

Source:

1 | his intro / background

1.1 | used to be very into econ

1.2 | worked at world bank bc he thought it was a good place to meet people who were interested in math and econ and help the world

1.3 | was sent to a country (forgot) during communism->capitalism transition and saw that the forced capitalist policies were not working

1.4 | went into management because that allowed him to actually help

1.5 | sante fe institute

1.5.1 | centeripece for a global movement to involve complexity in sciences accross disciplines

1.5.2 | from los alamos national labs

1.5.3 | 'universal relationships'

1.5.4 | lots of nobel prizes

1.5.5 | applications of graph theory and network theory, and lots of econ

1. understanding when societies are going to have a revolution, finiance, energy grid

2 | **other related areas**

2.1 | **do individuals matter in history**

2.2 | **impacts on marketing based on faith studies?**

3 | **Overview**

3.1 | **this intersession is "interdisciplinary fixing of economics"**

4 | **Warmup**

4.1 | **insectivora, macroscelidea avg mass vs avg BMR, guess avg bmr for pholidota given avg mass**

4.1.1 | **I just took the ratios and took a high and low**

4.1.2 | **a few strategies for solving the problem**

1. look for a common ratio (assume 0 mass = 0 BMR)
2. fit a line
3. it's actually not a linear relation, and the answer is relatively unexpected (much lower ratio)

4.2 | **the monkey business illusion (ball passing -> miss other stuff)**

4.2.1 | **when you get attached to a tool, you miss loads of other things**

5 | **universality**

5.1 | **examples**

5.1.1 | **common limit theorem**

1. lots of common processes produce gaussian distributions
(a) thus, there is a "universality" in the normal distribution

5.1.2 | **other theorem? (something with gauss)**

1. if things are often normal distributions, then statistics kind of works (because that's what it's all based on)

5.1.3 | **all mamals average the same number of heartbeats**

1. small animals have fast hearts and die sooner, vice versa

5.1.4 | **metabolic rate (first warm up problem)**

1. log log linear → constant rate of savings? **SUBLINEAR SCALING**
2. constant increase in efficiency
3. roughly 3/4 or 2/3 exponent
4. exponent can be derived by networks (circulatory system)
 - (a) where can this be applied?
 - i. many city statistics
 - A. 15% boost/saving for every size double for amount of gas stations, boost in gdp, # of patents, new AIDs cases, etc

6 | **city**

6.1 | **superlinear scaling → city should grow**

6.2 | **results**

- 6.2.1 | **finite time singularity? when the growth curve goes vertical.. what does that mean. maybe environmental collapse**
- 6.2.2 | **trying to increase GDP and decrease crime/AIDs by growing won't really work because both scale in the same way**

7 | **complexity**

7.1 | **core**

7.1.1 | **taking a general tool and applying it elsewhere**

7.2 | **methodology**

7.2.1 | **start with a data rich domain and find the generative mechanism, then apply to the data sparse**

7.3 | **definition of complexity**

7.3.1 | **difficult to come up with a concrete definition**

7.3.2 | **handwavey: systems of networked adaptive agents are complex**

1. networked
 - (a) networks have 'finite' sides (classifications of nodes)
 - (b) complexity perspective: they provide an analyzable structure at the mezzo-level of granularity
 - i. ways networks are analyzed

- A. degree of a node
- B. betweenness centrality
- C. eigenvector complexity?
- D. avg path length
- E. degree distribution
- F. clustering
- G. community structure

2. agents

- (a) assume that all companies or consumers are equal and if they differ, then they differ along one variable
- (b) agents are actually different though?

3. adaptivity

- (a) such as evolutionarily inspired adaptation
 - i. genetic algorithms / evolutionary algorithms
 - ii. often used to come up with a pretty good answer for a hard (NP complete or more difficult) problem

8 | other structures

8.1 | many complex systems have network structures

8.2 | cellular automata

8.3 | almost everything is a network, but they mean network like everyone knows everyone else

8.3.1 | it's a nice assumption if you want to use calculus, but sometimes its a poor model

8.3.2 | somewhere along the way, textbooks inverted it

8.3.3 | try to find the underlying mechanism and build models that reflect it