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Building a neural network in your bedroom

At TedxCERN, 18-year-old Florida high school student and Google Science Fair Winner, Brittany Wenger, explained how she built a neural network to help tackle breast cancer.

On

Wenger taught herself to code in C-Sharp when she was just 13. However, she programmed her neural network using Java, which she learned at school. Image courtesy CERN.

Friday 3 May, 2013, top scientists, philosophers, educators, and musicians descended on Geneva for TedxCERN. However, one of the highlights of the event was a talk given by 18-year-old Florida high school student Brittanny Wenger. Wenger was awarded first prize in last year's Google Science Fair for creating an artificial neural network to help tackle cancer.

In a recent in-depth interview with *iSGTW*, Wenger explains how she first became interested in the concept of artificial intelligence when, aged just 13, she took a course on futuristic thinking at her high school. "I was enthralled. I went home and ordered a college programming textbook. I'd never coded anything before, but I started learning to code and eventually I did code an artificial network."
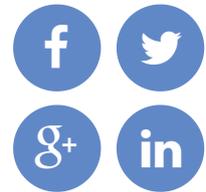
Wenger's first neural network was tasked with playing soccer, a sport she loves. However, three

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years later, when her older cousin was diagnosed with breast cancer and this inspired Wenger to try to help make the process better by improving the diagnostics.

"As the world becomes smaller, the cloud is something which can really connect it and make sure that hospitals around the world have access to the same technologies. Artificial neural networks learn based on their experiences and their mistakes, so I need to gain more experiences for my network. I had 681 samples at the time of the Google Science Fair and I'm now up to 691, so I am getting there. But, the thing about the cloud is that it doesn't just let me collect more data samples, it's also what's going to enable a million hospitals in the world to log onto my program at exactly the same time, not crash it, and use it to diagnose patients - if they want to do that, because of the cloud I've got the infrastructure to support that. Going forward, it's important that hospitals around the world can have access to the same technologies and the cloud is something that can facilitate that."

Wenger on the importance of the cloud in enabling her project.

She taught a computer how to diagnose breast cancer - to determine whether breast masses are malignant or benign. She created a cloud-based neural network to help doctors better detect breast cancer using a less invasive form of biopsy, known as Fine Needle Aspiration (FNA). Despite this being the cheapest, the least invasive, and the quickest method of diagnosis, many doctors are unwilling to use it due to a lack of reliability. Wenger recognized this lack of reliability as an opportunity to put her programming skills to use, so as to improve the accuracy of FNAs and thus provide women with the option of using this quick and non-invasive diagnostic method.

In her own words, Wenger explains: "I created an artificial neural network, which is a type of program that's coded to think like the brain, so it can actually detect patterns that humans can't detect, in order to provide doctors with a tool to analyze FNAs, so as to revive them and put them back into hospitals. Currently, the neural network that I built is working really well. I've deployed it to the cloud, so it's accessible to hospitals worldwide. This means that I can get more data and I can get it into hospitals, helping real people. It's also 99.1% sensitive to malignancy, so this means that most cancer patients are being diagnosed correctly."

During her talk at TedxCERN, Wenger described how it had taken her several failed attempts before she was finally able to make her model work correctly. "The great thing about science is that you learn as much from your failures as you do from the experiments that work," she says.

At the end of her talk, Wenger interviewed via videolink global superstar Will.i.am, who spoke of the importance of science, technology, engineering and maths education. He praised the hard-work and determination of young people like Wenger hoping to enter the world of research and revealed to the audience that he himself was planning to learn some coding skills. Wenger concluded her talk by saying: "Together with hard work and passion, we can truly revolutionize the world around us - to me, that's what's exciting about science."

Read iSGTW's *full interview with Wenger here:*

*While interviewing Will.i.am, Wenger was joined on stage by the Collège International de Ferney-Voltaire Choir
and International School of Geneva Chorus, who together sang 'Reach for the Stars (Mars Edition)',
a song composed by Will.i.am and beamed back to Earth from the Red Planet by NASA's Curiosity rover. Image courtesy CERN.*

'Google Science Fair winner builds neural network to fight cancer.'

Read next week's issue for more exciting news from TedxCERN, when we'll be featuring Ian Foster's session on big data.

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