AI claims to solve 167-year-old maths mystery

TECHNOLOGY
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A mathematician who works for artificial intelligence giant Anthropic claims he has solved a Holy Grail of maths problems with the help of the company's AI tool Claude.

It marks the second time in recent months that an AI company or someone linked to one claims to have cracked a famed unsolved mathematics problem.

Levent Alpöge, a member of the company's technical staff, made the announcement by way of a four-page explanation posted on his website. He said that he believes by working with Claude, he has found a proof of the Riemann Hypothesis.

"Claude and I have had a great time together with such breadth in recent months, but this time Claude far outpaced me near the finish line," Alpöge wrote. "No, Claude flew, and danced, and sparkled near that finish line."

Formulated in 1859, the Riemann Hypothesis centres on the distribution of prime numbers – those that are only divisible by one and themselves – as they grow towards infinity.

Alpöge said his discovery came late one night. He messaged Anthropic CEO Dario Amodei to ask about "my ability to announce," as the San Francisco-based company was about to make major news with its stock market debut.

A day after the company's initial public offering – the most valuable in history – Alpöge revealed he'd solved the problem that has proved elusive for more than 150 years. Anthropic did not respond to an email from The Associated Press requesting comment on Alpöge's claim.

Alpöge released his and Claude's proof of the Riemann Hypothesis within 17 million lines of Lean code, a programming language that allows people to program proofs of mathematical theorems. Traditionally, the findings buried in that code would be published in a formal paper, said Alex Kontorovich, distinguished professor and department chair of mathematics at Rutgers University.



Mathematician Levent Alpöge.
Photo: Getty Images

"Usually when somebody gives you a paper, that's also kind of code for a proof and you have to actually read the paper, follow it yourself, figure out if you believe every single line in that paper. And when you're done, you should have a deep understanding of why something is true," he said.

He said Claude followed that code and said the proof is true.

"Does that mean I understand it? Not yet. But the computer is extraordinarily picky, way pickier than I am and so if you can satisfy the computer, there's a very, very good chance you're going to satisfy me too," he said. "But I have to do the work."

Hours after the announcement, the Riemann Hypothesis remained listed as unsolved on the Clay Mathematics Institute's website. The institute had selected the hypothesis back in 2000 as one of seven Millennium Prize Problems and offered a reward of $US1 million ($1.5 million) for the solution.

The assessment process of whether the problem has actually been solved takes time, explained Martin Bridson, president of the institute.

"This is an announcement of historic significance, which holds the promise of a dramatic transformation in the perception of what is possible in the struggle to extend the human understanding of mathematics," he said in a statement. "But the journey from today's announcement to a place of real understanding will be long and difficult."

Alpöge said he is "presenting the world with a complete argument before having mastered a massive neighbourhood around its mathematics." He said more than 250,000 pages came out of his work with AI.

In September, OpenAI said its technology was key in a similar breakthrough with Navier-Stokes, an equation that governs the flow of fluids.

"Navier-Stokes fell and now the Riemann Hypothesis," said Kontorovich. "There's some kind of out-of-body experience where I'm looking at myself saying, 'Yes, the Riemann Hypothesis has been solved,' and kind of trying to comprehend what the hell these words are coming out of my mouth."

Anthropic made a blockbuster Wall Street debut this week, through which it raised a record-breaking $US81 billion at a $US1.5 trillion valuation.

Amodei has projected an optimistic vision for AI's future in which the technology leads to significant advancements in math and science research while simultaneously warning about the potential risks AI poses.

AP