



Using artificial intelligence to create reliable software New Computer Science professor at the University of Stuttgart awarded ERC Starting Grant

Programming errors in software can be expensive and in extreme cases can cost lives. Previously they were detected using testing software, but this method is not foolproof. Prof. Michael Pradel, Professor of Programming Languages at the Institute of Software Technology at the University of Stuttgart since September 1, 2019, is focusing on artificial intelligence when it comes to detecting errors. A few days ago, he received a much-coveted Starting Grant from the European Research Council worth 1.5 million euros for his revolutionary process.



Prof. Michael Pradel, University of Stuttgart. Photo: Katrin Binner

We have all seen the consequences of software errors for ourselves. Crashing apps, websites that are slow to load, features that don't work...but these are only the tip of the iceberg. Programming errors in online retail can cost millions. In safety-critical applications, for example in self-driving cars or in medicine, they can even cost lives. Because software is developed by human

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beings, it is impossible to completely eliminate errors. And with the increasing prevalence and complexity of software, the number of errors is also going up.

Previously, software errors were detected using testing software, which is based on the “program 1 analyses program 2” principle. These pieces of testing software are still made by human beings though, and can only detect errors which are already known. In order to be able to also predict and prevent future errors, Michael Pradel is focusing on artificial intelligence in his software lab. “The core idea is using the many existing software errors out there to learn how new errors can be detected automatically”, explains Pradel. “This is why we’re developing machine learning models which predict whether a piece of program code will be correct or will have errors in it.”

Deep learning

In order to achieve this, Pradel and his team want to develop new methods as part of the ERC project which will enable a computer to “understand” a program and the idea behind it. This uses the so-called “deep learning” method, which scientists implement in the program and develop in a way which has not been done before. The names in the source code are of course an important indicator of errors. Artificial intelligence looks at a huge number of lines of code and learns how the names are commonly used. If it then comes across an inadvertent link between the variables “length” and “color” for example, then it presumes it to be an error.

“What makes this new procedure so revolutionary is that every developer can create their own tools to detect errors. Before, these kind of tools could only be created by a few specialists”, explains Pradel. The researchers have already achieved some very encouraging successes with the first prototypes and have been able to detect a variety of errors which were previously unknown or unidentified - even when using software which in some cases has already been in use for a very long time. Michael Pradel has also tested his ideas in practice during his six-month stint spent researching at Facebook.

However, Pradel doesn’t think that artificial intelligence will replace programmers any time soon. “Our aim is more to use the automatic tools to support the relatively monotonous work of searching for errors and to free up more time for the programmers to concentrate on more interesting tasks such as creating new functions”, says Pradel. Ultimately the goal is to make



software development more productive - also because it's getting more and more difficult for companies to find qualified programmers due to the massive shortage of them on the job market.

About Michael Pradel

Michael Pradel was born in Jena in 1983 and studied Computer Science and Engineering in Dresden, Paris and Lausanne. He completed a doctorate at ETH Zurich in 2012 in the field of program analysis in automatic and precise error detection. After a research stint at UC Berkeley in the USA, he has worked at TU Darmstadt since 2014, most recently as an assistant professor. During a spell working in industry between February and July 2019, he gained first-hand experience of the industry giant Facebook. Since September 1, 2019 he has held the Chair of Programming Languages at the Institute of Software Technology at the University of Stuttgart.

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