

Voting, Success, and Superstars

Last updated: 2024/12/02, 17:59:56 EST

Principles of Complex Systems, Vols. 1, 2, & 3D
CSYS/MATH 6701, 6713, & a pretend number, 2024–2025

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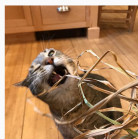
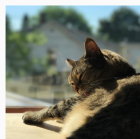
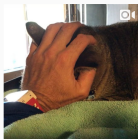
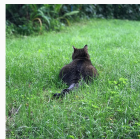
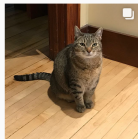
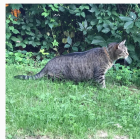
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Outline

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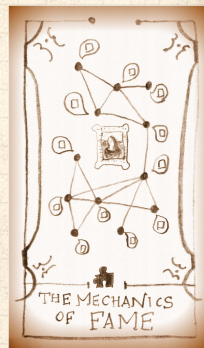
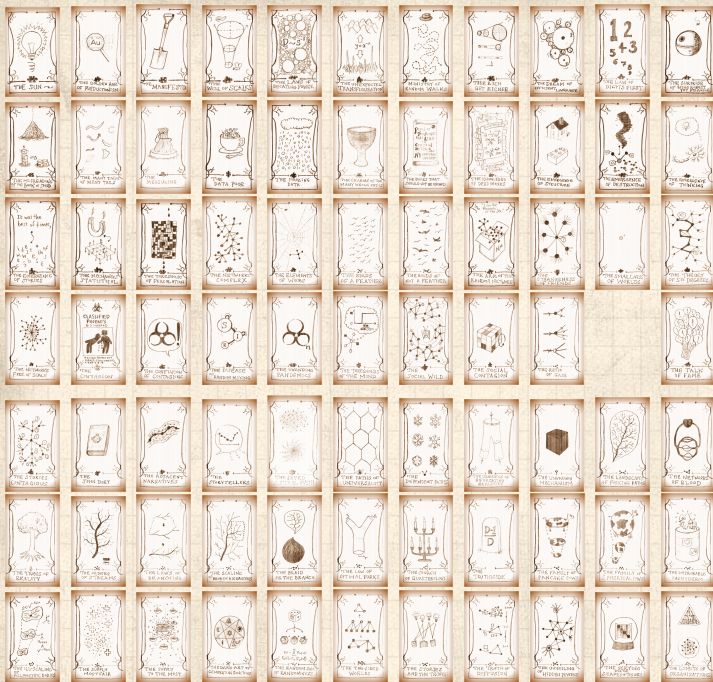
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Where do superstars come from?

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“The economics of superstars” 

S. Rosen,

Am. Econ. Rev., **71**, 845–858, 1981. ^[5]

Examples:



Full-time Comedians (≈ 200)



Soloists in Classical Music




Economic Textbooks (the usual myopic example)





Highly skewed distributions again...



Rosen's theory:

 Individual quality q maps to reward $R(q)$.

 $R(q)$ is 'convex' ($d^2 R/dq^2 > 0$).


 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'.





“Stardom and Talent”

Moshe Adler,

American Economic Review, **75**, 208–212, 1985. ^[1]



“Consumption capital”: “Appreciation [of music] increases with knowledge. But how does one know about music? By listening to it, *and discussing it with other persons who know about it.*”



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’?)



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.



Score-based voting versus rank-based voting:




“A theory of measuring, electing, and ranking” [↗](#)

Balinski and Laraki,

Proc. Natl. Acad. Sci., **104**, 8720–8725, 2007. [2]





“Aggregating partial, local evaluations to achieve global ranking” 

Laureti, Moret, and Zhang,
Physica A, **345**, 705–712, 2004. ^[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



Dominance hierarchies



“Individual differences versus social dynamics in the formation of animal dominance hierarchies” 

Chase et al.,

Proc. Natl. Acad. Sci., **99**, 5744-5749, 2002. ^[3]



The aggressive female *Metriacrima* zebra:



Pecking orders for fish...

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Dominance hierarchies

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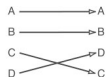
References

Fish forget—changing of dominance hierarchies:

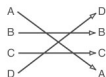
1st Hierarchy → 2nd Hierarchy



(6)

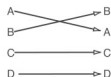


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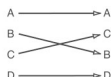


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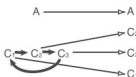
1st Hierarchy → 2nd Hierarchy



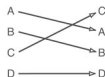
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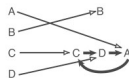
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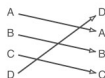
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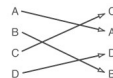
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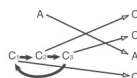
(1)



(2)



(2)



(1)



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



Dominance hierarchies

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Methods of Forming Hierarchies			
Size of set	Group assembly	Round-robin competition	
4	<p>(23) (2) n=25</p>	<p>(9) (3) (3) (1) n=16</p>	
5	<p>(10) (1) n=11</p>	<p>(6) (1) (1) (2) (1) (1) n=12</p>	



Group versus isolated interactions produce different hierarchies



Music Lab Experiment



48 songs

30,000 participants

How probable is the world?

Can we estimate variability?

Superstars dominate but are unpredictable. Why?

	[Help]	[Log off]	# of down loads
GROWTH PEOPLE: "names"			86
ACCEPT THAT "the r people"			52
LISTFORPEOPLE: "no way out"			45

multiple 'worlds'

Inter-world variability

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Music Lab - Song Selection - Mozilla Firefox


File Edit View Go Bookmarks Tools Help

http://www.musiclab.columbia.edu/me/songs

	# of down loads	[Help] [Log off]	# of down loads	# of down loads
HARTSFIELD: "enough is enough"	20	GO MOREDECA: "it does what it told"	12	UNDO: "while the world passes"
DEEP ENOUGH TO DIE: "for the sky"	17	PARKER THEORY: "the sad"	47	UP FOR NOTHING: "in sight of"
THE THRIFT SYNDICATE: "2003 a tragedy"	20	MISS OCTOBER: "pink aggression"	27	SILVERFOX: "glow"
THE BROKEN PROMISE: "the end in friend"	19	POST BREAK TRAGEDY: "horace"	14	STRANGER: "one deep"
THIS NEW DAWN: "the belief above the answer"	12	FORTIFYING: "tear"	24	FAR FROM KNOWN: "route 9"
NOONER AT NINE: "walk away"	6	THE CALEFACTION: "trapped in an orange peel"	20	STUNT MONKEY: "inside out"
MORAL HAZARD: "waste of my life"	8	SZMETRO: "lockdown"	17	DANTE: "this mystery"
NOT FOR SCHOLARS: "as seasons change"	27	SIMPLY WAITING: "best with the count"	16	FACING THROUGH: "with me last"
SECRETARY: "keep your eyes on the ballistics"	5	STAR CLIMBER: "tell me"	38	UNKNOWN CITIZENS: "telling over"
ART OF KAMELY: "seductive into, melodic breakdown"	10	THE FASTLANE: "if death do us part i don't"	31	BY NOVEMBER: "if i could take you"
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "mines and mines"	17	DRAWN IN THE SKY: "top the ride"
EMBER SKY: "this upcoming winter"	25	SUM RANA: "the bolshoik boogie"	15	SELSAUS: "stars of the city"
SALUTE THE DAWN: "i am one"	13	CAPE RENEWAL: "hassleback work v1"	12	SIBRIAN: "eye patch"
RYAN ESSMAKER: "detour, the still"	14	UP FALLS DOWN: "a brighter burning star"	11	EVAN COLD: "robust downey j"
BEERBONG: "father to son"	12	SUMMERSWASTED: "a plan behind destruction"	17	BENEFIT OF A DOUBT: "run away"
HALL OF FAME: "best mistakes"	19	SILENT FILM: "all i have to say"	61	SHIPWRECK UNION: "out of the woods"

Experimental Study of Inequality and
Unpredictability in an Artificial
Cultural Market



"An experimental study of inequality and
unpredictability in an artificial cultural market" 
Salganik, Dodds, and Watts,
Science, **311**, 854–856, 2006. ^[6]



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References

Experiment 1

[illegible]

Experiments 2–4

[illegible]

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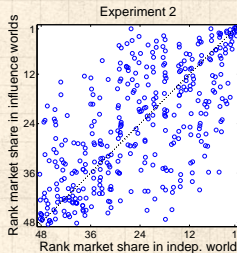
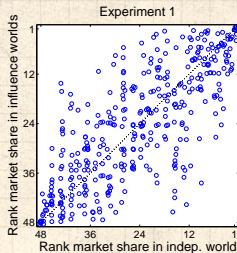
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Variability in final rank.



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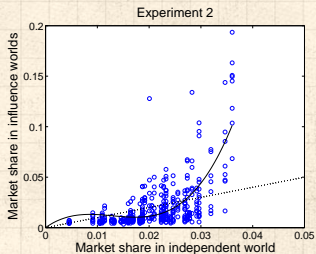
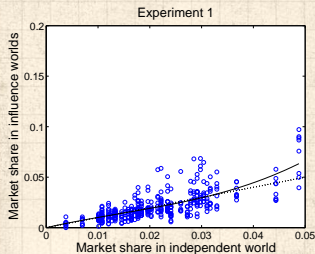
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Variability in final number of downloads.



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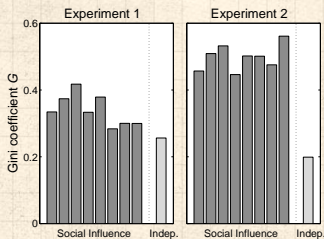
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Inequality as measured by Gini coefficient:

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



Music Lab Experiment

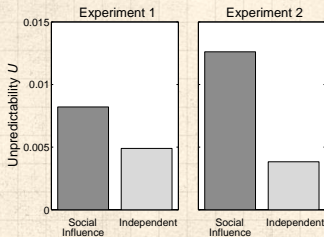
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Unpredictability

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



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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... [8, 9])



Music Lab Experiment—Sneakiness [7]

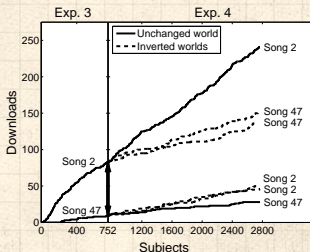
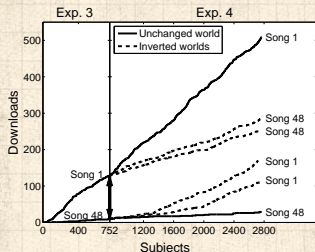
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🧱 Inversion of download count

🧱 The pretend rich get richer ...

🧱 ... but at a slower rate



References I

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