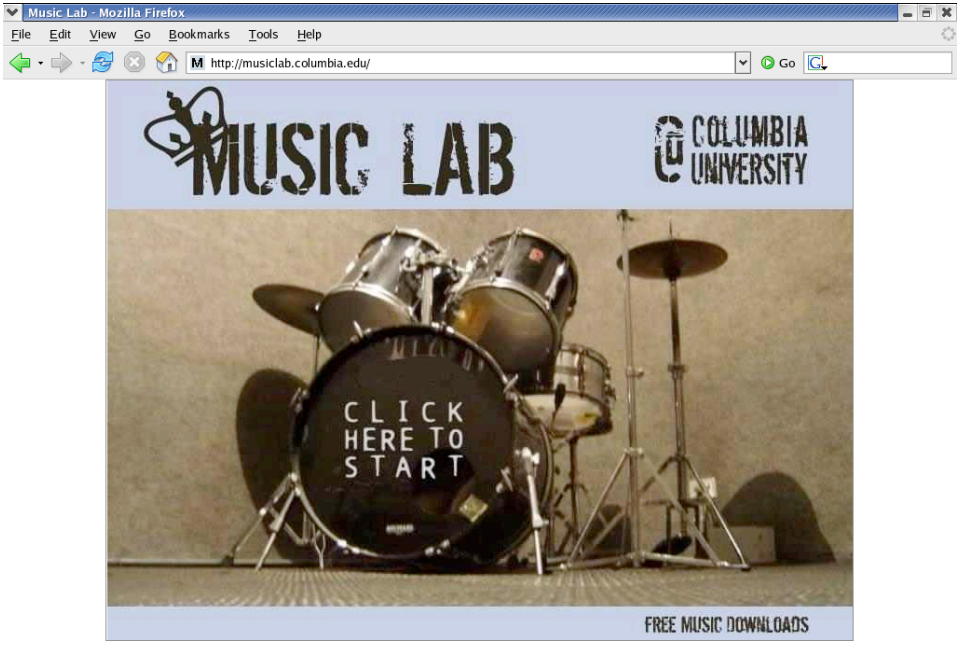
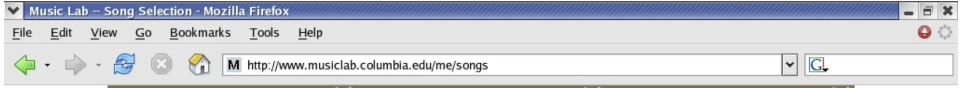
Class slides for Tuesday, October 6: Social fads, part 1

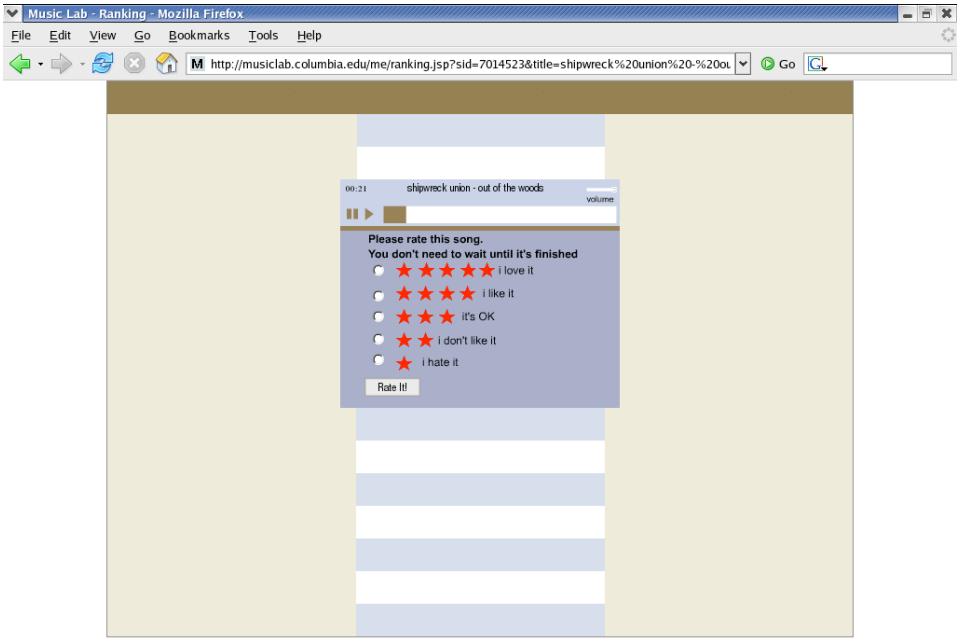
Matthew J. Salganik

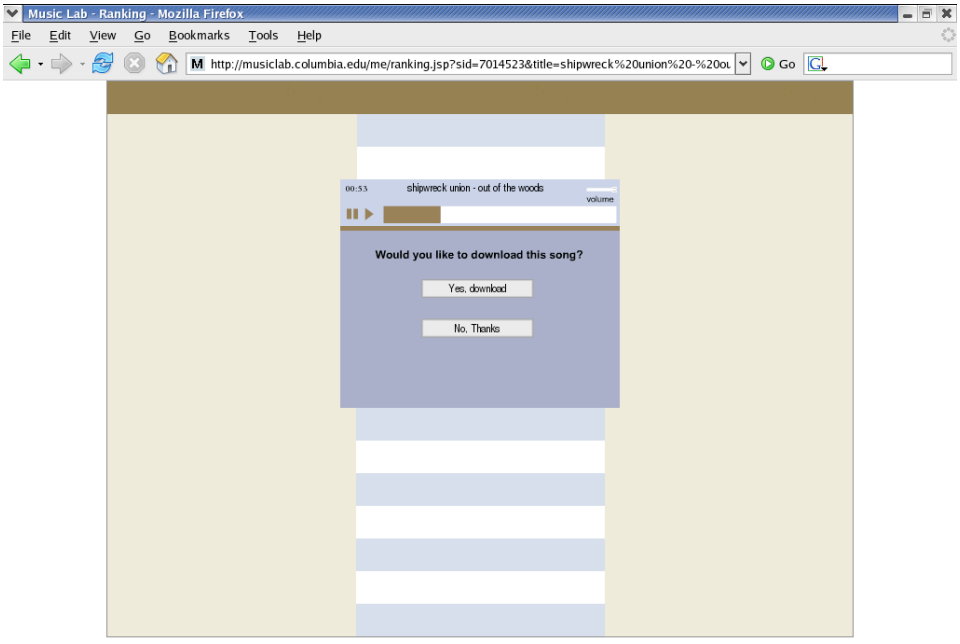
COS 597E/SOC 555 Limits to prediction
Fall 2020, Princeton University

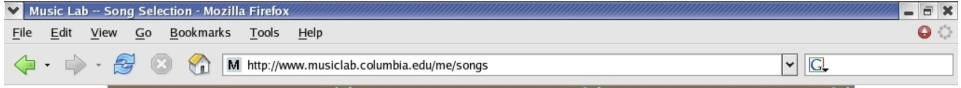

Music Lab - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://musiclab.columbia.edu/
Go
MUSIC LAB
COLUMBIA UNIVERSITY
CLICK HERE TO START
FREE MUSIC DOWNLOADS



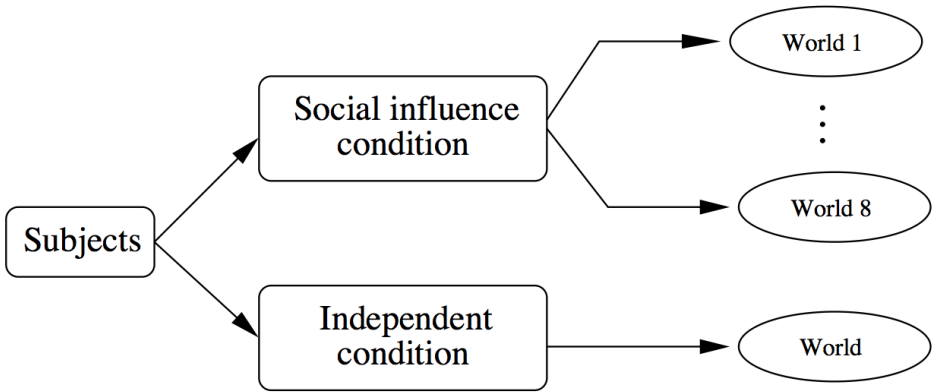
	# of downloads	[Help] [Log off]	# of downloads		# of downloads
HARTSFIELD: "enough is enough"	20	GO MOREDCAI: "it does what its told"	12	UNDO: "while the world passes"	24
DEEP ENOUGH TO DIE: "for the sky"	17	PARKER THEORY: "she said"	47	UP FOR NOTHING: "in sight of"	13
THE THRIFT SYNDICATE: "2003 a tragedy"	20	MISS OCTOBER: "pink agression"	27	SILVERFOX: "gnaw"	17
THE BROKEN PROMISE: "the end in friend"	19	POST BREAK TRAGEDY: "florence"	14	STRANGER: "one drop"	10
THIS NEW DAWN: "the belief above the answer"	12	FORTHFADING: "fear"	24	FAR FROM KNOWN: "route 9"	18
NOONER AT NINE: "walk away"	6	THE CALEFACTION: "trapped in an orange peel"	20	STUNT MONKEY: "inside out"	46
MORAL HAZARD: "waste of my life"	8	52METRO: "lockdown"	17	DANTE: "lifes mystery"	14
NOT FOR SCHOLARS: "as seasons change"	27	SIMPLY WAITING: "went with the count"	16	FADING THROUGH: "wish me luck"	10
SECRETARY: "keep your eyes on the ballistics"	5	STAR CLIMBER: "tell me"	38	UNKNOWN CITIZENS: "falling over"	34
ART OF KANLY: "seductive intro, melodic breakdown"	10	THE FASTLANE: "til death do us part (i dont)"	31	BY NOVEMBER: "if i could take you"	20
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "miseries and miracles"	17	DRAWN IN THE SKY: "tap the ride"	12
EMBER SKY: "this upcoming winter"	25	SUM RANA: "the bolshevik boogie"	15	SELSIUS: "stars of the city"	22
SALUTE THE DAWN: "i am error"	13	CAPE RENEWAL: "baseball warlock v1"	12	SIBRIAN: "eye patch"	14
RYAN ESSMAKER: "detour_(be still)"	14	UP FALLS DOWN: "a brighter burning star"	11	EVAN GOLD: "robert downey jr"	10
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

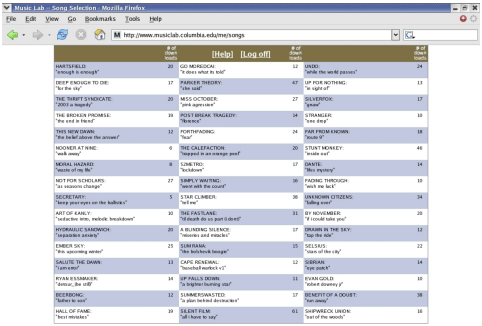

Music Lab - Ranking - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://musiclab.columbia.edu/me/ranking.jsp?sid=7014523&title=shipwreck%20union%20-%20ou
Go
00:21
shipwreck union - out of the woods
volume
Please rate this song.
You don't need to wait until it's finished
i love it
i like it
it's OK
i don't like it
i hate it
Rate It!


Music Lab - Ranking - Mozilla Firefox
File Edit View Go Bookmarks Tools Help
http://musiclab.columbia.edu/me/ranking.jsp?sid=7014523&title=shipwreck%20union%20-%20ou
Go
00:53
shipwreck union - out of the woods
volume
Would you like to download this song?
Yes, download
No, Thanks

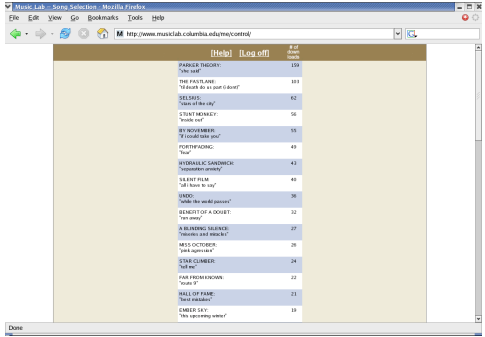


	# of downloads	[Help] [Log off]	# of downloads		# of downloads
HARTSFIELD: "enough is enough"	20	GO MOREDCAI: "it does what its told"	12	UNDO: "while the world passes"	24
DEEP ENOUGH TO DIE: "for the sky"	17	PARKER THEORY: "she said"	47	UP FOR NOTHING: "in sight of"	13
THE THRIFT SYNDICATE: "2003 a tragedy"	20	MISS OCTOBER: "pink agression"	27	SILVERFOX: "gnaw"	17
THE BROKEN PROMISE: "the end in friend"	19	POST BREAK TRAGEDY: "florence"	14	STRANGER: "one drop"	10
THIS NEW DAWN: "the belief above the answer"	12	FORTHFADING: "fear"	24	FAR FROM KNOWN: "route 9"	18
NOONER AT NINE: "walk away"	6	THE CALEFACTION: "trapped in an orange peel"	20	STUNT MONKEY: "inside out"	46
MORAL HAZARD: "waste of my life"	8	52METRO: "lockdown"	17	DANTE: "lifes mystery"	14
NOT FOR SCHOLARS: "as seasons change"	27	SIMPLY WAITING: "went with the count"	16	FADING THROUGH: "wish me luck"	10
SECRETARY: "keep your eyes on the ballistics"	5	STAR CLIMBER: "tell me"	38	UNKNOWN CITIZENS: "falling over"	34
ART OF KANLY: "seductive intro, melodic breakdown"	10	THE FASTLANE: "til death do us part (i dont)"	31	BY NOVEMBER: "if i could take you"	20
HYDRAULIC SANDWICH: "separation anxiety"	20	A BLINDING SILENCE: "miseries and miracles"	17	DRAWN IN THE SKY: "tap the ride"	12
EMBER SKY: "this upcoming winter"	25	SUM RANA: "the bolshevik boogie"	15	SELSIUS: "stars of the city"	22
SALUTE THE DAWN: "i am error"	13	CAPE RENEWAL: "baseball warlock v1"	12	SIBRIAN: "eye patch"	14
RYAN ESSMAKER: "detour_(be still)"	14	UP FALLS DOWN: "a brighter burning star"	11	EVAN GOLD: "robert downey jr"	10
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


Subjects
Social influence condition
Independent condition
World 1
World 8
World



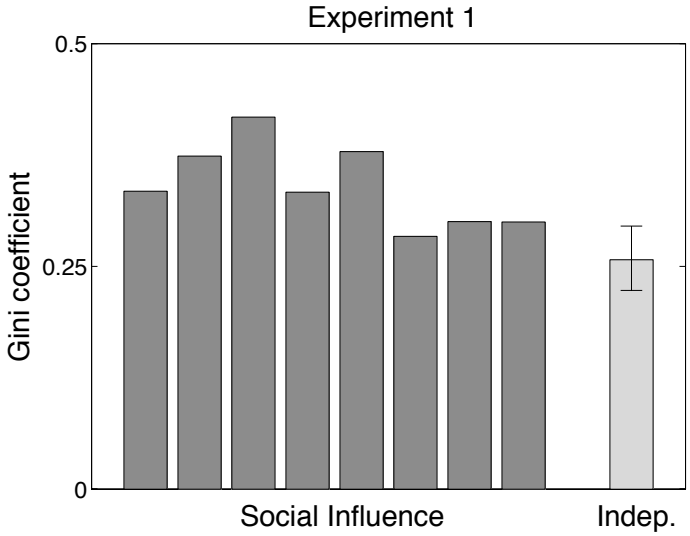
(a) Experiment 1, Weaker signal

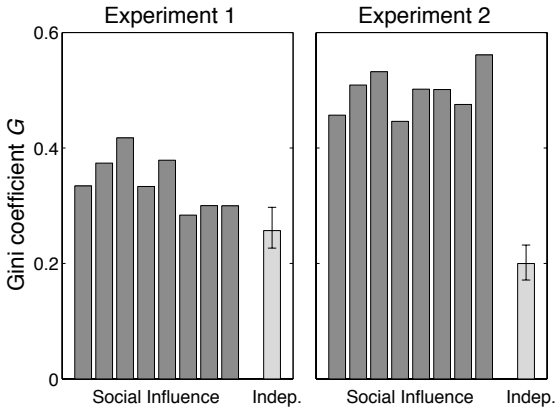


(b) Experiment 2, Stronger signal

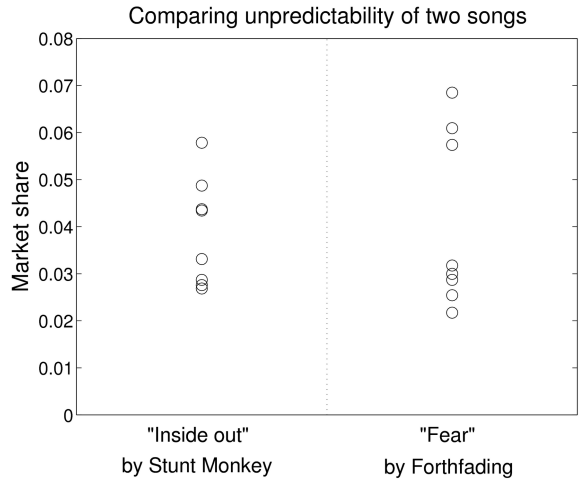
Two main measures

- Inequality
- Unpredictability

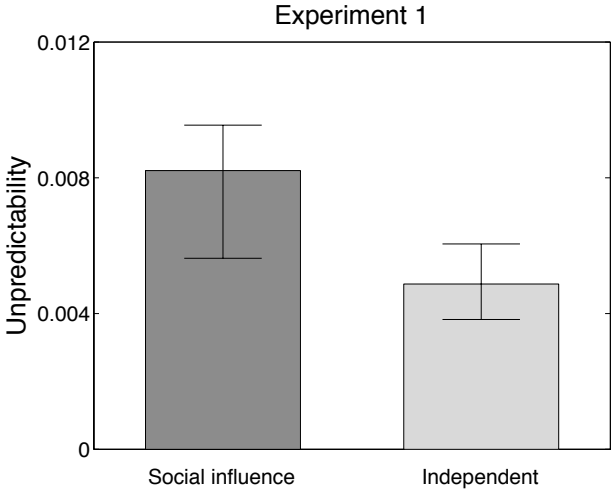

Experiment 1
0.5
0.25
0
Gini coefficient
Social Influence
Indep.

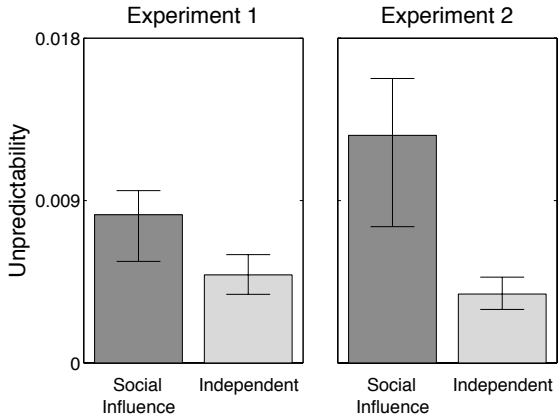


Median Gini coefficient increases from 0.34 (France) to 0.50 (Nigeria)



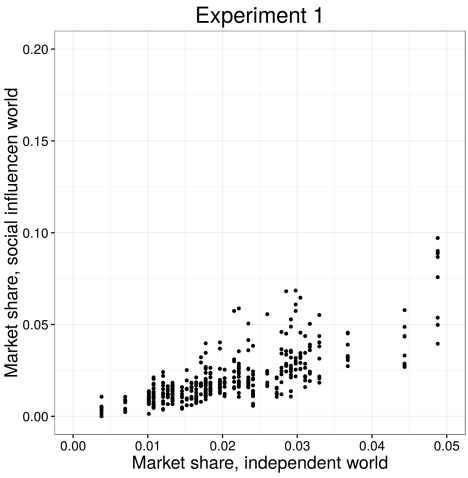
U = mean difference in market share across all pairs of realizations

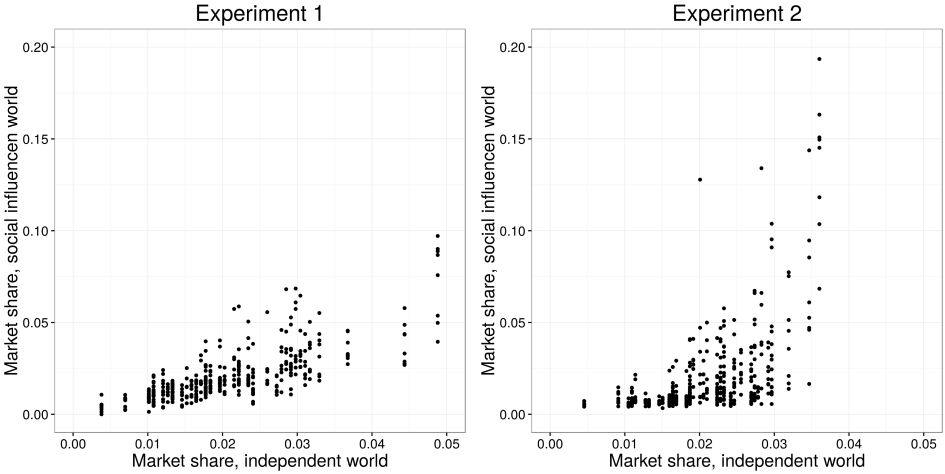

Experiment 1
0.012
0.008
0.004
0
Unpredictability
Social influence
Independent



Unpredictability increases by about 50%

What is the relationship between “quality” and success? Or expressed in terms of Martin et al. (2016) what is the relationship between “skill” and success?

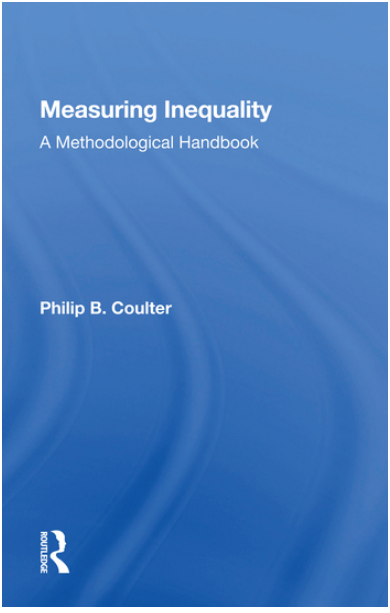

Experiment 1
Market share, social influencen world
0.20
0.15
0.10
0.05
0.00
0.00
0.01
0.02
0.03
0.04
0.05
Market share, independent world


Experiment 1
Market share, social influencen world
0.20
0.15
0.10
0.05
0.00
0.00
0.01
0.02
0.03
0.04
0.05
Market share, independent world
Experiment 2
Market share, social influencen world
0.20
0.15
0.10
0.05
0.00
0.00
0.01
0.02
0.03
0.04
0.05
Market share, independent world

Behind the MusicLab

Two main measures

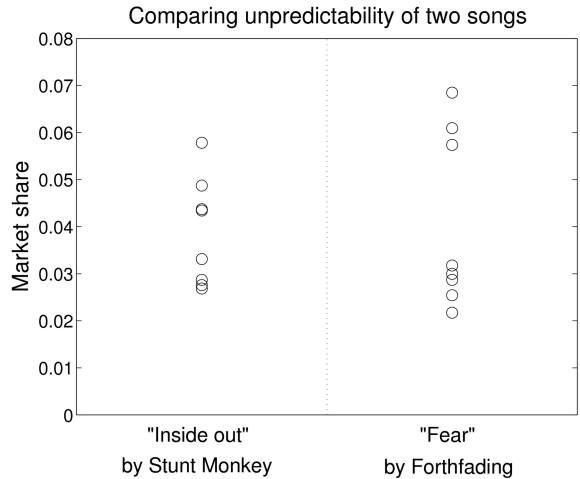
- Inequality
- Unpredictability


Measuring Inequality
A Methodological Handbook
Philip B. Coulter
ROUTLEDGE

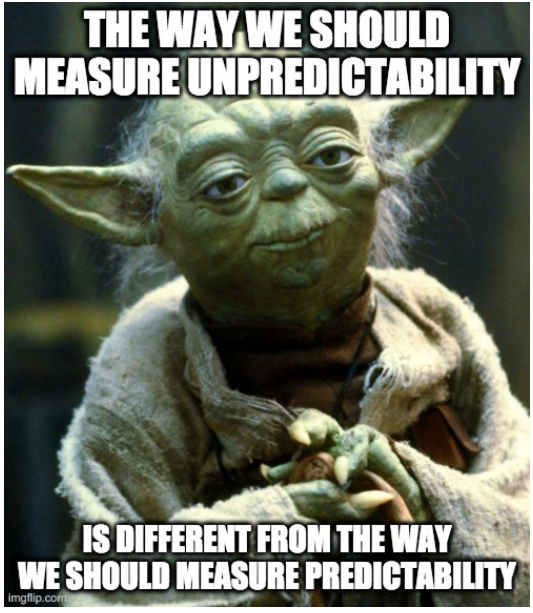
CONTENTS

Table 3-2: Primary Properties of Indexes Based on the Deviations Model

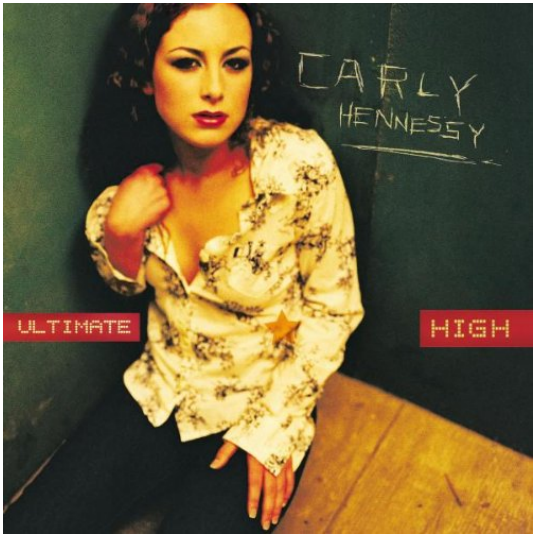
	Polarity	Type of index	Concentration	Comparative standard	Constant additions	Transfers	Scale invariance	Population symmetry	Lorenz dominance	Scale	Definition	Information use	Upper and lower limits	Simplicity
Wilcox's deviation from the mode (DM)	equality	relative, ANONC	no	mode	increase	yes	yes	no	no	nominal	yes	good	1, 0	good
Dahl's polyarchy (P)	equality	absolute, type A	yes	mean	increase	yes	yes	yes	yes	interval	yes	good	1-(1/K),0	fair
Schutz's inequality (S)	inequality	absolute, type A	no	mean	decrease	no	yes	yes	no	nominal	yes	poor	1-(1/K),0	good
Mayer's uniformity (M)	equality	absolute, type A	yes	mean	increase	yes	yes	yes	yes	nominal	yes	good	K-1, 0	good
Nagel's equality (E)	equality	relative, ANONC	yes	mean	decrease	yes	yes	yes	yes	nominal	yes	good	1, 0	good
Gini's mean relative difference (MRD)	equality	relative, ANONC	yes	all other components	increase	yes	yes	yes	yes	interval	yes	good	1, 0	fair
Gini coefficient (G)	inequality	absolute, type A	yes	all other components	decrease	yes	yes	yes	yes	interval	yes	good	1-(1/K), 0	poor
Przeworski's instability (D_t)	inequality	absolute, type A	no	adjacent component	decrease	yes	yes	yes	yes	nominal	yes	good	t_n-1, 0	poor



U = mean difference in market share across all pairs of realizations


THE WAY WE SHOULD
MEASURE UNPREDICTABILITY
IS DIFFERENT FROM THE WAY
WE SHOULD MEASURE PREDICTABILITY
imgflip.com

How did we come to study unpredictability?



https://www.youtube.com/watch?v=2wfhk46_tXE

aps
ASSOCIATION FOR
PSYCHOLOGICAL SCIENCE

Hindsight Bias

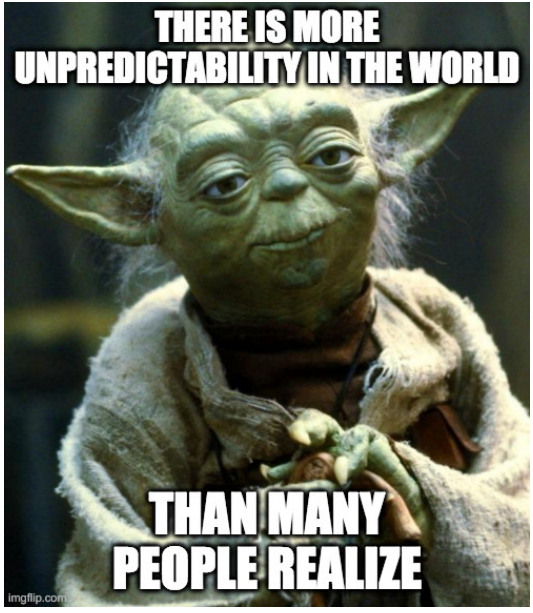
Perspectives on Psychological Science
7(5) 411–426

DOI: 10.1177/1745691612454303
http://pps.sagepub.com
SAGE

Neal J. Roese[1] and Kathleen D. Vohs[2]
[1]Kellogg School of Management, Northwestern University and [2]University of Minnesota

Abstract

Hindsight bias occurs when people feel that they "knew it all along," that is, when they believe that an event is more predictable after it becomes known than it was before it became known. Hindsight bias embodies any combination of three aspects: memory distortion, beliefs about events' objective likelihoods, or subjective beliefs about one's own prediction abilities. Hindsight bias stems from (a) cognitive inputs (people selectively recall information consistent with what they now know to be true and engage in sensemaking to impose meaning on their own knowledge), (b) metacognitive inputs (the ease with which a past outcome is understood may be misattributed to its assumed prior likelihood), and (c) motivational inputs (people have a need to see the world as orderly and predictable and to avoid being blamed for problems). Consequences of hindsight bias include myopic attention to a single causal understanding of the past (to the neglect of other reasonable explanations) as well as general overconfidence in the certainty of one's judgments. New technologies for visualizing and understanding data sets may have the unintended consequence of heightening hindsight bias, but an intervention that encourages people to consider alternative causal explanations for a given outcome can reduce hindsight bias.


THERE IS MORE
UNPREDICTABILITY IN THE WORLD
THAN MANY
PEOPLE REALIZE
imgflip.com

Exploring limits to prediction in complex social systems

Travis Martin
University of Michigan
Dept. of Computer Science
Ann Arbor, MI
travisbm@umich.edu

Jake M. Hofman
Microsoft Research
641 6th Ave, Floor 7
New York, NY
jmh@microsoft.com

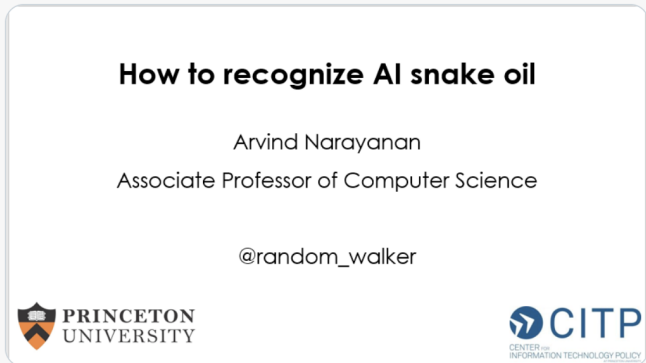
Amit Sharma
Microsoft Research
amshar@microsoft.com

Ashton Anderson
Microsoft Research
ashton@microsoft.com

Duncan J. Watts
Microsoft Research
duncan@microsoft.com

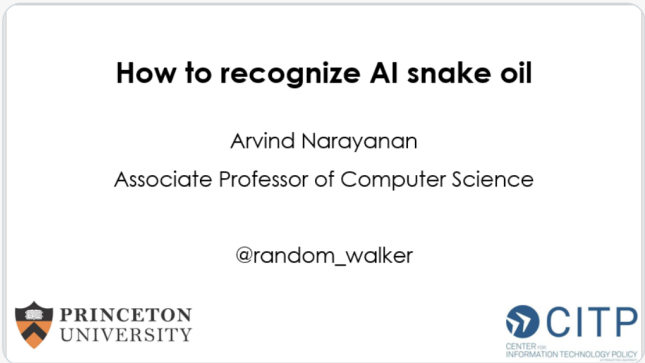
Arvind Narayanan @random_walker · Nov 19, 2019

Much of what's being sold as "AI" today is snake oil. It does not and cannot work. In a talk at MIT yesterday, I described why this happening, how we can recognize flawed AI claims, and push back. Here are my annotated slides: cs.princeton.edu/~arvindn/talks...



Arvind Narayanan @random_walker · Nov 19, 2019

Much of what's being sold as "AI" today is snake oil. It does not and cannot work. In a talk at MIT yesterday, I described why this happening, how we can recognize flawed AI claims, and push back. Here are my annotated slides: cs.princeton.edu/~arvindn/talks...



168 5.4K 10.1K

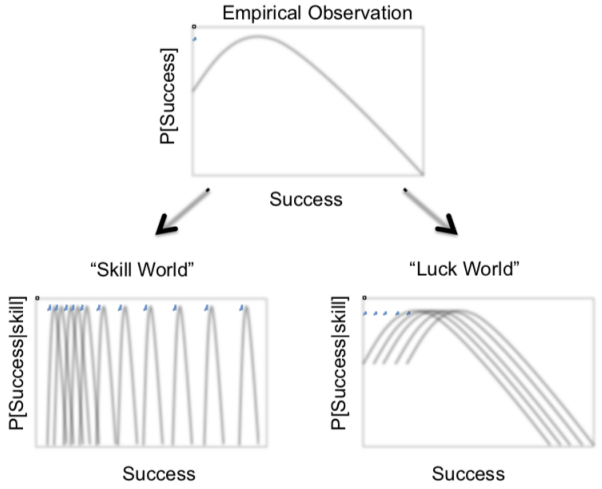
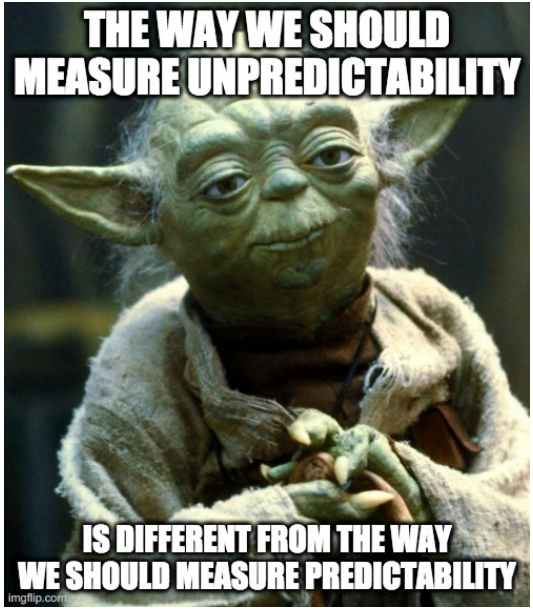


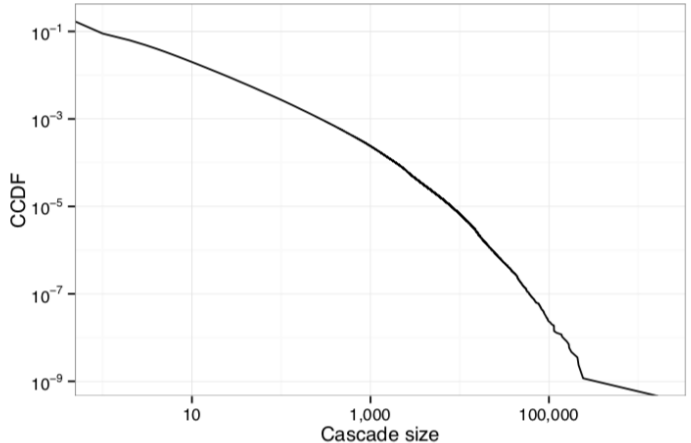
Figure 1: Schematic model illustrating two stylized explanations for an empirically observed distribution of success.

$$s = f(q) + \epsilon$$

$$F = \frac{\mathbb{E}[\mathrm{Var}(\mathrm{S}|Q)]}{\mathrm{Var}(\mathrm{S})} = \frac{\sum_q \sum_{i:q_i=q} (\bar{s}_q - s_i)^2}{\sum_j (\bar{s} - s_j)^2}, \qquad (1)$$

$$F = \frac{\sum_i (f(q_i) - s_i)^2}{\sum_j (\bar{s} - s_j)^2} = 1 - R^2, \tag{2}$$


THE WAY WE SHOULD
MEASURE UNPREDICTABILITY
IS DIFFERENT FROM THE WAY
WE SHOULD MEASURE PREDICTABILITY
imgflip.com



I believe that it is in general hard to predict outcomes with more variation. Is that true?

Model	*Tweet time*	*Domain*	*Spam score*	*Category*	*Tweet topic*	*Past url success*	*User time*	*Followers*	*Friends*	*Statuses*	*User topic*	*Past user success*	*Topic interaction*
1. Basic content	✓	✓	✓	✓									
2. Content, topic	✓	✓	✓	✓	✓								
3. Content, past succ.	✓	✓	✓	✓	✓	✓							
4. Basic user							✓	✓	✓				
5. User, topic							✓	✓	✓	✓	✓		
6. User, past succ.							✓	✓	✓	✓	✓	✓	
7. Content, user	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
8. All	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 2: Features used in different models for cascade size prediction.

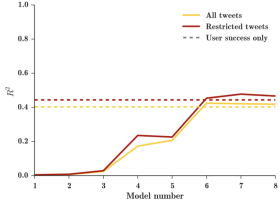


Figure 4: Prediction results for models using different subsets of features. R^2 increases as we add more features, but only up to a limit. Even a model with all features explains less than half of the variance in cascade sizes.

Model	*Tweet time*	*Domain*	*Spam score*	*Category*	*Tweet topic*	*Past url success*	*User time*	*Followers*	*Friends*	*Statuses*	*User topic*	*Past user success*	*Topic interaction*
1. Basic content	✓	✓	✓	✓									
2. Content, topic	✓	✓	✓	✓	✓								
3. Content, past succ.	✓	✓	✓	✓	✓	✓							
4. Basic user							✓	✓	✓	✓			
5. User, topic							✓	✓	✓	✓	✓		
6. User, past succ.							✓	✓	✓	✓	✓	✓	
7. Content, user	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
8. All	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Table 2: Features used in different models for cascade size prediction.

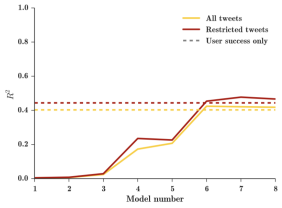


Figure 4: Prediction results for models using different subsets of features. R^2 increases as we add more features, but only up to a limit. Even a model with all features explains less than half of the variance in cascade sizes.

What about my favorite feature? What about deep learning? What about . . . .

They don't close the loop. It is very hard to get the simulation results and the empirical results to work together tightly.

Exploring limits to prediction in complex social systems

Travis Martin
University of Michigan
Dept. of Computer Science
Ann Arbor, MI
travisbm@umich.edu

Jake M. Hofman
Microsoft Research
641 6th Ave, Floor 7
New York, NY
jmh@microsoft.com

Amit Sharma
Microsoft Research
amshar@microsoft.com

Ashton Anderson
Microsoft Research
ashton@microsoft.com

Duncan J. Watts
Microsoft Research
duncan@microsoft.com

Prediction and explanation in social systems

Jake M. Hofman,* Amit Sharma,* Duncan J. Watts*

SCIENCE

Psychology's Replication Crisis Is Running Out of Excuses

Another big project has found that only half of studies can be repeated. And this time, the usual explanations fall flat.

ED YONG NOVEMBER 19, 2018

https://www.theatlantic.com/science/archive/2018/11/psychologys-replication-crisis-real/576223/

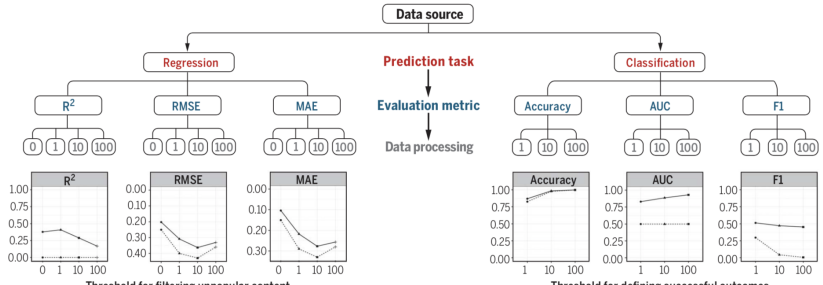


Fig. 1. A single question may correspond to many research designs, each yielding different answers. (**Top**) A depiction of the many choices involved in translating the problem of understanding diffusion cascades into a concrete prediction task, including the choice of data source, task, evaluation metric, and data preprocessing. The preprocessing choices shown at the terminal nodes refer to the threshold used to filter observations for regression or define successful outcomes for classification. Cascade sizes were log-transformed for all of the regression tasks. (**Bottom**) The results of each prediction task, for each metric, as a function of the threshold used in each task. The lower limit of each vertical axis gives the worst possible performance on each metric, and the top gives the best. Dashed lines represent the performance of a naive predictor (always forecasting the global mean for regression or the positive class for classification), and solid lines show the performance of the fitted model. R^2, coefficient of determination; AUC, area under the ROC curve; RMSE, root mean squared error; MAE, mean absolute error; F1 score, the harmonic mean of precision and recall.

This is why you have to pre-register assignment 1

Prediction and explanation in social systems

Jake M. Hofman,* Amit Sharma,* Duncan J. Watts*

Closing thoughts:

- social fads are partially unpredictable and partially predictable

Closing thoughts:

- social fads are partially unpredictable and partially predictable
- likely mechanism is cumulative advantage

Closing thoughts:

- social fads are partially unpredictable and partially predictable
- likely mechanism is cumulative advantage
- we see that same mechanism in other settings (e.g., disease)

Class slides for Tuesday, October 6: Social fads, part 1

Matthew J. Salganik

COS 597E/SOC 555 Limits to prediction
Fall 2020, Princeton University