376 The relationships between different scientific disciplines shown as a map... awesome detail, strangely beautiful [large image]

(seedmagazine.com)
submitted 1 year ago by naturenet
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sort by: **hot**

skoro777 1 point 7 months ago [-]

I agree that it's got serious problems with the overlapping text—I did the crazy typography, and you can read some of my misgivings on), but some have found meaning in the "clumpiness" of the structure, its circular shape (not the usual everything-to-everything hairball), and where things end up. (The rubber band links indicate shared paper references: I find it interesting that CNS and Brain research pull between medicine and the social sciences, with Mental Health even more directly between.) Pool sex

permalink reply

kboyack 2 points 1 year ago [-]

As one of the mapmakers, I'll add some context and attempt to answers some of the threads. The map shows the 800k papers that were most highly co-cited by papers published in 2003. So the map contains some very famous work: Watson/Crick, Einstein, etc. We call it a paradigm map because the clusters are the reference points in science upon which current science is being built. Math is not as prominent as might be expected because the culture in math is different than the culture in biochemistry - math papers have far fewer references, thus lower co-citation rates. Also, math is enabling, and is spread throughout the CS and engineering regions, especially where algorithms are used to solve engineering problems. Regarding analytic philosophy, it might have shown up had we included the arts/humanities literature in the map, but we didn't have those data. Also, regarding distances between different fields and paradigms, we all have different perceptions about what "should be", but when you consider taking 800k papers down to 700 clusters in two dimensions, the reduction says that something has to give - distances won't be exact. And yet, the ordering of, and linkages between paradigms and fields, while not exact, is meaningful and representative of how science works.

permalink reply

Megasphaera 3 points 1 year ago [-]

Interesting and very nicely laid out, but also pointless. Since when is "Central Nervous System" a discipline? Why is mathematics so small? Where is the connection between Molecular Biology/Genetics and Computer Science (aka bioinformatics)?

permalink reply

bushwakko 1 point 1 year ago [-]

I'm missing this link too. I'm an AI student and I'm currently working a lot with Genetic Algorithms which is not only inspiried but directly modeled on evolution. This does not only benifit CS, because evolutionary factors like learning and how learning actually brings a species biologically closer to what is learnable (at least what is learnable and beneficial), actually confirms evolutionary theories that are hard to prove/observe in nature. This and also that much of CS likes to use biologically plausible models in general would mean a stronger link between the two field imho.

The learning is called the Baldwin Effect: http://en.wikipedia.org/wiki/Baldwin_effect

permalink parent reply

wbpaley 0 points 1 year ago [-]

Megasphaera: by “pointless” do you mean that it doesn’t correspond to how *you* understand the world to be structured?

In fact the layout and the small labels are derived *directly and only* from the raw data of citations; only the large labels are pulled out by hand. Also, I’m not sure anyone ever promised that they labelled *diciplines* (I didn’t), they just describe the common focus of the nearby paradigms; the phrase we used is “general areas of scientific inquiry” in the description at Seed which was unfortunately deep-linked past.

I prefer bushwakko’s formulation “*I’m missing* this link” (italics mine), because at least he admits there might be something he doesn’t already know.

permalink parent reply

Megasphaera 2 points 1 year ago [-]

> by “pointless” do you mean that it doesn’t correspond to how you understand the world to be structured?

Uh, yes. I later read the Seed description, which is indeed much clearer. What it shows I think is not paradigms, but to a large degree where the research money goes. Evidently, more to Molecular Biology than to Mathematics (which may or may not be justified, I don't know). Still it's puzzling that bioinformatics is completely absent, where that field is really burgeoning.

> I’m not sure anyone ever promised that they labelled diciplines

taken from the headline.

permalink parent reply

wbpaley 1 point 1 year ago [-]

> > I'm not sure anyone ever promised that they labelled di[s]ciplines
>
> taken from the headline.

Fair, I missed that. We didn’t write the Reddit title, but you were reasonable in trying to use it.

> What it shows I think is not paradigms, but to a large degree where the research money goes.

The researchers involved (Kalvans at scimap.org and Boyack at Sandia National Labs) use “paradigm” in a jargon sort of way to mean, in this image at least, sets of scientific papers that have been cited together a lot by other papers (called a co-citation metric).

In fact, the size & number of nodes comes not from where the research money goes, but from how many & where scientific papers are published: circle area is preoportional to the number of papers in each paradigm; paradigms are split by heterogeneity among paper co-citation “fingerprints”.

The papers here are *every one* of the 800,000 or so papers in the Thompson ISI research paper database for 2003, so it should err towards paradigms that publish more papers per capita or per idea. It may be true that mathemeticians publish less as a group; I know I’ve heard that observation about Computer Science papers versus Boiology papers.

Also:

> Where is the connection between Molecular Biology/Genetics and Computer Science (aka bioinformatics)?

There is a minimum threshold beneath which links are ignored. (Links show which paradigms cite the same papers.) So if CS and Genetics folks only share a few base reference papers, that link might not have been strong enough to make the cut. Without doing that link pruning, this network ends up looking like the usual *completely* unreadable and undrawable everything-to-everything hairball.

permalink **parent** **reply**

jnrosemas 3 points 1 year ago [-]

commence rasturbation procedure...

permalink **reply**

sam512 3 points 1 year ago [-]

Downvoters: He's referring to this, a tool for taking detailed images and blowing them to enormous sizes.

permalink **parent** **reply**

jotaroh 13 points 1 year ago [-]

where is creationism?

permalink **reply**

Codebender 26 points 1 year ago [-]

Don't be silly, Creationism isn't science, you're thinking of Intelligent Design. It's on the back.

permalink **parent** **reply**

bruiser 24 points 1 year ago [-]

Truly amazing piece of work. Full explanation here. And you can buy a poster of it (I did!).

permalink **reply**

vdoma 8 points 1 year ago [-]

sorry, it just seems so meaningless to me. there are so many overlapping lines and text, can't make out head or tail from it.

permalink **parent** **reply**

wbpaley 12 points 1 year ago [-]

I agree that it’s got serious problems with the overlapping text—I did the crazy typography, and you can read some of my misgivings on), but some have found meaning in the “clumpiness” of the structure, its circular shape (not the usual everything-to-everything hairball), and where things end up. (The rubber band links indicate shared paper references: I find it interesting that CNS and Brain research pull between medicine and the social sciences, with Mental Health even more directly between.)

permalink parent reply

bruiser 4 points 1 year ago [-]

Great job on the type. The font used for the large discipline descriptions is delicious, and tantalizingly familiar. What is it?

[edit] Got it: Myriad Pro Light Italic. Or is it the Semi Light Italic?

permalink parent reply

wbpaley 6 points 1 year ago [-]

Yes (I think I read you) Myriad Pro Light Semi-Extended Italic. That whole Myriad Pro typeface family is remarkable—amazing expressive range; cured me of an over-reliance on serif faces: clean, but with the character and humanity I thought only came with serifs; graceful, yet strong. So sad gifted co-designer Carol Twombly (also of *Trajan* fame) has stopped designing type. It’s what gives this calendar its air.

Hey, how do you develop such a sensitive eye with a handle like *Bruiser*?

permalink parent reply

bruiser 3 points 1 year ago [-]

"What's in a name? That which we call a rose..."

Truth is, I've loved type since I was a kid. I go shopping for fonts at the online foundries like some people go shopping for music at the iTunes Music Store.

Your use of the word 'expressive' exactly sums up the feeling I get when I look at the word 'Physics' for example, in that Light Semi Italic. And the word 'Applied' is so beautiful I almost want to accuse it of showing off.

permalink parent reply

truedoughca 5 points 1 year ago [-]

I was wondering why math was such a small cluster relative to the others, but it makes more sense now. One thing still confuses me. According to the explanation, "flowing labels list common words unique to each paradigm, large labels general areas of scientific inquiry." What does that light line of text coming from math say? Something about sputtering and glasses? These are the most common words unique to mathmematicians?

permalink parent reply

cgibbard 3 points 1 year ago [-]

I don't think the papers which they used were usual mathematics fare. Most likely they were sporadic applied mathematics papers published in science journals. The words were probably chosen algorithmically, and some paper classified under Math happened to use the word "glasses" quite a lot relative to papers published in all the other disciplines.

permalink parent reply

hsfrey 2 points 1 year ago [-]

It has something to do with an optimization technique called "simulated annealing", where the criteria are tightened with successive iterations, similar to annealing glass.

permalink parent reply

morner 4 points 1 year ago [-]

Hah, I used a very similar method to generate maps of social networks. It's a brilliant technique, and results in reasonably pretty pictures. You can see one of the earlier results from my program at deviantART, which is also where I collected my data.

Edit: I just uploaded a newer render, which looks a lot nicer

permalink parent reply

IKbot 18 points 1 year ago [-]

Science: it works, bitches.

permalink reply

truedoughca 13 points 1 year ago [-]

XKCD's masterpiece would probably hang nicely next to this one.

permalink parent reply

NewSc2 5 points 1 year ago [-]

Biochemistry and Organic Chemistry seems like they should be closer than what the poster shows.

permalink reply

wbpaley 5 points 1 year ago [-]

This is astute, and one of the more interesting findings to come from the representation. Turns out Organic Chemistry is largely basic science—people discussing formal scientific issues amongst themselves, not applications. While Biochem is *all about* applications—largely to medicine as you can see by the placement; but having some shared basis with (links to) Ecology and Biology. The very big cyan node just above the "An" in Analytical Chemistry (labelled “quantitative proteomics” among other things) is a key group of people taking the O-Chem work and translating it for use in the “real world.”

permalink parent reply

master_gopher 3 points 1 year ago [-]

Has anyone already got the poster? How does it look? I'm thinking of getting one, but isn't the small text be almost unreadable at that size?

permalink reply

wbpaley 6 points 1 year ago [-]

I have one (actually, started with a couple thousand... ;) and can report that it was designed so that the smallest type is about the same size as the small type on the back of credit cards: about 4 pt. You’re right: *almost* unreadable, up to comfortable but small: the only way to pack so much information into so little space.

Here's where you get them (for *free*, BTW, but so we don’t lose our shirts you pay shipping and handling). Hope you like it!

permalink parent reply

master_gopher 2 points 1 year ago [-]

Thanks, I may get one.

permalink parent reply

austinb 2 points 1 year ago [-]

Interesting stuff, article page on Seed:

> This map was constructed by sorting roughly 800,000 published papers into 776 different scientific paradigms ... based on how often the papers were cited together by authors of other papers.

permalink reply

dbenhur 4 points 1 year ago [-]

Tsk. They seem to have left out the important fields of aetherometry, culinary science, cryptozoology, creation science, political science, and scientology!

permalink reply

spike2131 2 points 1 year ago [-]

And economics.

permalink **parent** **reply**

ZanThrax 9 points 1 year ago [-]

Well, they included social science, so don't feel too bad.

permalink **parent** **reply**

alaskamiller 0 points 1 year ago [-]

Looks like a Flying Spaghetti Monster. Hmm..

permalink **reply**

wbpaley 1 point 1 year ago [-]

Yeah, that’s it’s major flaw in my opinion.

While this feather-boa—or spaghetti, I like that—label layout algorithm packs in a lot of words, and lets the type itself point to the nodes being labeled, it’s at an early stage of development and looks *much* too organic.

Better than straight lines in my opinion, because the practice of science *is* an organic process and the representation should convey that. It’s just that the shapes of those curves call too much attention to themselves, and aren’t directly driven by any data (only indirectly by node placement, available space, & the hairy algorithm).

I’m inching towards the supple and subtle curves of text used for hundreds of years to label geographic features in maps, like labels following along rivers or mountain ranges (that sadly we’ve mostly lost in this age of GIS).

Work in progress: wait ’til next year... ;)

permalink **parent** **reply**

NewSc2 -2 points 1 year ago [-]

Biochemistry and Organic Chemistry seems like they should be closer than what the poster shows.

permalink **reply**

sorbix -3 points 1 year ago [-]

Analytic Philosophy could have been in the middle... it's as much of a scientific endeavor as math, and would link pretty much the entire left side of that map.

permalink **reply**

mhartl *comment score below threshold* [+] (1 child)