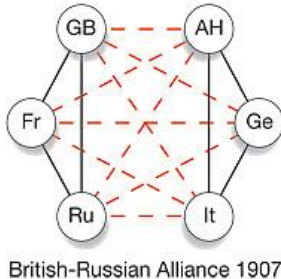
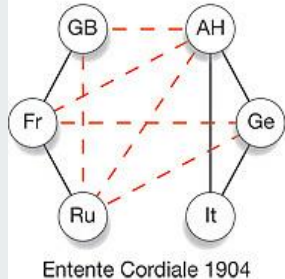
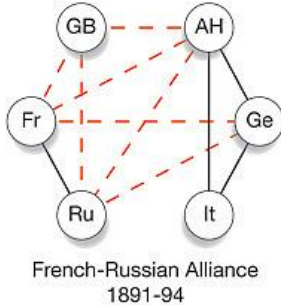
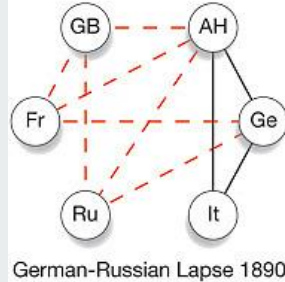
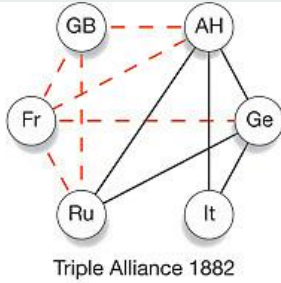
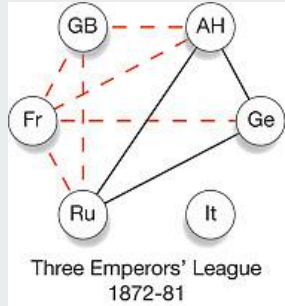


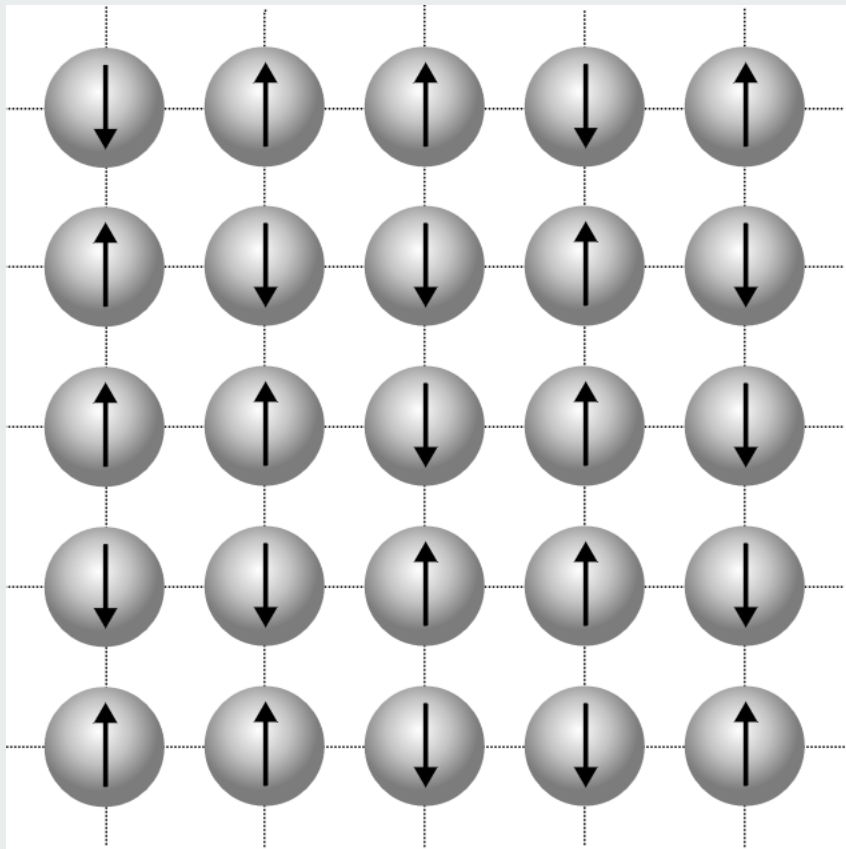
$$s_{ij} = \begin{cases} +1 : \text{friendship} \\ -1 : \text{hostility} \end{cases}$$

$$U = -\frac{1}{\binom{n}{3}} \sum_{i,j,k} s_{ij} s_{jk} s_{ki}$$

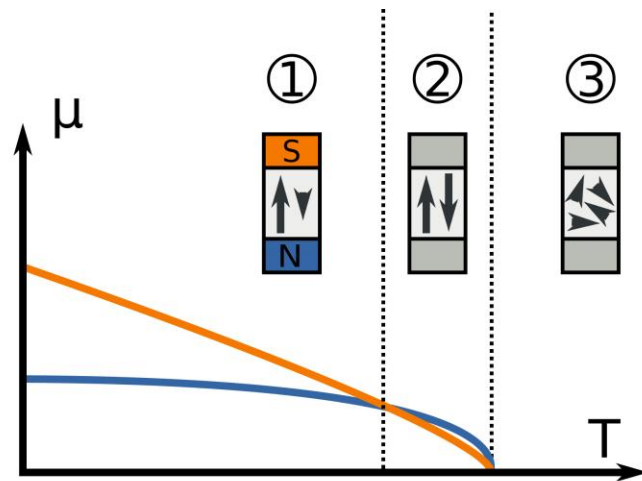
فیزیک و جامعه: نظریه توازن هایدر

– نتیجه جنگ؟
– ثبات در منطقه؟
– ...

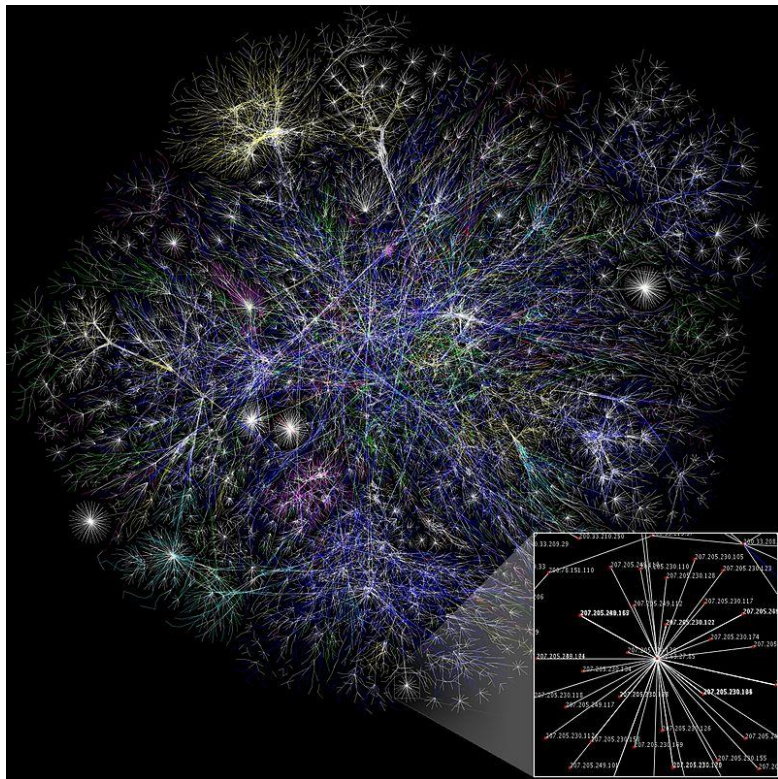




فیزیک و جامعه: مدل های مغناطشی!



Network Science



Partial map of the Internet based on the January 15, 2005 data found on opte.org. Each line is drawn between two nodes, representing two IP addresses. The length of the lines are indicative of the delay between those two nodes. This graph represents less than 30% of the Class C networks reachable by the data collection program in early 2005.

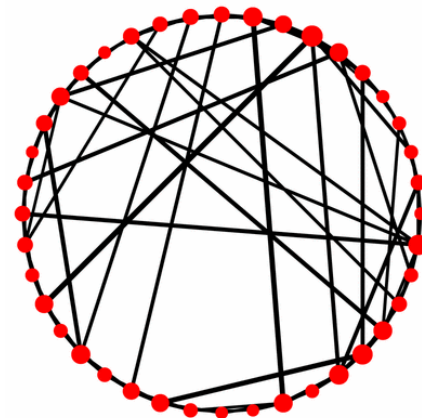
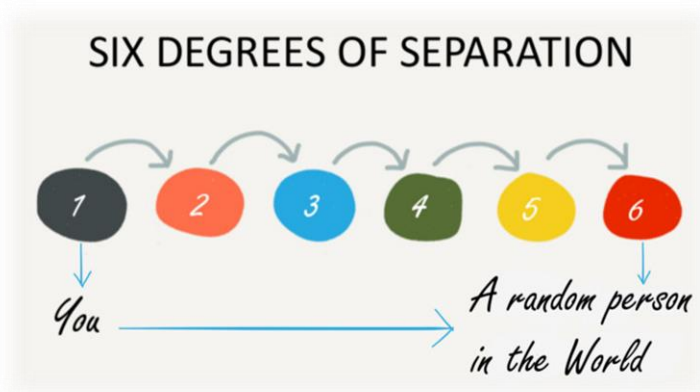
به دنیای
شبکه های
پیچیده
و علم شبکه
خوش آمدید!

فیزیک و جامعه:

شبکه های جهان کوچک و قانون شش درجه جدایی:

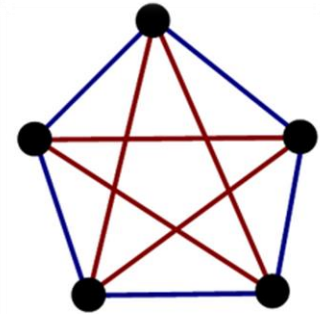
– «دنیا خیلی کوچیکه داداش!»

– «کوه به کوه نمیرسه ولی آدم به آدم میرسه!»



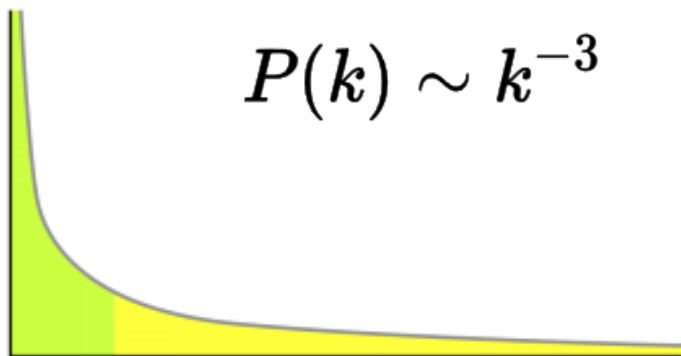
goo.gl/pR7Aoj

فیزیک و جامعه: فیس بوک یک شبکه اجتماعی



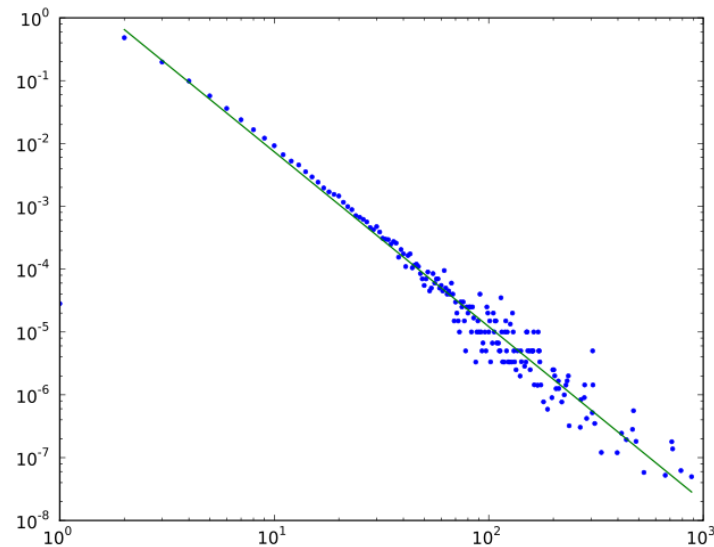
شبکه: گراف
هر فرد: یک راس
هر رابطه: یک لینک

فیزیک و جامعه: توزیع درجات و تیپولوژی شبکه



تابع توزیع توانی!

قسمت سبز رنگ ۸۰٪ از شبکه را شامل می‌شود
ده‌دراز زرد رنگ ۲۰٪ باقی‌مانده را.



فیزیک و جامعه: چگونه یک مدل ارائه دهیم!؟

مدل اتصال ترجمی (باراباشی- آلبرت)



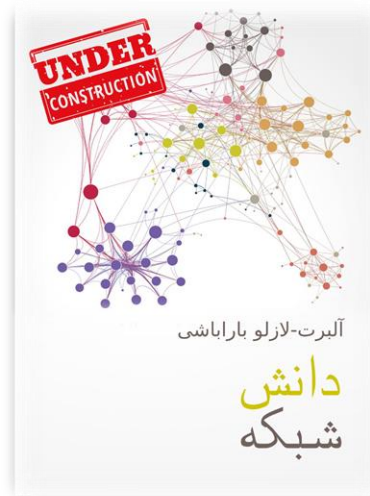
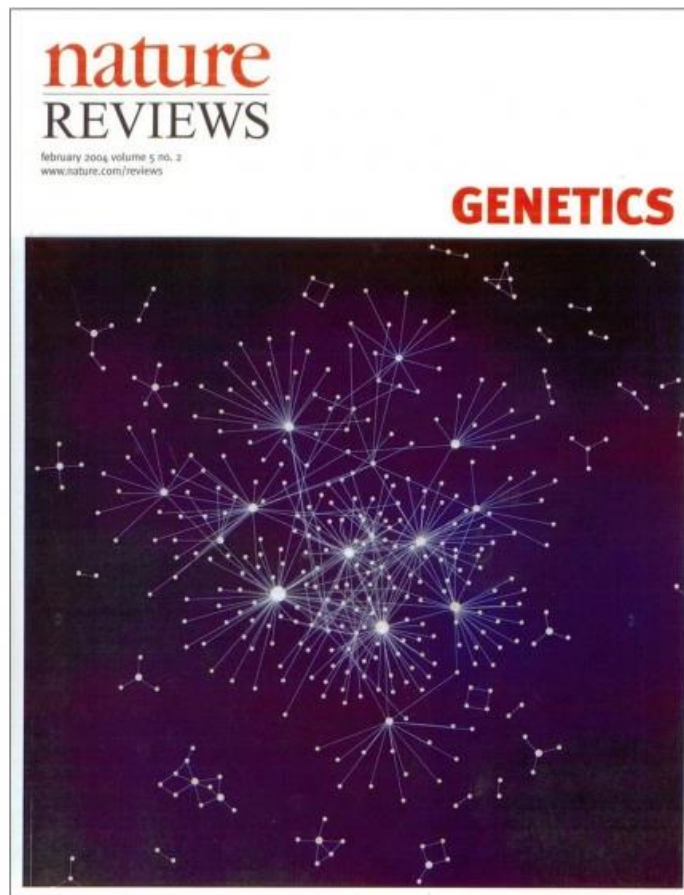
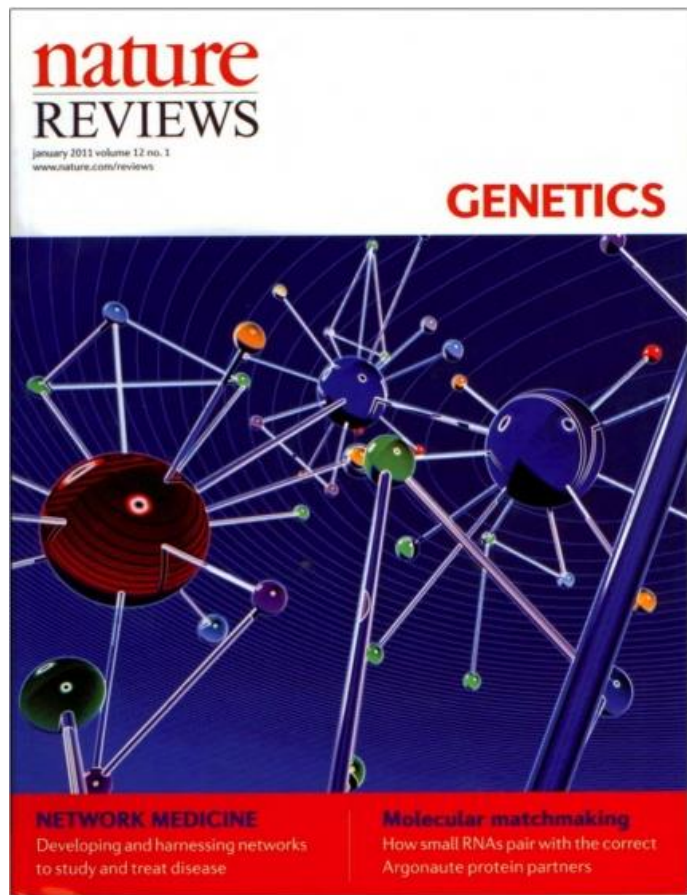


goo.gl/HCBp5w

شبکه ها و پزشکی



شبکه ها و ژنتیک

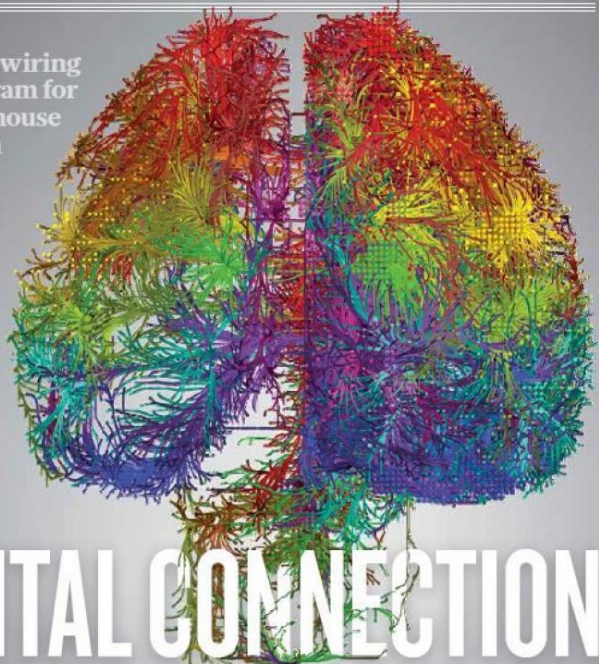


nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

A 3D wiring
diagram for
the mouse
brain

PAGE 207



VITAL CONNECTIONS

AGEING

**EPIGENETIC
CLOCKWORK**

DNA methylation
marks the years

PAGE 166

CLIMATE CHANGE

**REFINE THE
MESSAGE**

We need shorter – but
better – IPCC reports

PAGE 171

REVIEWS

**SPRING BOOKS
SPECIAL**

Prusiner's prions, fracking
history and more

PAGE 176

NATURE.COM/NATURE

10 April 2014 £10

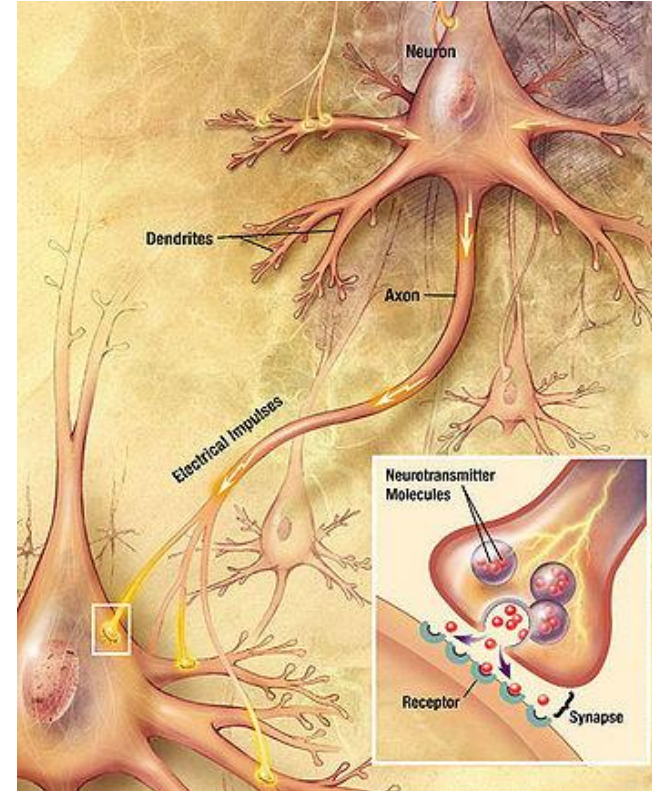
Vol. 508, No. 7495



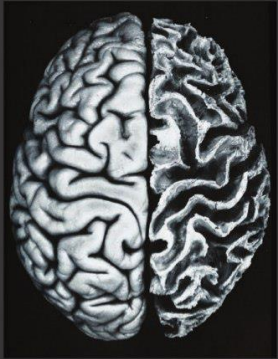
شبکه ها و علوم اعصاب فیزیک و مغز انسان



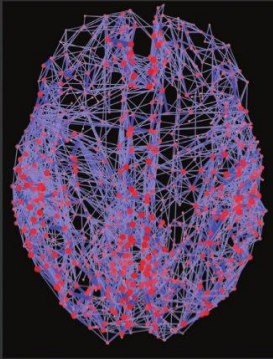
شبکه مغز انسان



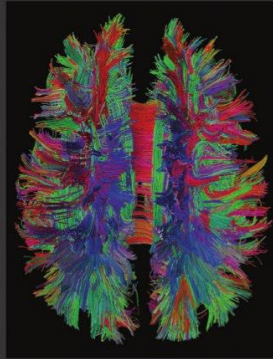
The Human Connectome



Anatomy
Klingler's method for fiber tract dissection uses freezing of brain matter to spread nerve fibers apart. Afterwards, tissue is carefully scratched away to reveal a relief-like surface in which the desired nerve tracts are naturally surrounded by their anatomical brain areas.

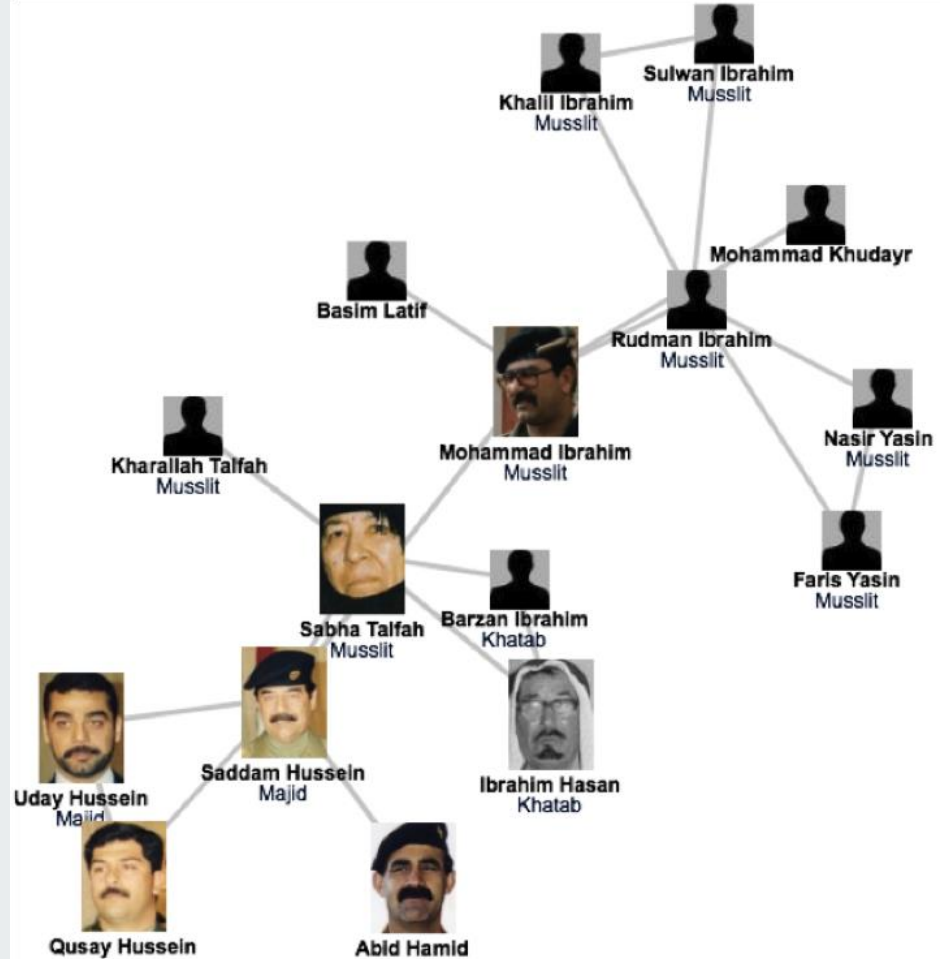


Connectome
Shown are the connections of brain regions together with "hubs" that connect signals among different brain areas and a central "core" or backbone of connections, which relays commands for our thoughts and behaviors.



Neuronal Pathways
A new MRI technique called diffusion spectrum imaging (DSI) analyzes how water molecules move along nerve fibers. DSI can show a brain's major neuron pathways and will help neurologists relate structure to function.

فیزیک و سیاست پیچیدگی سیاسی!



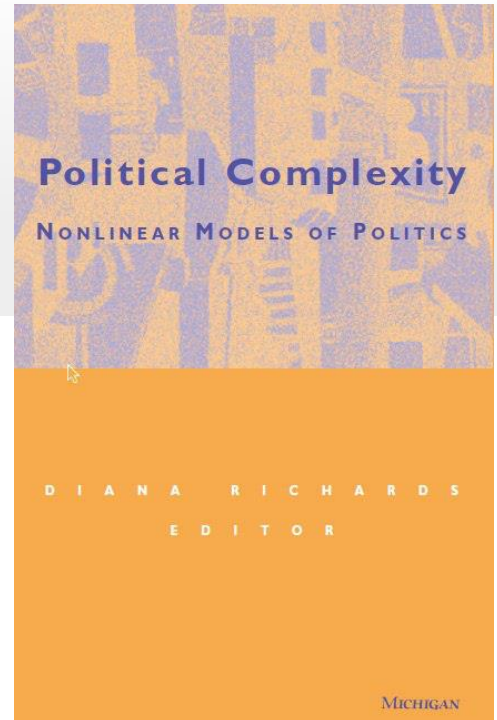
Original Articles

Social Network Analysis and Counterinsurgency Operations: The Capture of Saddam Hussein

Brian J. Reed & David R. Segal

Pages 251-264 | Published online: 19 Nov 2012

“ Download citation <http://dx.doi.org/10.1080/00380237.2006.10571288>



فیزیک و اقتصاد اقتصاد پیچیدگی

“We should look to new ideas from physics and related fields to solve the ongoing economic problems faced by countries around the world.”

— James Weatherall, from *The Physics of Wall Street*

✓ فزیک و اقتصاد
✓ اقتصاد پیچیدگی



How Everything Is Connected to
Everything Else and What It Means for
Business, Science, and Everyday Life

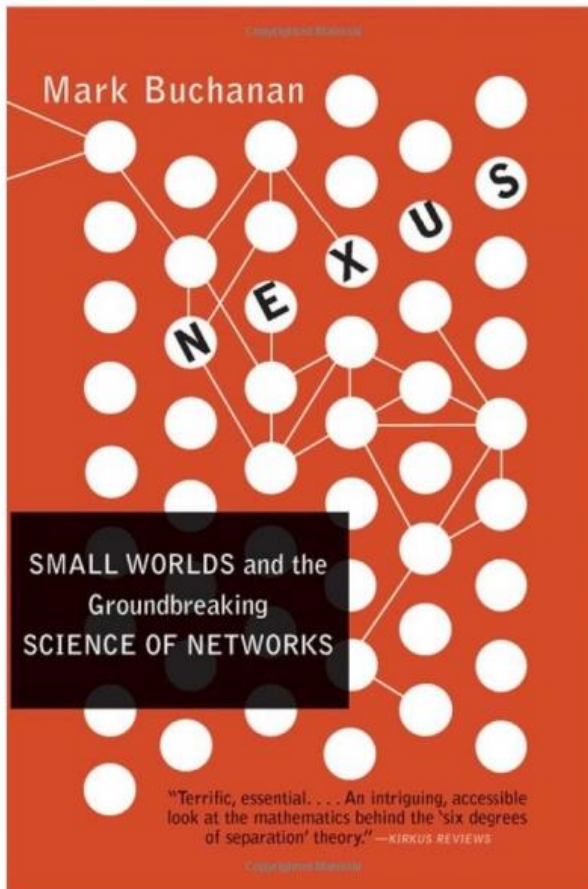
Linked



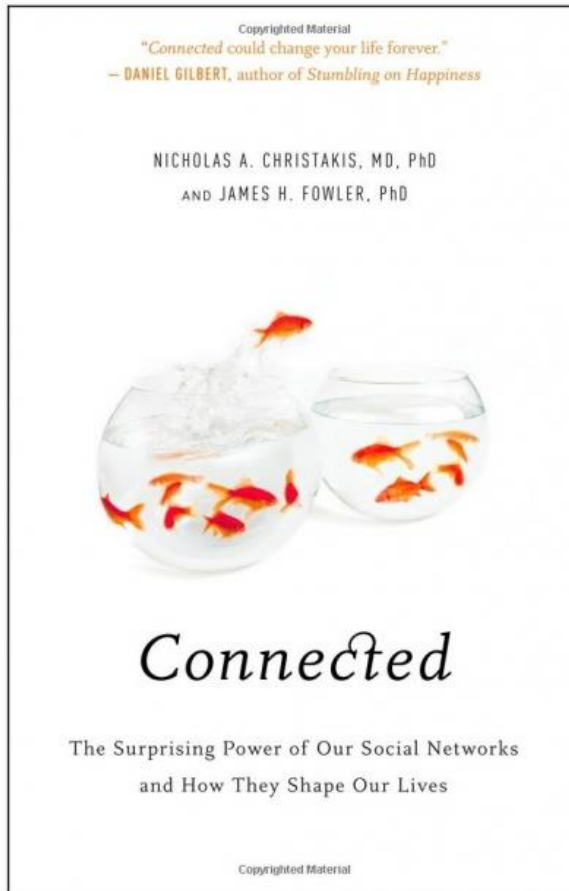
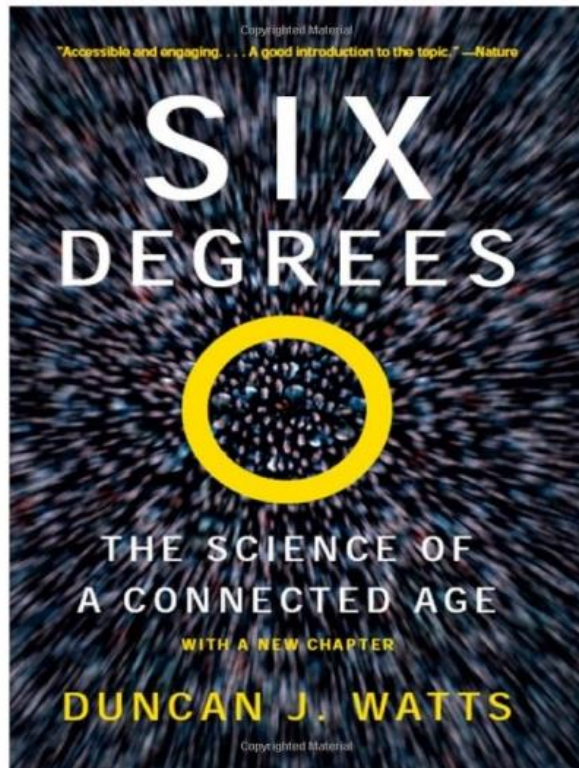
"*Linked* could alter the way we think about all of the
networks that affect our lives." —*The New York Times*

Albert-László Barabási

With a New Afterword



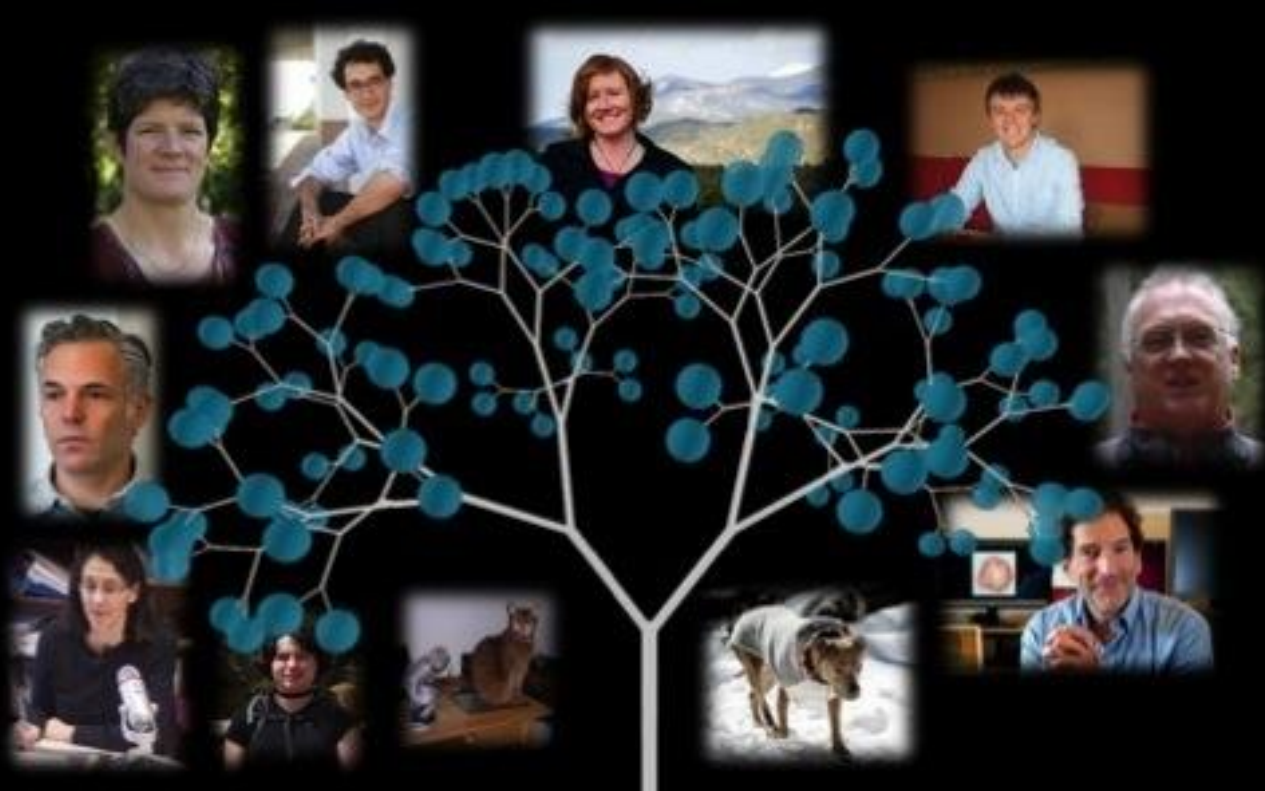
پیشنهاد
برای
مطالعه



پیشنهاد
برای
مطالعه

پایان قسمت سوم

Special thanks to:



COMPLEXITY
EXPLORER

سپاس از همراهی شما

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