Mri in practice chapter 1

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MRI sees the spine with a large magnet, which stimulates (excites) hydrogen atoms in the vertebrae (bone building blocks of the spine), spinal bag (contains spinal cord, nerves and cerebrosophal fluid), supporting muscles and ligaments. Since the human body is mostly composed of water (which is 2 parts hydrogen and 1 part oxygen, or H2O), an accurate picture of the anatomy of the spine can be achieved. The strong magnets needed to excite the body's water molecules (H2O) are constructed in such a way that the patient is completely surrounded by a magnetic field. Basically, the patient should fit in a magnet and be fully covered by it. Advertising water molecules that make up most of the human body can be seen as very tiny bar magnets, from the north and south poles. Inside the MRI magnet, all the water molecules of the body that were previously randomly located are now lining up to collide either north or south. All the noise generated in the magnetic case is from mechanical devices called gradients. Gradients emit an FM radio signal, which councils lined up water molecules from the north or south. When the gradient is turned off (no noise) the molecules pop back north or south, and the energy needed to previously tip them is issued as another FM radio wave, which is then detected on a listening device associated with noisy gradients. The computer analyzes this new FM radio wave and digital images are constructed that represent the studied anatomy. No radiation with MRI, and the scan is painless. If postoperative scar, or infection or tumor of the spine is suspected, a contrasting material can be injected into the vein. Contrast agent, as a rule, accumulate and sketch tissues with abnormal vessels (scar tissue, infection and swelling, as a rule, have abnormal vessels). For a patient who has already undergone spinal surgery, the contrasting substance traditionally helps in differentiating a recurrent or remaining herniated disc from scar tissue. In order to expose more students to computer science, 17 states have passed legislation to create basic mathematical and scientific requirements in the curriculum, rather than treating them as electives. But lawmakers in Texas have made computer programming count on a foreign language requirement, with Kentucky and New Mexico preparing to follow suit. So, is language coding or math? How human brains interpret coding, how debates add up. Those in the math and science camp argue that computer science involves more than just a language a computer can interpret- in particular, it requires an algorithm of learning logic that requires specially trained technical instructors. On the other hand, supporters language furiously declares its case, seeing an opportunity to fill gaps in the curriculum left by the abbreviation language departments in schools. While legislators and educators are fighting over whether computer programming is considered a foreign language or mathematics, there has been little scientific evidence to support or disprove any case. I mean, until now. Researchers from Passau University, Magdeburg University, Carnegie Mellon, the Georgia Institute of Technology, the Leibniz Institute of Neuroscience and the Metop Research Institute gathered their heads to find out exactly how programmers understand code. Their study was taken this year at the International Conference on Software Development.This is the first study in which scientists have studied the brains of programmers using neuroscience imaging tools. You can find the study here in the form of PDF. The study's primary author, computer scientist Janet Siegmund of passau University, was so interested in the debate about language or mathematics that she decided to look into the brains of programmers using MRI in the hope of shedding light on the issue. It was actually my starting point, says Sigmund. She wanted to know how the brain registered the act of programming, which led her to her current research question: How do programmers understand code? In the experiment, 17 participants interpreted several lines of code while lying inside an MRI machine. All subjects were university students who had a bachelor's degree in programming and Java language. Two of the 17 participants were women. Each person read several different Java code fragments with similar complexity so that researchers could focus on the brain imaging data. To eliminate brain activity that was not related to code interpretation, the researchers subtracted image data related to the task of detecting errors. They found that detecting bugs did not activate parts of the brain that were dealing with the task of interpreting the code. The entire test code consisted of several lines, at the end of which the program will print the output. The participants' task was to predict the printed output after studying the code. All participants were able to understand the code on time. Programming-Language LinkSo, does computer programming fall into the languages of the subject area? This seems to make some sense based on what we learned from the study, says Sigmund. But Sigmund stresses that additional research would better reinforce her findings, especially since it was an initial attempt to answer a mathematical or linguistic question. She says: In fact, with this kind of research, you should always say that more research needs to be done. But what we found is that it seems to be related. Future research may improve the current experiment. We had a very artificial kind of testing because you did have small fragments of the original 20 lines of code, sigmund says. Anything more would fall out of the observation deck mirror that was attached to the inside of the MRI machine. What's more, the code can't be so complex that an object can't complete a task in the allotted time. Real programs usually contain numerous lines and most likely a stump of an external reviewer. Christian Kestner, the second author of the study, explains in detail why more work is needed. He says: There is no clear evidence that learning a programming language is like learning a foreign language, but our results show that there are clear similarities in brain activation that show that the hypothesis is plausible. It is important to note that participants did not actively write computer programs in the experiment. They just read snippets of code to understand. Thus, it is inaccurate to say unequivocally that computer programming is more of a language than a math. The truth is still there. Previously, attempts to understand the cognitive abilities of programmers used qualitative indicators and mainly relied on self-reaki programmers, on which experiments were conducted. But Sigmund decided to use the hard data method from neuroscience to directly measure the programmer's understanding of the code using AN MRI images. Colored areas were active areas of the brain when participants read and understood the code. Embracing the tool is carried out by a learning curve. You need a lot of experience with MRI research. You need to know how the machine works and what you can do with the data, says Sigmund. A chance meeting with biologists at the conference brought in the know-how that Sigmund and her colleagues needed to properly plan and interpret the data from their MRI study. I don't think we'd be there if we didn't have new biologists on board, Sigmund said. Blurred boundaries between math and languageUit study can give insight into how reading code can affect a student's brain. Even so, it's hard to know for sure if other parts of the brain have been activated. Last year, neuroscientists did research on patients whose brains were implanted with electrodes. Using this invasive method, they were able to identify the area of the brain that processes numbers called the lower temporal gyrus. They also concluded that the region was physically close to the language processing area. It is possible that the MRI scans in Sigmund's study may not have been able to detect activity in the region. Maya Szalavitz, writing for Time, writes: Since the lower temporal gyrus is so close to the ear canals, functional MRI machines, which detect changes in the use of oxygen and blood flow of nerve cells, may not be as sensitive to the activity of neurons hidden in this area. Even more evidence confuses the difference between language and processing computational areas of the brain. In 2000, a study concluded that the same region that is responsible for processing is also important in the implementation of mental calculations. By the way, Sigmund Sigmund her colleagues found activity in the same region. No matter how you look at it, most brain imaging studies remind readers that the activated areas that show with the selected image method correspond to several different processes that are open to interpretation. Sigmund and her colleagues also acknowledge that the way they interpreted the results of their study was open to consideration, writing in the paper that they may have missed important processes. But Sigmund repeats: The activation model we found shows very clear and really different areas activated that are related to our current understanding of the program. Comp-Sci is more than just CodeEven, if the Sigmund and Kestner study showed a link between computer reading and brain language centers, it doesn't speak in computer science in general. Amy Hirotaka, public policy and advocacy manager for the nonprofit Code.org, wrote in an email: Computer science is more than just code. Fundamental concepts of computer science, like logic and problem solving, are well aligned with mathematics and natural disciplines, going beyond simply learning the programming language. Given that now that computer science can quit the school's foreign language department, Hirotaka sees problems with the quality of teachers down the line. Each department has its own ways of certifying teacher credentials. Suffice it to say that obtaining foreign languages and maths faculties converge on one certification standard will create an administrative mess, even if it gives students more foreign language options. Hirotaka added: Counting computer science as a foreign language may sound like a creative solution, but it causes serious problems when it comes to teacher certification and departmental coordination. Brainwashing programmers in real WorldSchool politics aside, the study could pave the way for improvements in programming. Kestner is quick to point out that using neuroscience can help us determine what makes a great programmer different from the average. We still don't have a clear idea of how to train really good developers. For decades, researchers have found that there are individual programmers who program more productively at higher quality, and make the most of the communication in the project. They are often referred to as 10Xers because many studies have shown that they produce ten times as much code, or a tenth of the time or make ten times more communication, says Kestner. He adds: We know that these developers exist; we often quickly recognize them. Most of us know at least one such developer, and every technology company tries to hire them. But we have no idea how they got there and whether we can train others to succeed at similar levels. Learning about how the program is different among beginners, professionals and 10Xers can give us a better understanding of what makes a really great programmer. Sigmund imagines that research research to improve the syntax of the software. Now that we do have a better idea of what's going on inside the programmer's brain, we've found that it's been related to the processing of natural language. Maybe programming languages should be more like natural languages, she says. More domain languages, such as S'L, are closer to natural language processing. It's going to get closer to Java, Sigmund says. This opens the door for many future studies in this area. The actual activations found in this study are good and confirm basically what we expected, but the key result is proof of the concept of using MRI as a tool in software development research, says Kestner. In here. mri in practice chapter 1 quizlet. mri in practice chapter 10 quizlet

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