

# NEWS FOR KIDS.net

## *Real News, Told Simply.*

### **Musicians Use AI to Help Finish Beethoven's 10th**

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Bonn, Germany

Beethoven, one of the world's most-loved composers, is famous for his nine symphonies. Before he died, he began a new symphony, but never finished it. Computer scientists and musicians have now used artificial intelligence to finish his 10th Symphony.



Figure 1: Beethoven's only from-life portrait by Joseph Karl Stieler.

Ludwig van Beethoven was born over 250 years ago, yet his music is still played daily around the world. Even people who think they've never heard Beethoven's music probably have. His melodies are often used in movies, TV shows, and even cartoons.

Beethoven wrote many famous pieces of music, but he's probably best known for his nine symphonies. A symphony is a long, complicated piece of classical music, usually divided into four parts. The four parts are often linked by "themes" – repeated musical ideas that tie the whole piece together.

When Beethoven died in 1827, he had some ideas for a 10th Symphony. But all that he left behind were some notes about the piece and a few "sketches" – short bits of written music.

In 2019, a special team of musicians, computer scientists, and historians was formed. Their goal: to try to complete

Beethoven's 10th Symphony to celebrate his 250th birthday.

The team didn't just want to complete the symphony, they wanted to come as close as possible to producing the symphony that Beethoven meant to write. That's where deep learning came in.

#### **Deep Learning**

*Deep learning – sometimes called Artificial Intelligence (AI) – describes computer programs that sort deeply through huge amounts of information. This allows them to find patterns humans may not have noticed. The programs can then use those patterns in new and surprising ways.*

To train an AI to help with the symphony, the team turned every piece of music that Beethoven ever wrote into a form the computer could understand.

By feeding the program all of Beethoven's music, the AI could look for patterns in the

way Beethoven wrote. This included, for example, how he re-used simple melodies all through a piece to create a theme, or how he moved between different parts of the symphony.

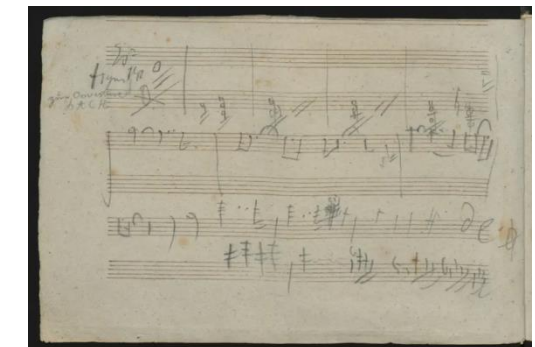


Figure 2: A page of notes from Beethoven's planned 10th symphony.

Other members of the team studied Beethoven's notes and sketches, and worked to figure out what Beethoven was planning to do. Where in the symphony did he plan to use each little bit of music that he left?

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One early test told the team they were on the right track. They took a few minutes of music created by the AI based on Beethoven's sketches, and played it for Beethoven experts, musicians, and reporters. No one could tell which parts had been written by Beethoven and which parts the AI made up.

Finally, the AI had the challenge of trying to connect the little musical bits into a symphony.

It took over two years, but the team was able to complete Beethoven's 10th Symphony. Not simply a melody, but 40 minutes of music for a full orchestra – a large group of musicians playing everything from string instruments, like violins, to trumpets, flutes, drums, and piano.

Last Saturday night, the piece was performed for the first time ever by the Beethoven Orchestra in Bonn, Germany.

So Beethoven now has a 10th Symphony. And though Beethoven didn't write it all, the team feels sure that the music is very much like what he might have written, if he'd had the chance.



Figure 3: Beethoven Orchestra, Bonn Germany.

### Did You Know...?

*This is the second attempt to finish Beethoven's 10th Symphony. In 1988, musician Barry Cooper also worked on completing part of Beethoven's 10th.*

## News Roundup: Barbados Leader, Iran's Gas

NFK EDITORS - OCTOBER 29, 2021

### Barbados Elects Its First President Ever

On October 20, Barbados elected its first president ever. Parliament chose Sandra Mason, who is currently the country's Governor General, to become the country's first elected "head of state".



Figure 4: Queen Elizabeth II (Left) and Miss Mason (Right)

A head of state is different from the "head of government" (the prime minister). Normally, a head of state doesn't have much power, and mainly has "ceremonial" duties, like opening a session of Parliament.

For years, Barbados was a British colony. Even after it won independence in 1966, the country kept Queen Elizabeth II of England as its head of state. The job of the Governor General was to represent the queen in Barbados.

For Barbados, having its own elected head of state is an important step in breaking with its history as a colony. Prime Minister Mia Mottley described the election as an important moment, saying Ms. Mason "reflects the values of who we are."

Ms. Mason, who used to be a judge, will be sworn in on November 30, when the country celebrates its 55th year of independence.

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### **Computer Attack Freezes Iran's Gas Stations**

A computer attack in Iran made it impossible for gas (petrol) stations across the country to sell gas earlier this week. People trying to buy gas got the message “cyberattack 64411”. The attack led to huge lines at gas stations around the country.



Figure 5: Tehran, Iran the day of the attack.

Most people in Iran buy gas using a special card the government gives them. Gas is very cheap if it's bought with these cards – about 20 cents a gallon (5 cents a liter). In the United States, the current cost of gas is about \$3.38 a gallon (89 cents a liter).

On Tuesday, the cards didn't work. People could only buy gas by paying higher prices. Some electronic signs in the country were also attacked, and were changed to carry messages about gas.

Iran's government said on Wednesday that about 80% of the country's gas stations were working again. The government said the attack seemed similar to a July attack on its railway system, which also carried a “cyberattack 64411” message. The government thinks the attack may have come from outside the country.