The Twilight Zone, “Time Enough at Last”

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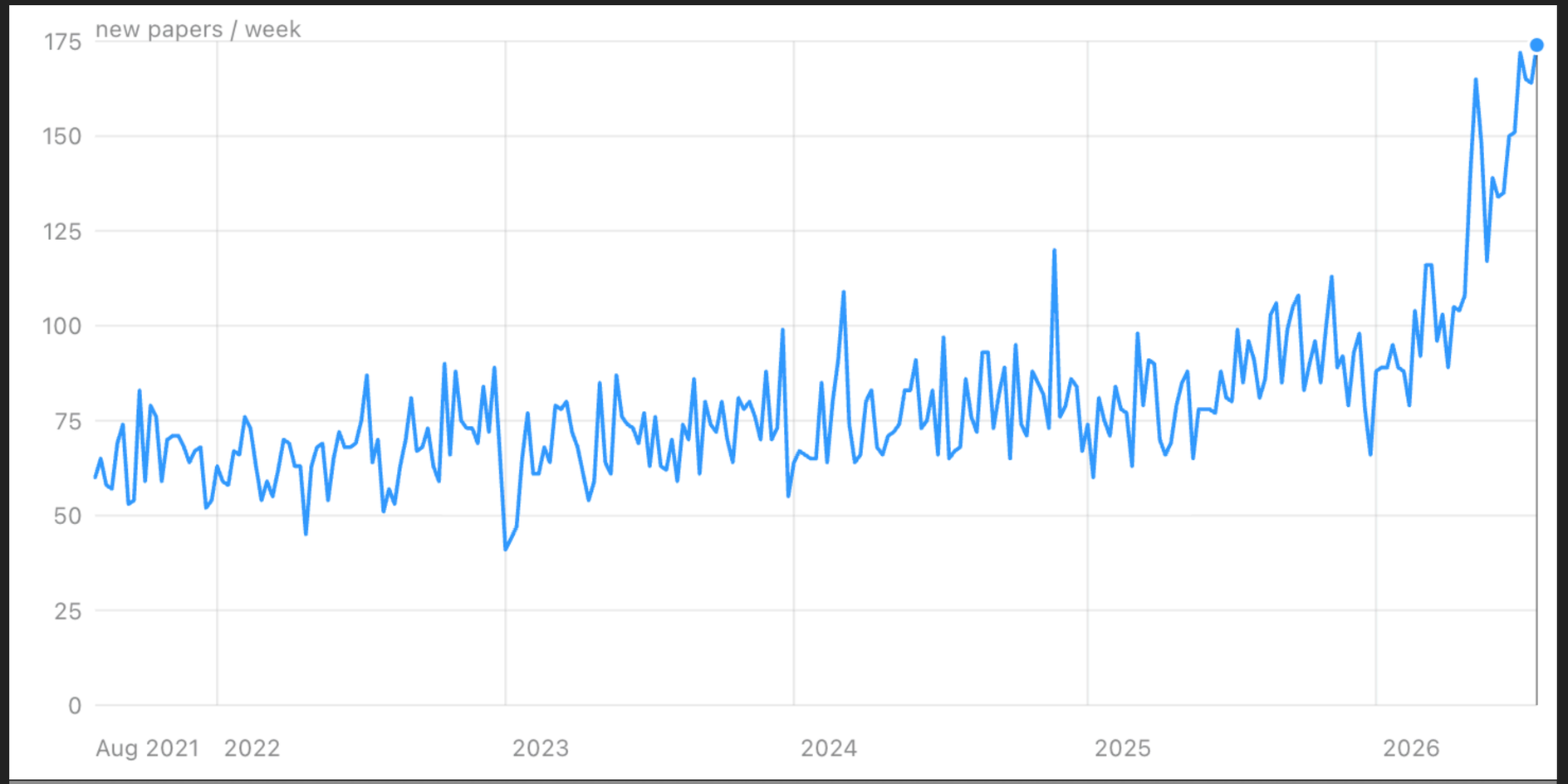
THE END OF MATHEMATICS

THE WORST-CASE SCENARIO

- What is the future of math research?
- Goal: tell a story in which math progress stalls despite robustly superhuman mathematical AI
- Not a prediction—I expect we'll avoid this future—but I think the risks I'll outline are real

…Surely, surely, slumber is more sweet than toil, the shore
Than labour in the deep mid-ocean, wind and wave and oar;
O, rest ye, brother mariners, we will not wander more.
—*The Lotos-Eaters,* Alfred, Lord Tennyson

2026: THE GOLDEN AGE?



New papers per week, math.CO (most other areas show increases, but less dramatic)

2026: THE GOLDEN AGE?

- Missing graph: number of papers read
- How much of the surplus is correct/interesting?
- But:

We present a collection of results obtained by an internal OpenAI model, spanning mathematics and theoretical computer science:

1. **High-dimensional sphere packing.** The asymptotic strength of the Cohn–Elkies linear program is determined exactly. This gives an improved general packing bound in high dimensions and settles the corresponding Fourier sign-uncertainty problem asymptotically.
2. **Binary and spherical codes.** Classical upper bounds for fixed-distance binary and spherical codes are improved by exponential factors for all parameters. The spherical construction also recovers the sphere-packing exponent of Chapter 1.
3. **Non-sofic groups.** An explicit non-sofic group is constructed, resolving the question of whether every countable group admits finite permutation approximations. The argument uses property-(T) expanders and the binary Leavitt algebra.
4. **Connes's rigidity conjecture.** Infinitely many pairwise nonisomorphic property-(T) groups are constructed with the same group von Neumann algebra, disproving Connes's conjecture and answering a related finite-to-one question of Popa.
5. **Arithmetic circuit complexity.** For the permanent, division-free circuits require $\Omega(n^2 \log\log n)$ gates, while formulas require $\Omega(n^4/\log n)$ leaves.
6. **Quantum parallel repetition.** Exponential parallel repetition is proved for every finite two-player entangled game, extending the classical repetition principle beyond previously treated special classes of quantum games.
7. **Closest vector problem.** A direct reduction from 3SAT gives $n^{1/400}$-factor hardness for the Euclidean closest vector problem, with related consequences for binary decoding and other lattice norms.
8. **Ehrhart's volume conjecture.** The sharp bound $(n+1)^n/n!$ is proved in every dimension for convex bodies whose barycenter is their only interior lattice point.
9. **Multicolor Ramsey numbers.** A superexponential lower bound proves $R_k(3) = k^{\Theta(k)}$.
10. **Compactness and degeneracy.** Separate bipartite graph constructions disprove two conjectures in extremal graph theory: the compactness conjecture of Erdős and Simonovits and a degeneracy conjecture of Erdős.

REMARKS ON THE DISPROOF OF THE UNIT DISTANCE CONJECTURE

NOGA ALON, THOMAS F. BLOOM, W. T. GOWERS, DANIEL LITT, WILL SAWIN, ARUL SHANKAR, JACOB TSIMERMAN, VICTOR WANG, AND MELANIE MATCHETT WOOD

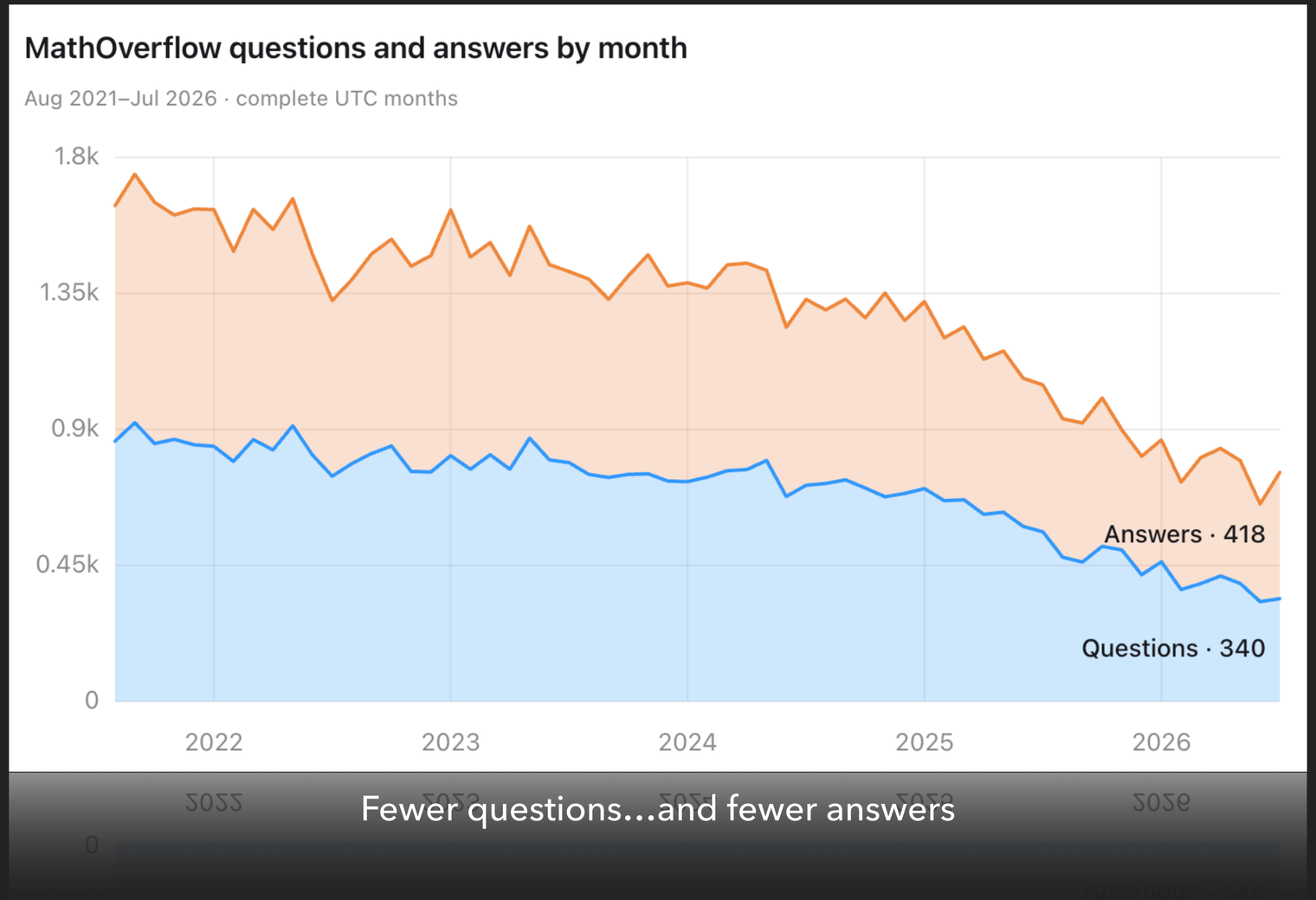
ABSTRACT. We present a short, digested, human-verified version of the recent OpenAI-generated counterexample to the Erdős unit distance conjecture, and a sequence of reflections on it. The argument relies crucially on ideas that may, at least in retrospect, be attributed to Ellenberg-Venkatesh, Golod-Shafarevich, and Hajir-Maire-Ramakrishna.

levent ✓
@__alpoge__

hello there the jacobian conjecture is false thanx to my close friend akhil for asking about it and my other close friend fable for working during the world cup final

((1+xy)^3 z + y^2 (1+xy) (4+3xy), y + 3 x (1+xy)^2 z + 3 x y^2 (4+3xy), 2 x - 3 x^2 y - x^3 z): \C^3\to \C^3, has jacobian determinant -2, and sends (0, 0, -1/4), (1, -3/2, 13/2), and (-1, 3/2, 13/2) to (-1/4, 0, 0)

2026: THE GOLDEN AGE?



Fewer questions…and fewer answers

SOMETHING STRANGE STARTS TO HAPPEN

A CONDITIONAL PROOF OF FEIGE'S CONJECTURE WITH A SHARP FINITE-DIMENSIONAL BOUND

MARK STANDER

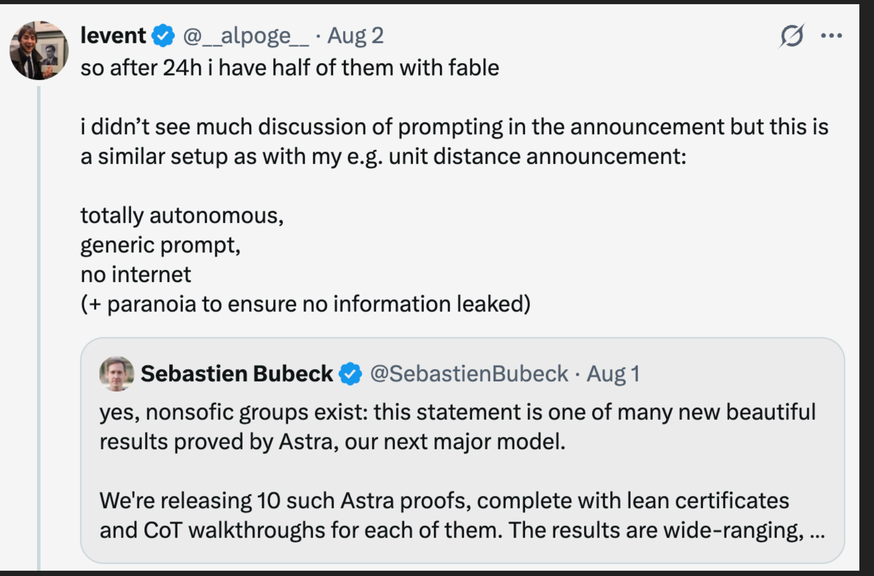
ABSTRACT. We record a short conditional consequence of a recent preprint of Vlassis and Thomas. Their Theorem 1 asserts that a Dirichlet-weighted statistic is a finite-sample, distribution-free super-uniform p-value for independent nonnegative random variables whose coordinatewise means are at most one. Assuming that result, we prove

$$\mathbb{P}\left\{\sum_{i=1}^{n} X_i < \sum_{i=1}^{n} \mathbb{E}X_i + 1\right\} \geq \left(\frac{n}{n+1}\right)^n > e^{-1}.$$

On Feige's conjecture

Zipei Nie, Jiaye Wei

We present a short proof of Feige's conjecture: for n independent nonnegative random variables with expectation one, the probability that their sum is less than $n + 1$ is at least $\left(\frac{n}{n+1}\right)^n \geq \frac{1}{e}$. The proof was obtained with the assistance of GPT-5.6 Sol and builds on the recent breakthrough of Vlassis and Thomas establishing Gaffke's conjecture on the finite-sample validity of a distribution-free p-value. We also discuss the implications of the subsequent work of Ming, Ramdas, Shen, Wang, and Waudby-Smith.



[Submitted on 27 Jul 2026]

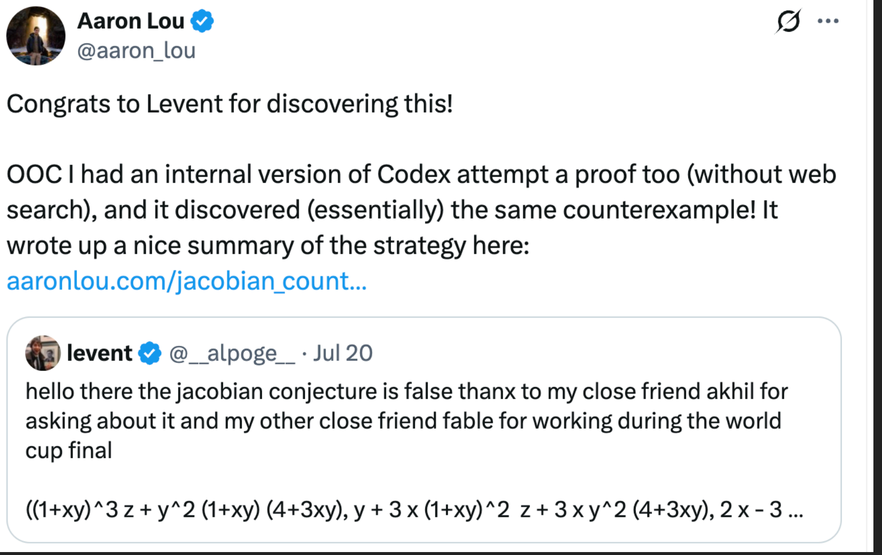
Sharp small-deviation inequalities for sums of independent nonnegative random variables

Weibo Fu, Yanjun Han, Guanyang Wang, Jun Yan, Peng Zhang, Zhengqing Zhou

Let $(X_1, \dots, X_n)$ be independent nonnegative random variables with $\mathbb{E}X_i \leq 1$, and write $S = \sum_i X_i$. For $\delta > 0$, we prove that

$$\mathbb{P}(S < \mathbb{E}S + \delta) \geq b_{n,\delta},$$

where $b_{n,\delta} = \delta(n/(n+\delta))^n$ for $0 < \delta < 1$ and $b_{n,\delta} = (1 - 1/(n+\delta))^n$ for $\delta \geq 1$. The bound is sharp for every n and $\delta \geq 1$. In particular, since $b_{n,\delta} \geq e^{-1}$ for $\delta \geq 1$, our result proves Feige's conjecture [Feige, 2004] in the affirmative for $\delta \geq 1$.
The proof is found by ChatGPT 5.6 Pro. It combines the exact Dirichlet calibration theorem of Vlassis and Thomas [Vlassis and Thomas, 2026], which resolves Gaffke's conjecture in statistics, with results in convex geometry including Grünbaum's centroid theorem [Grünbaum, 1960] and its generalization by Letwin and Yaskin [Letwin and Yaskin, 2024].



What's the marginal value of work someone else can do next week?

2027

- The profession continues to reward proxies for understanding:
  - The production of papers, and
  - Proving theorems/resolving conjectures

I'd like you to spin off 5 sub-agents to each do the following. Go online and search for an interesting open question in algebraic geometry. My suggestion is for each agent to search for papers containing a number of questions or conjectures, and to try to resolve one. (Here "interesting" means a solution would be publishable in a reputable journal.) Then solve the problem and write the solution in a TeX file. The TeX file should take the form of a high-quality paper, including background, context, relevant references, and a complete proof.

Comments: 5 pages. AI generated, human verified

What happens when one can automatically reconstruct a paper given a few key ideas?

"Last mile" mathematics $\Longrightarrow$ secrecy

2028

- The autoformalization flywheel comes online
- We rapidly start to sort out what's right and what's not
- LLMs can reliably check statements and definitions are formalized faithfully
- But: expensive to check *arguments* are formalized faithfully
- The statements can be trusted. Can the ideas?

SOLVED (LEAN)

Let $f(m)$ be such that if $A \subseteq \{1, \ldots, N\}$ has $|A| = m$ then every interval in $[1, \infty)$ of length $2N$ contains $\geq f(m)$ many distinct integers $b_1, \ldots, b_r$ where each b_i is divisible by some $a_i \in A$, where $a_1, \ldots, a_r$ are distinct.

Estimate $f(m)$. In particular is it true that $f(m) \leq \sqrt{m}$?

#650: [Er95c,p.5] number theory

CHAPTER 3

A Counterexample to the Soficity Conjecture

ABSTRACT. A countable group is sofic if finite pieces of its multiplication table can be faithfully approximated by permutations of finite sets. We prove that the unit group $L_{\mathbb{F}_2}(1,2)^\times$ of the binary Leavitt algebra is not sofic, disproving the soficity conjecture. The proof starts from Kun's expander decomposition for property-(T) groups and the Kun–Thom centralizer obstruction. A general expander-matching argument recovers a single expanding component from a union of expanders. Elementary groups over the Leavitt algebra then force Thompson's group V to be locally embeddable into finite groups, a contradiction.

A COUNTRY OF GENIUSES IN A DATACENTER, IF YOU CAN KEEP IT

- The production of papers is automated.
- Agents are theory-building, conjecturing, etc.
- Human mathematicians continue tokenmaxxing, (or more charitably, directing resources towards questions they find interesting). Math is a “lab science without labs.”
- Who is consuming what is generated?
- How is the next generation trained?

THE LONG TERM

RISKS

- Losing contact with the mathematics
- Loss of diversity of thought (all mathematicians using the same tools)
- Failing to train young mathematicians (in both expertise and values)
- Losing social/institutional structure of mathematics, trust
- Outdated incentives reshaping the composition of the profession

PATHOLOGIES OF THE PROFESSION

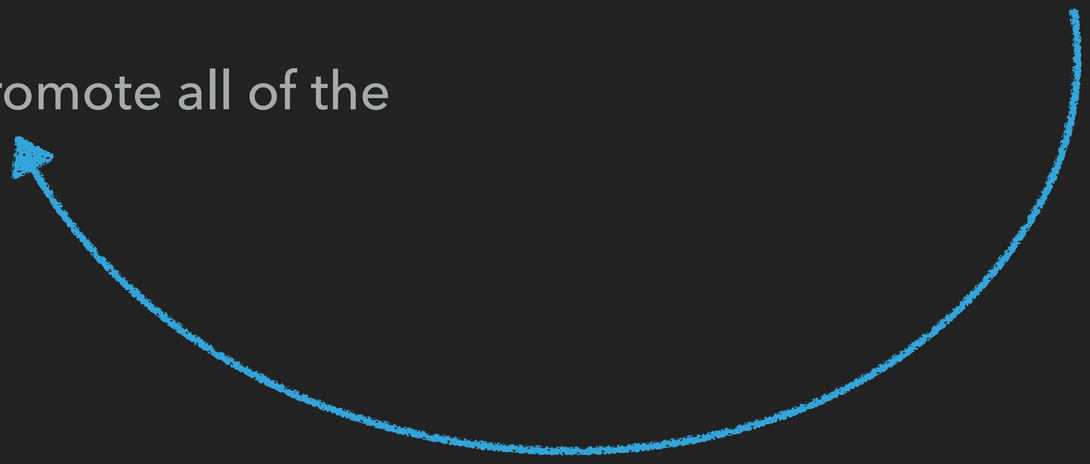
- Metrics, proxies, and goodharting
- Superficial engagement with material
- Competitiveness, ego, fear of being scooped
- Incorrect or low quality work
- Training and mentorship insufficiently rewarded

GOALS OF THE PROFESSION

- High quality science
- Development of human capital
- Development of human understanding
- Promotion of mathematical thinking/clarity of thought
- Institutional structure to promote all of the above

GOALS OF MATHEMATICIANS

- Fun
- Prestige, good jobs, etc.
- Understanding mathematics, learning, solving problems
- Social aspects of mathematics



How do we redesign our institutions to incentivize high quality science and production of human capital?

Which of our functions/values are robust to very capable AI?