





# Measuring Science Your Way

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In collaboration with Michael Harney, Tobias Mistele, and Tom Price. This research was supported by the Foundational Questions Institute.



# The trouble with measures

Scientists don't like them.

I'm not just a number!



### The real trouble with measures

We can't do without them.

Researchers as well as those in administration and policy making need a fast, reliable way to quantify scientific relevance.

So they use quantifiers that are readily available.



# Which leads to more trouble with measures

They create perverse incentives:

- Write several shorter papers rather than one long one.
- Try to publish similar results repeatedly.
- Work on trendy and productive topics.
- Trade co-authorships and citations.
- Exaggerate relevance of findings.

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### Which leads to even more trouble

- Optimizing for a specific measure makes this measure less and less useful as an indicator for scientific research. Instead it becomes an indicator for successfully optimizing said measure.
- The dominance of few measures streamlines research practices and research interests by devaluing non-conforming practices and interests.

### What can we do about it?

The cause of the problem is not the use of measures per se.

The cause is the use of bad measures:

Scientists presently use few and over-simplified measures: the h-index, total number of citations, the journal impact factor – and little else.

This is what creates perverse incentives, invites gaming, and streamlines research.

# We know that's not good but do it anyway...

Because even the computation of simple measures is prohibitively time-consuming for individual scientists or university personnel.

They therefore have to rely on publishers, abstract-servers, digital libraries, or subscription services (like dimensions.ai).

# But this problem is solvable

There are lots and lots of citation indices: The h-index, g-index, hg-index, the h-index, the M-index, the R-index, and so on.

There are further entirely different measures for academic productivity, eg those that work similar to Google's PageRank.

Idea: Make a larger variety of measures accessible to scientists.

# If you measure, measure right

SciMeter.org: A non-profit web-interface for research evaluation that is:

- Customizable and adaptive
   Define your own measure for research impact
- Transparent and reproducible
   Both data and algorithms are documented
- For Scientists, not against them
  Designed to help scientists make fast assessments

# How customizable measures help

Large variety: Prevents streamlining

Fast adaptation plus anonymity: Prevents Gaming

Both together: Weaken perverse incentives

Bonus: Objective measures counteract bias that comes from personal connections or in-group behavior.

Of course measures can not replace a qualitative, in-depth assessment. But they are necessary and will not go away.

We need them for fast filtering and sorting before the in-depth analysis.

We presently only use data from the arXiv (But are working on an extension).

#### Welcome to Scimeter

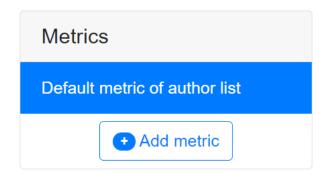
#### **Custom metrics**

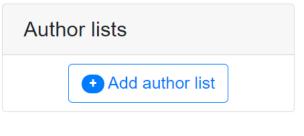
Create your own custom metric and apply it to a list of authors.

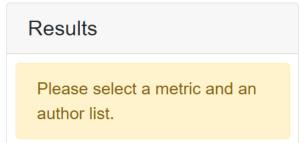
E.g. to rank a list of applicants.

Create your custom metric

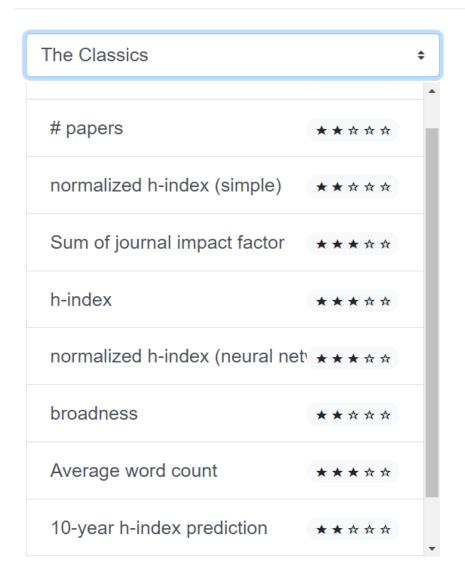
### **DIY Metrics**





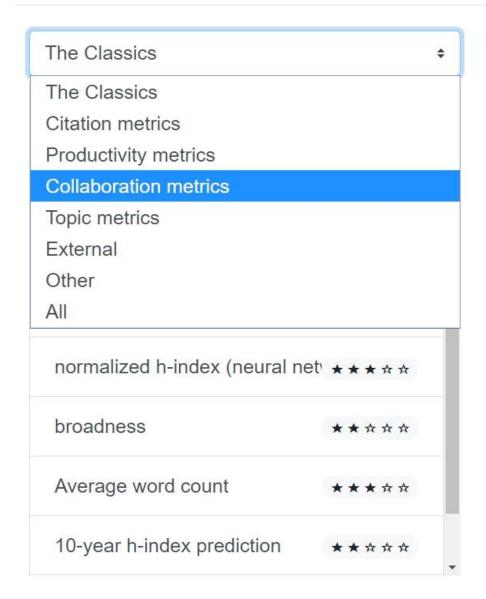


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#### Choose a metric



Please select a metric from the list.

Name	
Formula	
Blending mode	
	*
Description (optional)	

You can use the following **per-paper metrics** in the formula field by using their **alias** (left column):

date	publication date in years since 1990
	more
ncit	# citations more
naut	# authors more
jif	Journal impact factor more
pagerank	citation graph pagerank more

**nwords** # words more

The formula is evaluated for each paper and can contain the following **operations**:

a + b	sum of a and b
a - b	difference of a and b
a * b	product of a and b
a / <b>b</b>	quotient of a and b
ge(a, b)	1 if a >= b, 0 otherwise
le(a, b)	1 if a <= b, 0 otherwise
gt(a, b)	1 if a > b, 0 otherwise
lt(a, b)	1 if a < b, 0 otherwise
max(a, b)	maximum of a and b

### × Add author list List name Categories acc-phys adap-org alg-geom ao-sci astro-ph astro-ph.CO astro-ph.EP astro-ph.GA astro-ph.HE actro-nh IM Restrict to gender (optional)

density perturbations twin paradox low-energy effective action threefolds spontaneously broken gauged linear sigma model Calabi-Yau hypersurfaces phase diagram trans-Planckian four dimensions field theory conformal field theory fundamental string linear sigma model nonlinear sigma model complex structure moduli orbifold singularities string-inspired type II string theory expanding universe M-theory bounce inflaton field braneworld quantum geometry moduli fields power spectra worldvolume theory extra dimensions effective action dilaton Hilbert scheme de Sitter pp-wave compactification toroidal compactifications non-perturbative effects Kahler potential M2-branes heterotic string theory instanton corrections braneworld scenario Yukawa couplings superconformal theories fourfold inflaton type IIB string theory rational curves birational target space bulk fields string coupling Planck scale Chern classes superconformal field theories black hole solutions computational complexity primordial power spectrum dual description supergravity conformal theory Kahler moduli Hagedorn moduli stabilization string compactifications hypermultiplets inflationary cosmology background spacetime Calabi-Yau 3-folds orbifold flux vacua worldvolume cosmology compactified Yau threefolds "ahler toric Fayet-Iliopoulos magnetic charge eternal inflation inflationary scenario wrap field space p-branes Unruh fivebrane F-theory worldsheet Hodge numbers hypersurfaces 7-branes ped backreaction pp-wave background moduli baryogenesis mirror map heterotic stringy orientifold cyclic group warp factor winding modes super Yang-Mills horizon D-particle spacetime Ricci-flat Casimir energy string vacua Calabi-Yau spaces harvesting quotient singularities inflationary models gauge theory string states noncommutative geometry sigma model non-geometric Hagedorn temperature non-supersymmetric black hole low-energy limit Recently used Not recently used

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- 4. Paolo Salucci
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- 7. Matthieu Schaller

I have great difficulty getting funding for this project.

Any advice greatly appreciated.

## SCIMETER.ORG

Measuring science the right way. Your way.