Category Integration and Evaluation

Robert Ward
Georgia Institute of Technology

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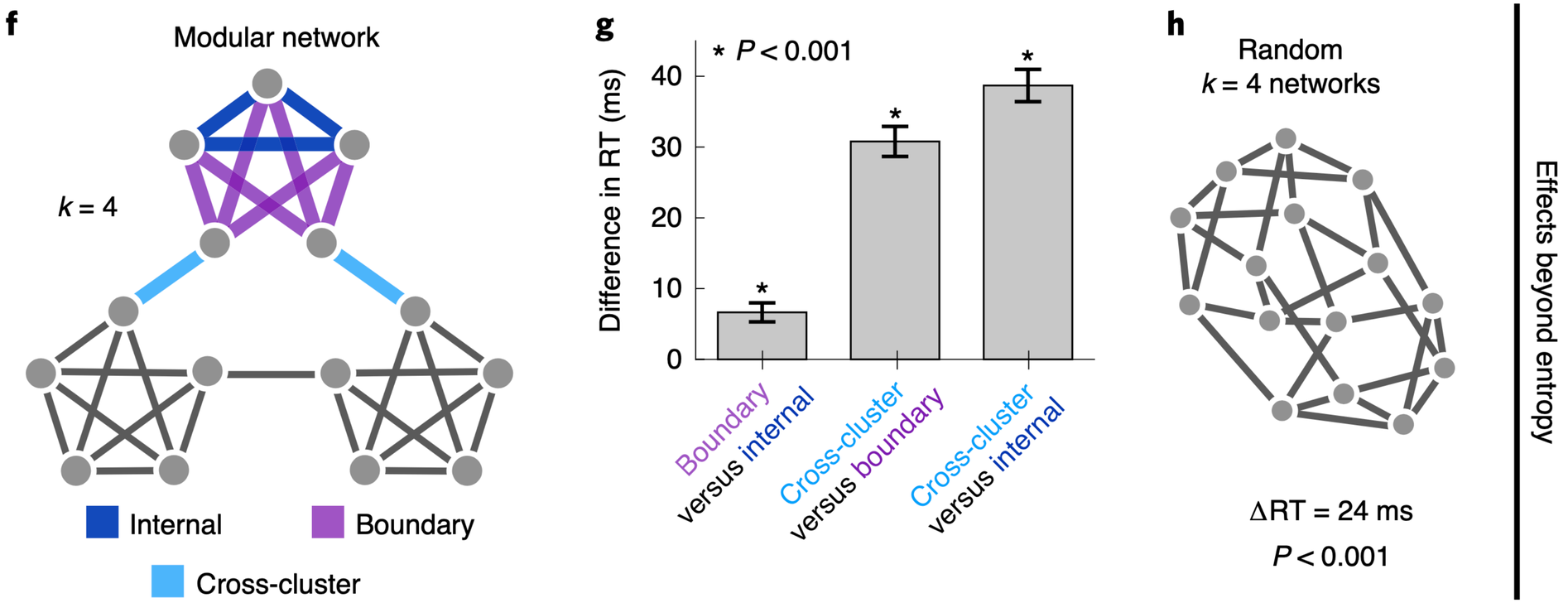
This talk

1. Theorize about category integration in evaluation
2. New methods to quantify integration
3. Evidence for theory from scientific marketplace

Dominant View

Alternate view

Topology mediates human expectations



Lynn et al. 2020

within / cross boundary transitions key

Predictions

1. Integration moderates the perceived ambiguity of category spanning offerings
2. But is independent of the evaluative mechanism
3. Implies, relationship between aggregate ambiguity (spanning + integration) and evaluation has diminishing marginal returns.

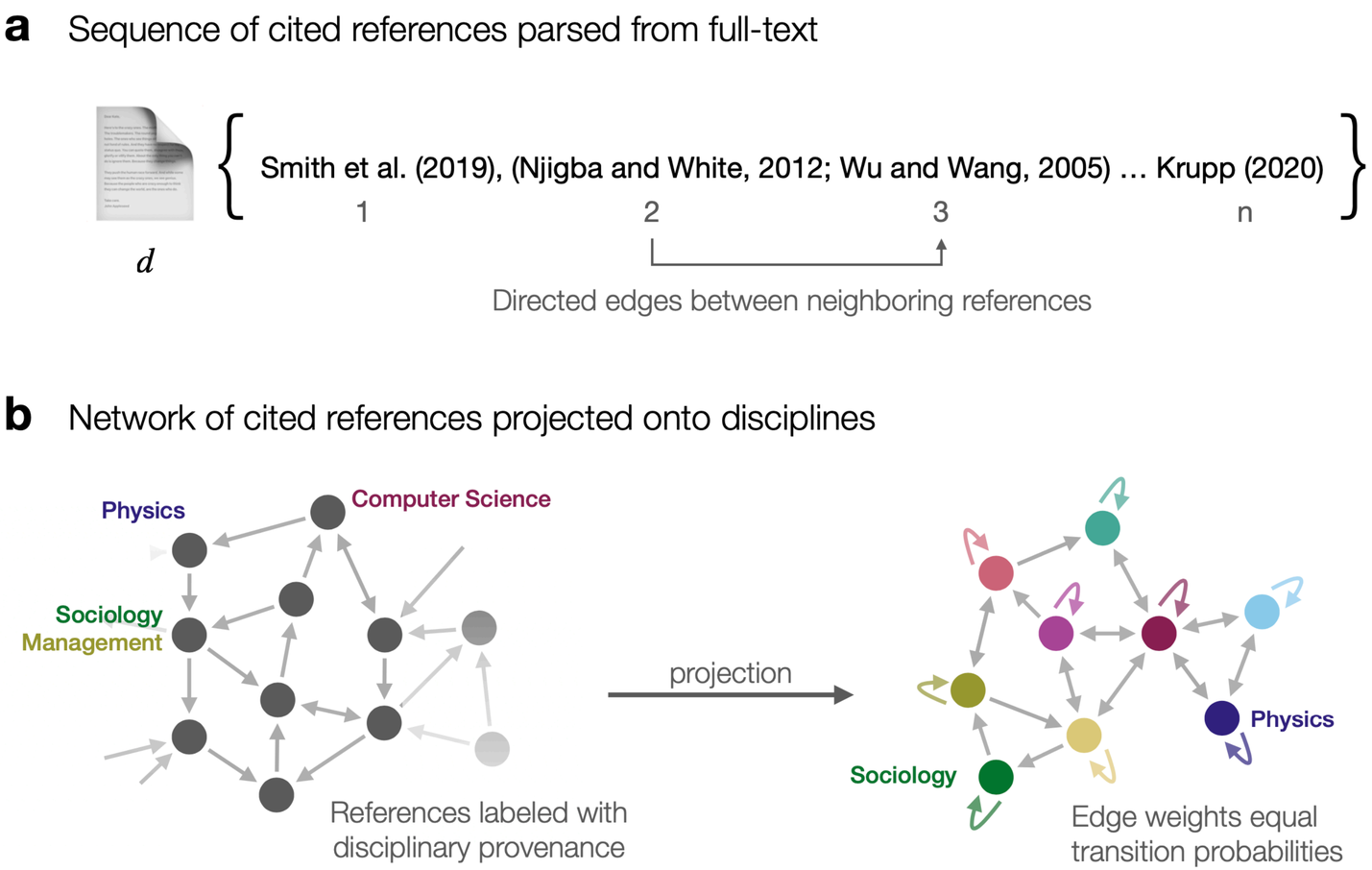
Data

Full-Text Corpus

Semantic scholar open access corpus (S2ORC)

Supplemented by:

Citation data from Web of Science



Quantifying Integration and Related Constructs

Φ Estimated from Web of Science population

$\mathbf{P}$ Observed for each paper

$$\text{Weighted Surprisal} = \underbrace{-\log_2 \phi_{ij}}_{\text{Subjective surprisal}} \times \underbrace{-\log_2 p_{ij}}_{\text{Objective surprisal}}$$

Manipulate this to get: *category spanning*, *category integration, aggregate ambiguity, weighted KL divergence*

Shannon, 1948; Guiaçsu, 1971

Spanning and Integration are Non-redundant

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Descriptive statistics for weighted KL Divergence
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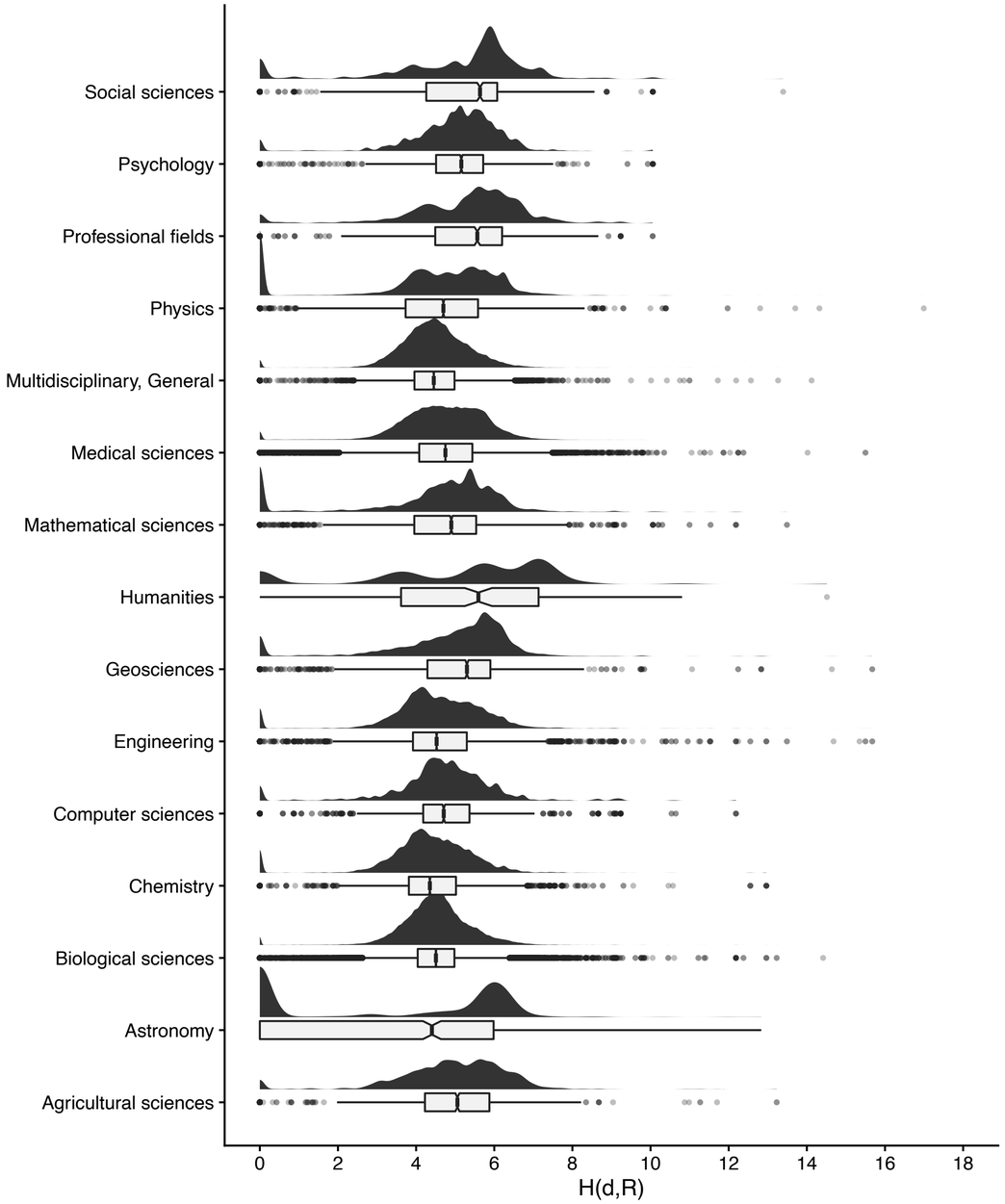
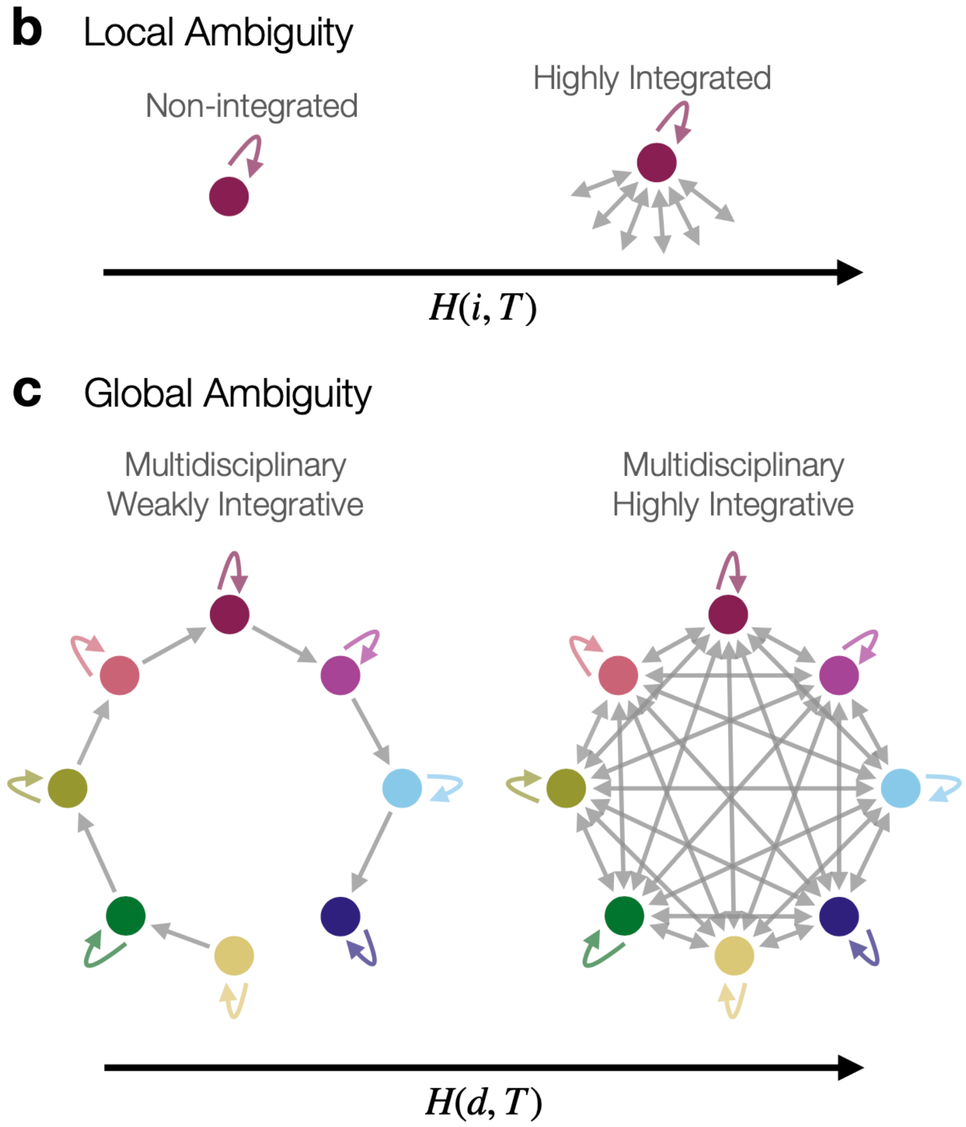
Mean normalized KL divergence: 40740129.315313876
Variance of normalized KL divergence: 3072391507090305.0

Minimum normalized KL divergence: 373
Maximum normalized KL divergence: 215721446

Deciles:
10 percent of data lies below 3285255.4000000004
20 percent of data lies below 6068310.6
30 percent of data lies below 10092982.4
40 percent of data lies below 14299086.6
50 percent of data lies below 17783499.0
60 percent of data lies below 24218642.0
70 percent of data lies below 36740981.39999999
80 percent of data lies below 53304913.6
90 percent of data lies below 122157857.4

Weighted KL Divergence between combinatorial and structural model of stimulus


Social sciences
Psychology
Professional fields
Physics
Multidisciplinary, General
Medical sciences
Mathematical sciences
Humanities
Geosciences
Engineering
Computer sciences
Chemistry
Biological sciences
Astronomy
Agricultural sciences
0
2
4
6
8
10
12
14
16
18
H(d,R)


b
Local Ambiguity
Non-integrated
Highly Integrated
$H(i,T)$
c
Global Ambiguity
Multidisciplinary
Weakly Integrative
Multidisciplinary
Highly Integrative
$H(d,T)$

Aggregate relationship

Negative Binomial

	Model 1	Model 2	Model 3	Model 4
Interdisciplinarity		−0.016•••	0.084•••	0.084•••
		(0.001)	(0.004)	(0.004)
Interdisciplinarity^2			−0.012•••	−0.012•••
			(0.001)	(0.001)
Team Size	0.018•••	0.021•••	0.020•••	0.020•••
	(0.0001)	(0.0001)	(0.0001)	(0.0001)
Journal Impact Factor	0.084•••	0.081•••	0.080•••	0.080•••
	(0.0003)	(0.0003)	(0.0003)	(0.0003)
Constant	2.375•••	2.571•••	2.403•••	2.493•••
	(0.137)	(0.165)	(0.165)	(0.017)
Discipline FE?	Yes	Yes	Yes	Yes
Year FE?	Yes	Yes	Yes	No
Observations	307713	278081	278081	278081
Log Likelihood	−1237271.000	−1123108.000	−1122734.000	−1123335.000
θ	1.314••• (0.003)	1.337••• (0.004)	1.340••• (0.004)	1.335••• (0.004)
AIC	2474606.000	2246282.000	2245536.000	2246708.000

•p < .05; ••p < .01; •••p < .001

Unexponentiated coefficients with standard errors in parentheses below.

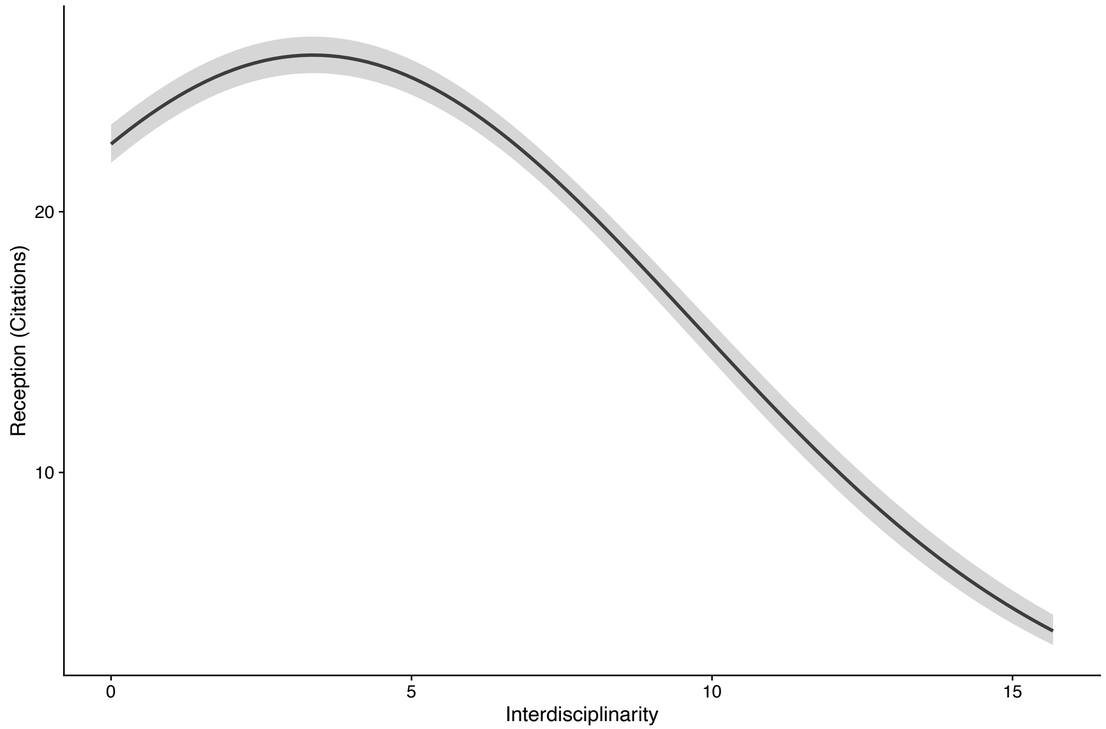


Table S3. Chi-Squared Values for Likelihood Ratio Tests (Linear v.s. Quadratic)

Full	759.766$^{\bullet\bullet\bullet}$
Agricultural sciences	3.626$^{\bullet}$
Astronomy	0.051
Biology	101.968$^{\bullet\bullet\bullet}$
Chemistry	1.225
Computer sciences	42.817$^{\bullet\bullet\bullet}$
Engineering	32.937$^{\bullet\bullet\bullet}$
Geosciences	0.212
Mathematical sciences	26.249$^{\bullet\bullet\bullet}$
Humanities	30.596$^{\bullet\bullet\bullet}$
Medical sciences	195.871$^{\bullet\bullet\bullet}$
Physics	35.507$^{\bullet\bullet\bullet}$
Professional fields	4.428$^{\bullet\bullet}$
Psychology	61.015$^{\bullet\bullet\bullet}$
Social sciences	30.627$^{\bullet\bullet\bullet}$

$^{\bullet}p < .1$; $^{\bullet\bullet}p < .05$; $^{\bullet\bullet\bullet}p < .01$

See tables S1 and S2.

Summary of contributions

1. Extend theories of categorization, evaluation consistent with understanding of underlying cognitive mechanisms
2. Strong evidence for mechanism and aggregate effects
3. Contrary to prevailing wisdom, to maximize their appeal, the authors

Thank You!

rward48@gatech.edu
@robertnward

End of slides