

# Voting, Success, and Superstars

Principles of Complex Systems

CSYS/MATH 300, Spring, 2013 | #SpringPoCS2013

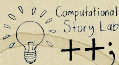
Winning: it's not for  
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References

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@peterdodds

Department of Mathematics & Statistics | Center for Complex Systems |  
Vermont Advanced Computing Center | University of Vermont



These slides brought to you by:

Voting, Success,  
and Superstars

**Sealie &  
Lambie  
Productions**



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# Outline

Voting, Success,  
and Superstars

Winning: it's not for everyone

Superstars

Musiclub

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## Voting, Success, and Superstars

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# Where do superstars come from?

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

Examples:

- ▶ Full-time Comedians ( $\approx 200$ )
- ▶ Soloists in Classical Music
- ▶ Economic Textbooks (the usual myopic example)



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- ▶ Highly skewed distributions again...



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## 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:
  2. Technology:
- ▶ Joint consumption versus public good
- ▶ No social element—success follows 'inherent quality'



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## Adler (1985): “Stardom and Talent”<sup>[1]</sup>

- ▶ 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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## 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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## Score-based voting versus rank-based voting:

- ▶ Balinski and Laraki<sup>[2]</sup>  
“A theory of measuring, electing, and ranking”  
Proc. Natl. Acad. Sci., pp. 8720–8725 (2007)



## 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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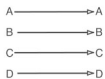




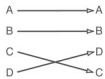
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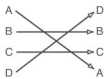
1st Hierarchy → 2nd Hierarchy



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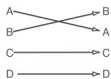


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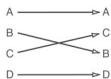


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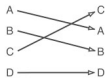
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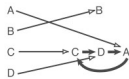
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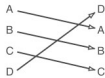
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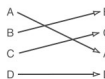
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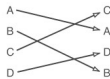
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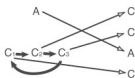
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(2)



(2)



(1)

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

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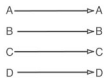
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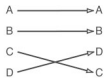
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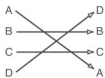
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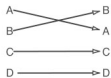


(4)

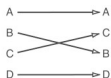


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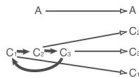
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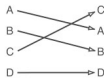
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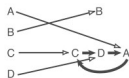
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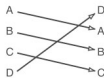
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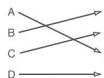
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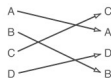
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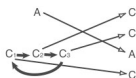
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Methods of Forming Hierarchies						
Size of set	Group assembly		Round-robin competition			
4	A A B C $C_1 \rightarrow C_2 \rightarrow C_3$ D (23) (2) n=25	A A → B B A → B C C ← D D (9) (3)	A C <sub>1</sub> → C <sub>2</sub> → C <sub>3</sub> (3)	B <sub>1</sub> → B <sub>2</sub> → B <sub>3</sub> D (1)		
5	A A B B C C D D E E (10) (1) n=11	A A → B B A → B C C ← D D E (6) (1)	A B → C C → E D → E (1)	B <sub>1</sub> → B <sub>2</sub> → B <sub>3</sub> D E (2)	A C <sub>1</sub> → C <sub>2</sub> → C <sub>3</sub> E (1)	A B D <sub>1</sub> → D <sub>2</sub> → D <sub>3</sub> (1)

- ▶ Group versus isolated interactions produce different hierarchies



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# Music Lab Experiment

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BAND NAME

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

SONG TITLE

NUMBER OF  
DOWNLOADS

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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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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 MOREDCAL: "It does what its told"	12	UNDO: "while the world passes"	24
DEEP ENOUGH TO DIE: "for the sky"	17	PARKER THEORY: "she said"	47	UP FOR NOTHING: "in sight of"	13
THE THRIFT SYNDICATE: "2003 a tragedy"	20	MISS OCTOBER: "pink aggression"	27	SILVERFOX: "gnaw"	17
THE BROKEN PROMISE: "the end in friend"	19	POST BREAK TRAGEDY: "flower"	14	STRANGER: "one drop"	30
THIS NEW DAWN: "the belief above the answer"	12	FORTHFADING: "tear"	24	FAR FROM KNOWN: "route 9"	18
WOONER AT NINE: "walk away"	6	THE CALEFACTION: "trapped in an orange peef"	20	STUNT MONKEY: "inside our"	46
MORAL HAZARD: "waste of my life"	8	52METRO: "lockdown"	17	DANTE: "it's mystery"	14
NOT FOR SCHOLARS: "as seasons change"	27	SIMPLY WAITING: "went with the count"	16	FADING THROUGH: "wish me luck"	30
SECRETARY: "keep your eyes on the ballistics"	5	STAR CLIMBER: "tell me"	38	UNKNOWN CITIZENS: "falling over"	34
ART OF KANLY: "reductive into, melodic breakdown"	10	THE FASTLANE: "if death do us part i dont"	31	BY NOVEMBER: "if i could take you"	20
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "misery and rrracks"	17	DRAWN IN THE SKY: "tap the ride"	12
EMBER SKY: "this upcoming winter"	25	SUMRANA: "the bolshievsk boogie"	15	SELSIUS: "stan of the city"	22
SALUTE THE DAWN: "i am em"	13	CAPE RENAISSANCE: "baseball warlock v1"	12	SIBIRIAN: "eye patch"	14
RYAN ESSMAKER: "detour, be still"	14	UP FALLS DOWN: "a brighter burning star"	11	EVAN GOLD: "inbet downey jr"	30
BEERBONG: "father to son"	12	SUMMERSWASTED: "a plan behind destruction"	17	BENEFIT OF A DOUBT: "run away"	38
HALL OF FAME: "best mistakes"	19	SILENT FILM: "all i have to say"	61	SHIPWRECK UNION: "out of the woods"	16

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References



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

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## Experiment 1

## Experiments 2-4

	Rank	Artist	Score	Rank
WINTERFELDS Through a Storm?	28	CELEBRATION	12	29
DEEP ENDICOR TO DIE The New Day	17	FRANKIE SAVINO The New Day	10	17
THE SHUFFY SUGARBOY SUGARBOY	25	WELL DECIDED The New Day?	20	25
THE SHUFFY SUGARBOY The New Day?	18	THE BEEHIVE The New Day?	16	18
THE SHUFFY SUGARBOY The New Day?	19	THE BEEHIVE The New Day?	17	19
THE SHUFFY SUGARBOY The New Day?	20	THE BEEHIVE The New Day?	18	20
THE SHUFFY SUGARBOY The New Day?	21	THE BEEHIVE The New Day?	19	21
THE SHUFFY SUGARBOY The New Day?	22	THE BEEHIVE The New Day?	20	22
THE SHUFFY SUGARBOY The New Day?	23	THE BEEHIVE The New Day?	21	23
THE SHUFFY SUGARBOY The New Day?	24	THE BEEHIVE The New Day?	22	24
THE SHUFFY SUGARBOY The New Day?	25	THE BEEHIVE The New Day?	23	25
THE SHUFFY SUGARBOY The New Day?	26	THE BEEHIVE The New Day?	24	26
THE SHUFFY SUGARBOY The New Day?	27	THE BEEHIVE The New Day?	25	27
THE SHUFFY SUGARBOY The New Day?	28	THE BEEHIVE The New Day?	26	28
THE SHUFFY SUGARBOY The New Day?	29	THE BEEHIVE The New Day?	27	29
THE SHUFFY SUGARBOY The New Day?	30	THE BEEHIVE The New Day?	28	30

	Rank	Artist	Score	Rank
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THE SHUFFY SUGARBOY The New Day?	21	THE BEEHIVE The New Day?	19	21
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THE SHUFFY SUGARBOY The New Day?	27	THE BEEHIVE The New Day?	25	27
THE SHUFFY SUGARBOY The New Day?	28	THE BEEHIVE The New Day?	26	28
THE SHUFFY SUGARBOY The New Day?	29	THE BEEHIVE The New Day?	27	29
THE SHUFFY SUGARBOY The New Day?	30	THE BEEHIVE The New Day?	28	30



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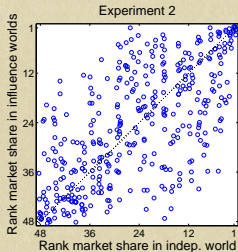
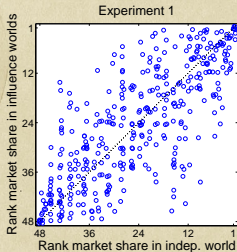
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- ▶ Variability in final rank.



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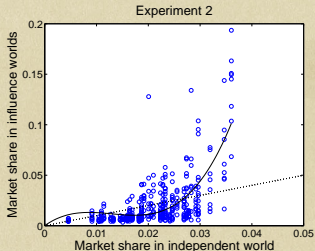
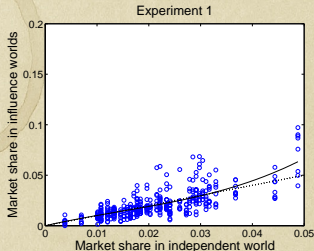
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- ▶ Variability in final number of downloads.



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- ▶ 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

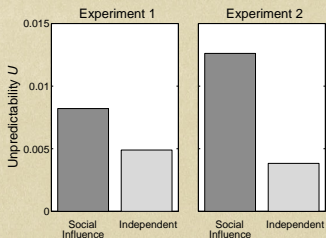
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## ► Unpredictability

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



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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.'
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# Music Lab Experiment—Sneakiness

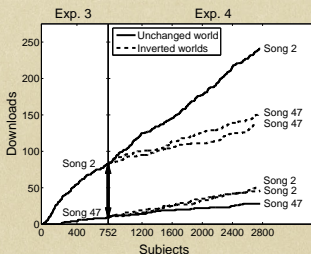
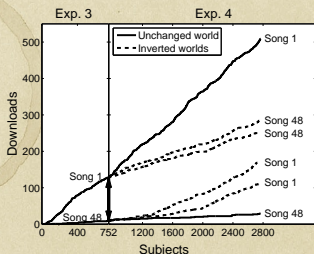
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- ▶ Inversion of download count
- ▶ The pretend rich get richer ...
- ▶ ... but at a slower rate



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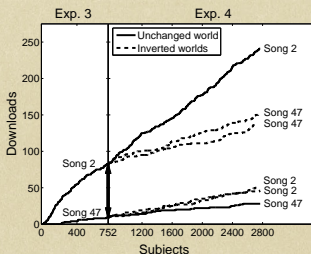
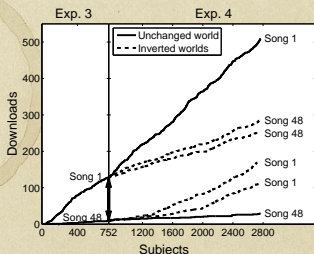
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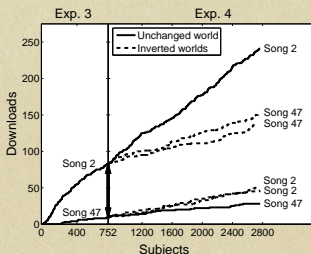
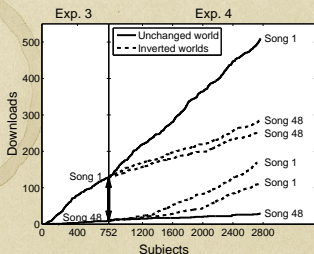
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