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Autor: Wenger, Susanne
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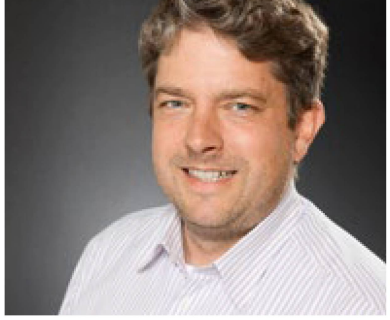
Swiss scientists calculate the most exact pi number ever

The University of Applied Sciences of Grisons made global headlines by calculating pi to 62.8 trillion decimal places – a new world record. The scientists behind this result were simply testing the performance of their supercomputer for the purpose of beneficial research.

SUSANNE WENGER

The team of Swiss scientists led by computer science professor Heiko Rölke at the University of Applied Sciences of Grisons (FHGR), clinched the world record early on a Saturday morning last August. They had managed to calculate pi to 62.8 trillion decimal places, surpassing the previous record set by the American Timothy Mullican in 2020 by 12.8 trillion decimal places. Their calculation was three times faster, taking 108 days and nine hours. Mullican needed 303 days for his 50 trillion decimal places.

According to the professor, reaction to the new world record has been "overwhelming". Rölke, who heads the recently established Centre for Data Analysis, Visualisation and Simulation in Chur, admits he was hoping the record attempt would generate a certain amount of PR. However, media inquiries came flooding in not only from within Switzerland but from all over the world. From prestigious newspapers, to major television channels and professional journals – everyone wanted to report on the world record. "The funniest bit was speaking live on South African radio," he says. "We talked a bit about pi."



The record-breaking calculation was more than just a fun challenge for Heiko Rölke. Photo: provided.

A fascinating number

π, spelled out as "pi" and named after the 16th letter of the Greek alphabet, is a number many of us remember from school. It is the ratio between a circle's

Main picture: the first 12,970 digits of Pi. That should be precise enough for most applications.

circumference and its diameter. We use pi to calculate the size of any circle, large or small. You may even recall its first few digits: 3.1415. But it doesn't end there, because pi is what mathematicians call a transcendental number. In other words, pi is comprised of an infinite number of decimal places.

Pi is a number that never settles into a repeating pattern, says Rölke. Every decimal place must be calculated individually. "This is the unique and fascinating thing." Which is why scholars have been studying pi for some 3,600 years already – from the ancient Egyptians to the Greek mathematicians Archimedes and Ptolemy; from China's Liu Hui to Iran's Jamshīd al-Kāshī and Germany's Leibniz. According to Rölke, there have been mathematicians and physicists who have spent a whole lifetime calculating the odd hundred or so decimal places of pi. The invention of the computer was a game changer, with the advent of electronic mainframe computers at the end of the 1940s extending Pi to 2,037 digits.

Methodology matters

At the end of the 1980s, the Ukrainian-born Chudnovsky brothers developed an algorithm for calculating the digits of pi – which Rölke and his team also employed to hit 62,831,853,071,796 decimal places on their supercomputer. To print out this mind-boggling number, you would have to fill around 17.5 billion A4 sheets of paper on both sides. Enough to take your breath away. And the FHGR scientists got nearer to the true value of pi than anyone else has before. But what is the point of identifying so many digits?

"There is no practical benefit," Rölke confesses cheerfully. Just a few decimal places are sufficient for most purposes. You need a lot more to calculate orbits in space. "But certainly not trillions."

But the world-record number was never meant to be of use per se. The scientists were more interested in the methodology. Their recently purchased supercomputer was an essential tool, but what was also important was having the necessary expertise to set up the hardware properly and ensure that it calculated non-stop over a period of weeks. Hence, the world-record attempt was a way to test the performance of their infrastructure. It also helped to expand their knowledge.

Fit for data-intensive research projects

"In preparing and performing the calculations, we were able to develop significant expertise and optimise our processes," says Rölke. And identify weaknesses such as shortfalls in back-up capacity. It took vast amounts of storage space to conduct such a lengthy pi calculation and record its progress. The scientists repeatedly had to shift the data to commercial external hard drives. As such, the whole process gave them good training for collaborating on data and CPU-intensive projects with partners in research and development.

Together with the Swiss Institute of Allergy and Asthma Research, which is also based in Grisons, they are currently studying the causes of allergies in children – an area in which still very little is known, says Rölke.

Swiss extremes

Higher, further, faster, more beautiful? In search of the somewhat different Swiss records. Today: the "world champions" of pi come from Switzerland.

This wide-ranging project requires extensive calculations for evaluating blood samples, focusing on messenger RNA from genes: "Standard calculations could only take us so far." Intense processing power is necessary for other projects such as climate simulations to predict floods and avalanches. Switzerland's universities of applied sciences are responsible for providing knowledge with a clear practical orientation.

A short-lived record

The pi world record is therefore of genuine scientific benefit, says Rölke. It has been registered with the Guinness Book of Records, but any bragging rights are likely to be short-lived. The mark tends to be broken again after one or two years. And the previous Swiss to extend the record did so only four years ago, when physicist Peter Trüeb calculated the number to 22.4 trillion decimal places in 2017. Google employee Emma Haruka Iwao beat this just two years later, with 31 trillion.

Rölke is relaxed about it. The small matter of publishing the new pi number is proving to be more of a headache for him. He says he would love to make the number freely available, but someone would need to cough up enough storage space for 62 terabytes of data. In uncompressed form, that is one huge slice of pi. "We will probably ask Google for help," he sighs. Our column inches are limited too, so we have decided to publish only the last ten most recently proven decimal places of pi. These are: 7817924264.