

Voting, Success, and Superstars

Principles of Complex Systems

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Outline

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Where do superstars come from?

Rosen (1981): "The Economics of Superstars" [5]

Examples:

- ▶ Full-time Comedians (≈ 200)
- ▶ Soloists in Classical Music
- ▶ Economic Textbooks (the usual myopic example)
- ▶ Highly skewed distributions again...

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Superstars

Rosen's theory:

- ▶ Individual quality q maps to reward $R(q)$
- ▶ $R(q)$ is 'convex' ($d^2R/dq^2 > 0$)
- ▶ Two reasons:
 1. **Imperfect substitution:**
A very good surgeon is worth many mediocre ones
 2. **Technology:**
Media spreads & technology reduces cost of reproduction of books, songs, etc.
- ▶ Joint consumption versus public good
- ▶ No social element—success follows 'inherent quality'

Superstars

Adler (1985): "Stardom and Talent"^[1]

- ▶ Assumes extreme case of equal 'inherent quality'
- ▶ Argues desire for coordination in knowledge and culture leads to differential success
- ▶ Success can be purely a social construction
- ▶ (How can we measure 'inherent quality'?)

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Voting

Evidence from the web suggestions (Huberman et al.)

1. Easy decisions (yes/no) lead to bandwagoning
 - ▶ e.g. jyte.com
 2. More costly evaluations lead to oppositional votes
 - ▶ e.g. amazon.com
- ▶ **Self-selection:** Costly voting may lower incentives for those who agree with the current assessment and increase incentives for those who disagree.

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Voting

Score-based voting versus rank-based voting:

- ▶ Balinski and Laraki^[2]
 "A theory of measuring, electing, and ranking"
 Proc. Natl. Acad. Sci., pp. 8720–8725 (2007)

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Voting

Laureti et al. (2004): "Aggregating partial, local evaluations to achieve global ranking"^[4]

- ▶ Model: participants rank n objects based on underlying quality q
- ▶ Assume evaluation of object i is a random variable with mean q_i
- ▶ Choose objects based on votes:

$$p_i(t) \propto v_i(t)^\alpha \text{ or } p_i(t) \propto q_i v_i(t)^\alpha.$$

- ▶ If $\alpha < 1$, correct quality ordering is uncovered
- ▶ If $\alpha > 1$, some objects are never evaluated and mistakes are made...
- ▶ Related to Adler's approach

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Dominance hierarchies

Chase et al. (2002): "Individual differences versus social dynamics in the formation of animal dominance hierarchies"^[3]

- ▶ The aggressive female *Metriaclicma zebra*:



- ▶ Pecking orders for fish...

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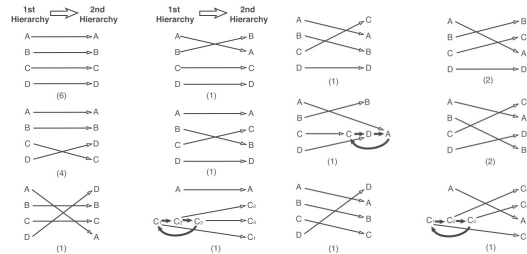
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Dominance hierarchies

Fish forget—changing of dominance hierarchies:



- ▶ 22 observations: about 3/4 of the time, hierarchy changed

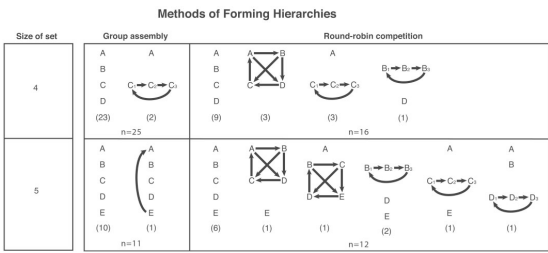
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Dominance hierarchies



▶ Group versus isolated interactions produce different hierarchies

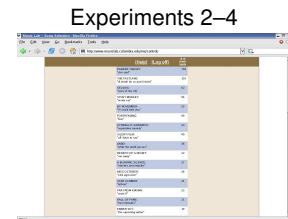
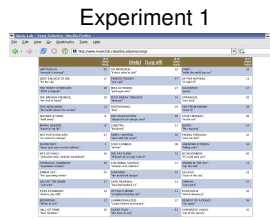
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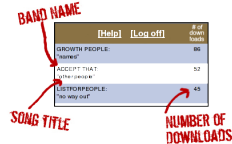
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48 songs
 30,000 participants

multiple 'worlds'
 Inter-world variability

- ▶ How probable is the world?
- ▶ Can we estimate variability?
- ▶ Superstars dominate but are unpredictable. Why?

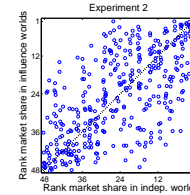
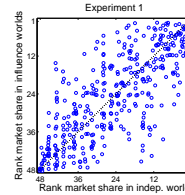
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▶ Variability in final rank.

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Rank	World	World	World	World
1	WANTRESS	40	WANTRESS	24
2	DEEP ENOUGH TO BE	12	WANTRESS	24
3	THE THIRTY SYNDICATE	28	WANTRESS	24
4	THE BUCKLE PROMISE	18	WANTRESS	24
5	THIS NEW DOWN	12	WANTRESS	24
6	ROCKED AT NINE	6	WANTRESS	24
7	MORAL HAZARD	6	WANTRESS	24
8	NOT FOR SCHOLARS	22	WANTRESS	24
9	SECRETARY	3	WANTRESS	24
10	HIT OF EARLY	18	WANTRESS	24
11	HYPERBOLIC SINGERS	20	WANTRESS	24
12	EMERSON	25	WANTRESS	24
13	SALUTE THE DOWN	13	WANTRESS	24
14	RYAN ESCAMOTE	14	WANTRESS	24
15	REVEREND	12	WANTRESS	24
16	HALL OF FAME	18	WANTRESS	24
17	WANTRESS	40	WANTRESS	24
18	WANTRESS	40	WANTRESS	24
19	WANTRESS	40	WANTRESS	24
20	WANTRESS	40	WANTRESS	24
21	WANTRESS	40	WANTRESS	24
22	WANTRESS	40	WANTRESS	24
23	WANTRESS	40	WANTRESS	24
24	WANTRESS	40	WANTRESS	24
25	WANTRESS	40	WANTRESS	24
26	WANTRESS	40	WANTRESS	24
27	WANTRESS	40	WANTRESS	24
28	WANTRESS	40	WANTRESS	24
29	WANTRESS	40	WANTRESS	24
30	WANTRESS	40	WANTRESS	24
31	WANTRESS	40	WANTRESS	24
32	WANTRESS	40	WANTRESS	24
33	WANTRESS	40	WANTRESS	24
34	WANTRESS	40	WANTRESS	24
35	WANTRESS	40	WANTRESS	24
36	WANTRESS	40	WANTRESS	24
37	WANTRESS	40	WANTRESS	24
38	WANTRESS	40	WANTRESS	24
39	WANTRESS	40	WANTRESS	24
40	WANTRESS	40	WANTRESS	24

Salganik et al. (2006) "An experimental study of inequality and unpredictability in an artificial cultural market" [6]

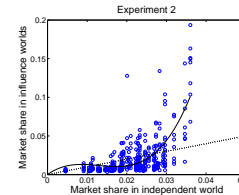
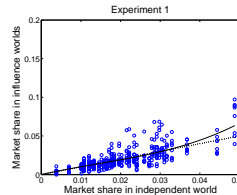
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▶ Variability in final number of downloads.

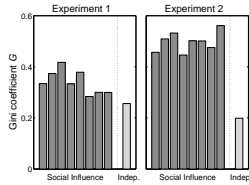
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- Inequality as measured by Gini coefficient:

$$G = \frac{1}{(2N_s - 1)} \sum_{i=1}^{N_s} \sum_{j=1}^{N_s} |m_i - m_j|$$

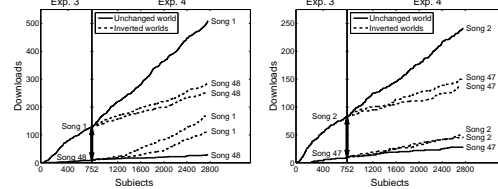
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Music Lab Experiment—Sneakiness



- Inversion of download count
- The pretend rich get richer ...
- ... but at a slower rate

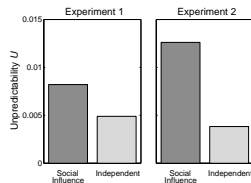
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- Unpredictability

$$U = \frac{1}{N_s \binom{N_w}{2}} \sum_{i=1}^{N_s} \sum_{j=1}^{N_w} \sum_{k=j+1}^{N_w} |m_{i,j} - m_{i,k}|$$

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References I

- [1] M. Adler. Stardom and talent. *American Economic Review*, pages 208–212, 1985. pdf (田)
- [2] M. Balinski and R. Laraki. A theory of measuring, electing, and ranking. *Proc. Natl. Acad. Sci.*, 104(21):8720–8725, 2007. pdf (田)
- [3] I. D. Chase, C. Tovey, D. Spangler-Martin, and M. Manfredonia. Individual differences versus social dynamics in the formation of animal dominance hierarchies. *Proc. Natl. Acad. Sci.*, 99(8):5744–5749, 2002. pdf (田)

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Sensible result:

- Stronger social signal leads to **greater following and greater inequality**.

Peculiar result:

- Stronger social signal leads to greater **unpredictability**.

Very peculiar observation:

- The most unequal distributions would suggest the greatest variation in underlying 'quality'.
- But success may be due to social construction through **following**. (so let's tell a story... [7, 8])

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References II

- [4] P. Laureti, L. Moret, and Y.-C. Zhang. Aggregating partial, local evaluations to achieve global ranking. *Physica A*, 345(3–4):705–712, 2004. pdf (田)
- [5] S. Rosen. The economics of superstars. *Am. Econ. Rev.*, 71:845–858, 1981. pdf (田)
- [6] M. J. Salganik, P. S. Dodds, and D. J. Watts. An experimental study of inequality and unpredictability in an artificial cultural market. *Science*, 311:854–856, 2006. pdf (田)
- [7] C. R. Sunstein. *Infotopia: How many minds produce knowledge*. Oxford University Press, New York, 2006.

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References III

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References

[8] N. N. Taleb.
The Black Swan.
Random House, New York, 2007.

