AI4REASON:
Artificial Intelligence for Large-Scale Computer-Assisted Reasoning

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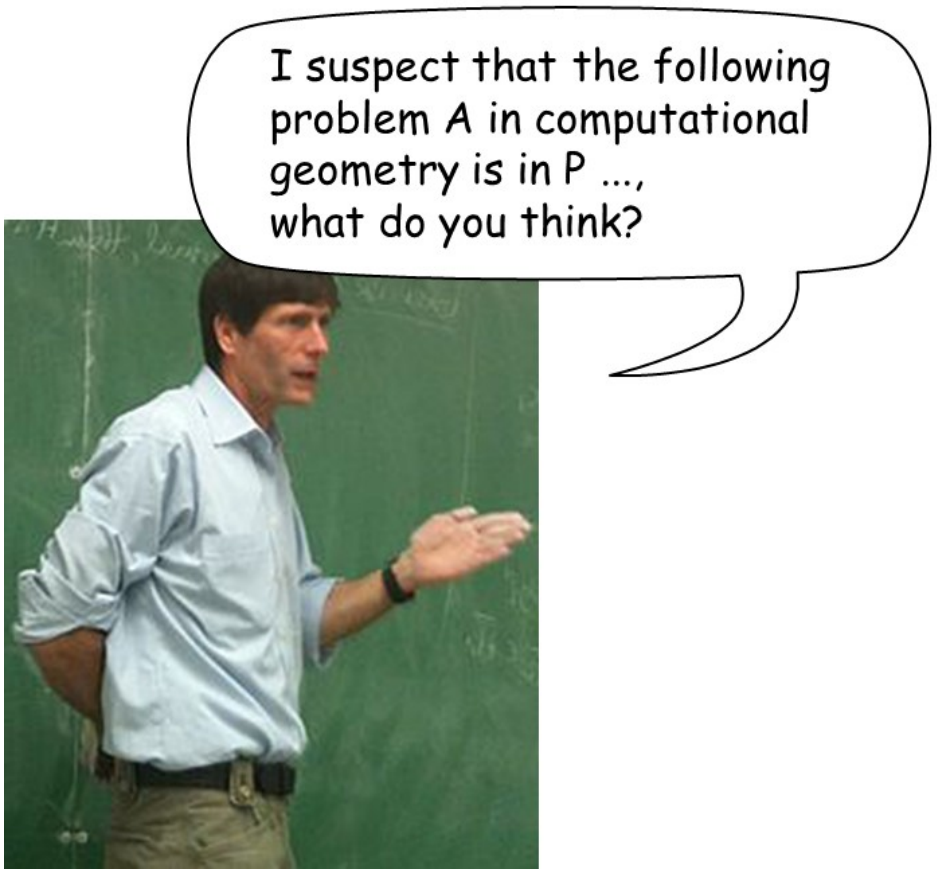
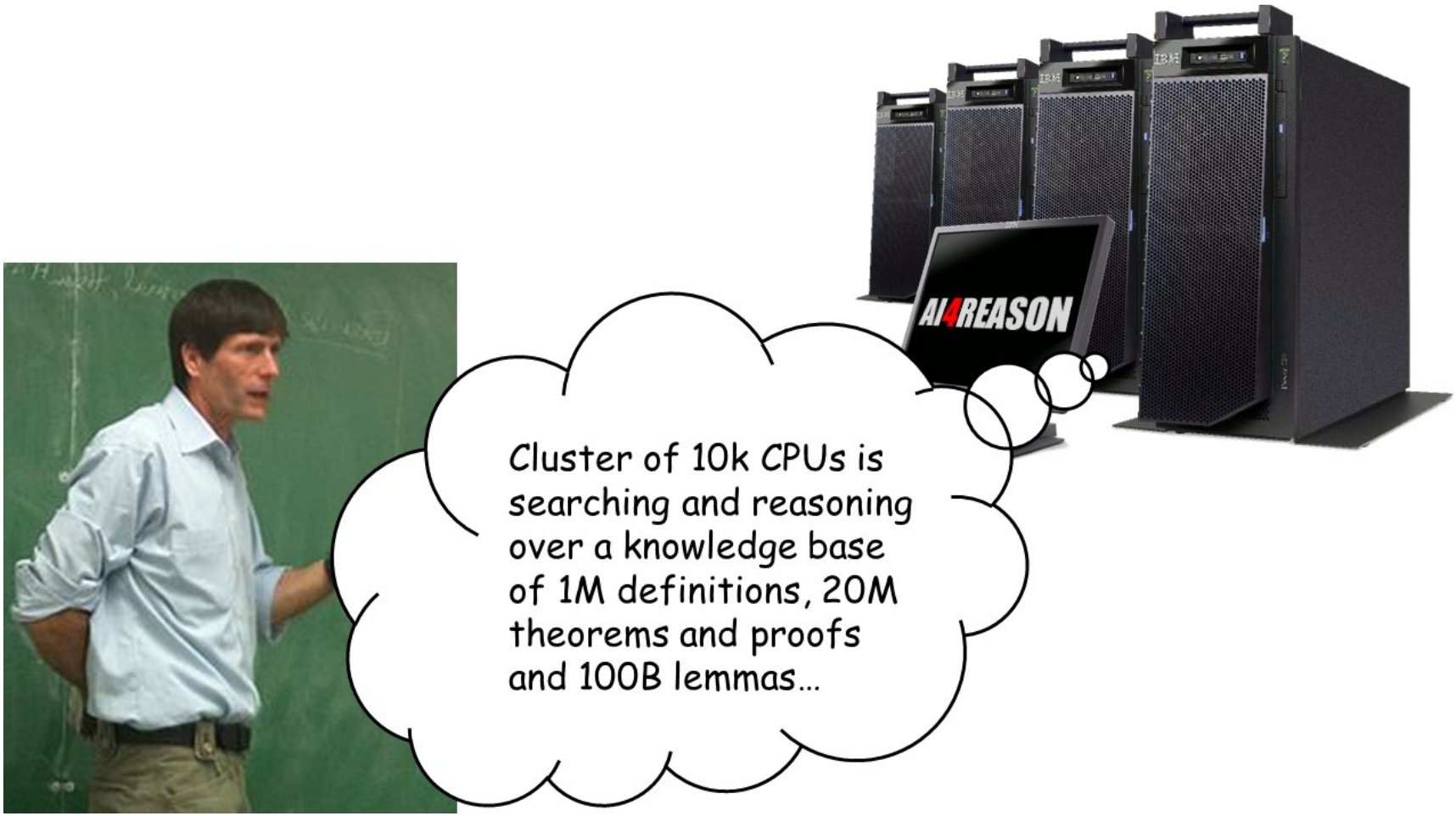
Not So Distant Future



Not So Distant Future



Not So Distant Future

Indeed, it is similar to a less known problem B number 13501 in my knowledge base. We can use a similar polynomial reduction to planar graphs as in B, and for the resulting constraint-solving problem we use a modified version Y of the $O(n^9)$ algorithm X published last year in Proc. of Indian Conf. on Graph Theory.

Not So Distant Future

Btw., A, B and X, Y generalize to a far-reaching conjecture that could solve a long-standing open problem.

Let's write an ERC proposal about exploring them!

How Distant?

- 15 - 50 years, depending on our efforts
- Today's numbers about 100x smaller:
  - 10k-30k computer-understandable definitions
  - 200k-300k (small) theorems and proofs
  - 1B-10B primitive lemmas
- Covers roughly the Bc level in Math/CS, PhD level still far

- The main bottleneck:

WEAK AUTOMATION OF REASONING
OVER LARGE COMPUTER-UNDERSTANDABLE CORPORA

- This is where a breakthrough is necessary

What Is Needed: The AI4REASON Plan of Attack

WP1 AI for finding relevant knowledge in large formal corpora:

- How to capture similarity and analogy of ideas?
- How to learn from proofs, counter-examples and theories?

WP2 AI-based guiding methods for reasoning tools:

- How to efficiently apply the learned guidance?
- How to automatically learn the best reasoning strategies?

WP3 AI for suggesting plausible conjectures and concepts:

- What makes a good conjecture for a given problem?
- What concepts are good for a given problem?

WP4 Self-improving AI interleaving learning and deduction:

- How to explore easier problems to learn for harder ones?
- How to develop theories and gain most useful knowledge?

WP5 Deployment and Cross-Corpora Reuse:

- Deploy the methods as strong online services
- Develop AI methods for aligning different corpora

My ERC Application

- Decide when to apply – is this your last year? Is your track record strong enough?
- Decide on the title, summary and panel – what reviewers do you want?
- My boss advised me against combined reviewing (involving mathematicians together with CS people)
- CV and track record – try to explain unusual things (career breaks, citation/publication metrics in your field, etc.)
- Prizes in competitions, awards, invited talks, quotes about you by famous people, etc.

ERC Application - writing and testing

- At least 1 month, you need to think about it earlier
- Advertise your institute, the team, etc.
- Ask your institute to make you good offers and advertise that in the proposal/interview
- Be honest about the risks, make a balanced program of more and less risky work packages, think about the mitigating factors
- Defend against possible criticism: use authorities who agree with you or cite you, explain why the critics are wrong
- Give it to all your (friendly) colleagues for proof reading and strengthening
- Make as many test talks as possible, iterate, ask for the most unpleasant questions from the audience
- The budget should not be artificially low, but your team should not be bigger than what you can handle

ERC Application - Groundbreaking?

- Don't overuse such words, but do it if you have a point
- If there are no "groundbreaking" aspects in part B1, you have a problem
- The second-stage reviewers (experts) are your friends (or should be)
- Highlite the main goals and the main ideas
- A friend of mine had "solid engineering" as his greatest strength – don't do it (he changed it)
- Watch for "incremental" research in the proposal

ERC Application - interview

- I took a short vacation to write the slides and prepare the talk
- Use pictures, make (part of) it generally understandable
- It is only 10 minutes - you can learn it by heart in a couple of hours
- It will help you to strengthen it and think of questions and replies
- At the interview be friendly, think on your feet, give interesting answers – some committee members will make an impression only from the interview

Experience in Czech republic (1 year)

- The Good
- The Bad
- The Ugly

Experience in Czech republic (1 year) – the Good

- good support from the new CIIRC team headed by V. Marik
- financial/personal/travel/equipment administrators almost comparable to NL
- very active CIIRC support for new large projects, etc.
- not everything works perfectly, but people are seriously trying to make things work
- great support from EURAXESS - Zuzana Dobesova - getting work visa for non-EU foreigners
- More good things:
  - We have managed to employ Chad Brown – world's top expert in higher-order theorem proving
  - Several extended (1 month) visits of senior and junior researchers to our group (4 people so far)
  - Many short visits and seminar talks
  - Good collaboration world-wide, a new AITP conference, a new group at Google Research
  - ....

Experience in Czech republic (1 year) – the Bad

- Bureaucracy – conference and research travel, rigid salary rules, strange internal rules about employement, public tender needed to buy a notebook!
- I am probably breaking some strange laws when paying per diem to foreign visitors
- ERC should impose minimal salaries of PIs in each EU country (like in Marie Curie grants)
- Unbelievable “scientific” system of scientific evaluation: “Jachyme, hod ho do stroje”
- How did Thomson Reuters with its mediocre products manage to impose monopoly in this country??
- no Czech financial/tax support for attracting “knowledge workers” (compare with NL, DK, etc.)

Experience in Czech republic (1 year) – the Ugly

- Why are we not speaking in English here today??? Are there no foreigners working in Czech science?
- Can we get a bit more relaxed in science here? (Friday happy hour with beer in NL/UK, sofas, table-tennis, lots of other perks for researchers at Google, ...)
- After 6 years in NL, I cannot bike in Prague without being killed by careless drivers. Do we all need to commute by car more than a 70-year old Dutch professor biking to work every day?

Thanks for Listening!

Questions?