The Theoria Challenge

Some say that theoretical physics will end in fire, some say in ice. The most recent result in high-energy theory to win a Nobel Prize dates back 50 years. The stark contrast between this stagnation and the rapid technological advancement during the same period is staggering.

Are we at the precipice of AI automating our efforts, surpassing our capabilities, and finding that elusive theory of everything? Or is our goal misplaced: is there even an underlying simpler explanation to the fundamental laws of nature or is that compression that we seek an artifact of our own limitations?

Those who spend their lives studying fundamental physics believe that there is something beautifully simple and surprising about the mathematical structure that describes the natural world. We look for breakthroughs that compress our understanding of phenomena across unfathomable scales. We know that it's not just about finding true statements but understanding the web of dualities that hint at simpler underlying principles, about understanding what assumptions are consistent and what branches can be ruled out with experiment.

Until we have data to test our theories, our canon is our data set. We see that recent developments in technology are poised to be incredibly helpful in accelerating our efforts. And so the question is: will industry efforts be enough?

With all the money going into AI research and all the times that 'solving physics' appears as a milestone toward AGI, many of us are scared that there is a basic flaw in this approach: that the aspect of compressing our theoretical understanding is missing in these efforts and will be a barrier to the optimistic timelines we are being told.

AI4Math has advanced more than AI4Theory for a variety of reasons, in particular, a longer history of formalization, strong community efforts, and more extensive benchmarks. Physicists can start building benchmarks and collaborate on small-scale research projects with industry players but is there a way we can help set the goals?

In a world where the people who could help us most think that they don't need us, what can we do to get both sides on the right track? Why not make a bet.

The premise is simple: bring the top minds in AI and physics together with the movers and shakers leading the AI revolution to determine a set of challenge problems, prize amounts, and deadlines. Whoever solves a challenge problem by its deadline gets its portion of the prize pool. If no one does, those funds go back to endow the field. It's a win-win that will push science, keep the hype in check, and give a way to fund blue sky theoretical physics not through the breakthroughs we can promise for next century, but through the engineering challenges we face today.

Sabrina, Project Theoria

