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## **Messages from the AI engine room**

### **No. "Hello World" just isn't enough**

*When it comes to AI, Germany can do more than "Hello World" if it really wants to!*

Artificial intelligence, or AI for short, continues to accomplish impressive technological leaps that pay off in many tasks: from product recommendations to speech recognition and language translation to the amazing computer program that recently succeeded in predicting the three-dimensional structures of proteins with high accuracy. Experts all over the world use it, among other things, to study spike proteins such as the corona variant Omikron. The journal SCIENCE considers the AI approach to be so significant that it has named it a scientific breakthrough of the year 2021!

No doubt: We are in a crucial phase of the AI transformation. But if Germany wants to play in the premier league of AI, policymakers must now implement a high-profile information technology and AI strategy instead of always babbling vaguely about "digitization".

There is no time to lose: By 2026, Germany will be short of 780,000 tech specialists, according to a recent study by the *Stifterverband für die Deutsche Wissenschaft*. Above all, the demand for AI experts and data analysts, and thus also the demand for programming skills, is increasing rapidly.

Anyone learning a new programming language traditionally first says hello to the world before diving into more complex programming tasks. To do this, she writes a short computer program that only outputs the text "Hello World!" on the screen — a simple task that provides initial insights into the components of a program written in a programming language. The first entry that Wikipedia founder Jimmy Wales typed on Wiki back in 2001 also started with "Hello World."

Researchers at DeepMind (Google's London-based AI sister company) have now taught the AI system "AlphaCode" to program much more than the saying "Hello World!". AlphaCode is trained to generate source code from specifications written in natural language. This is a popular task in many competitions that people face, at the International Olympiad in Computer Science, for example, or in recruitment tests for software developers.

The programming platform Codeforces, for example, provides new tasks every week, which interested developers can use to measure their problem-solving skills against others. Now AlphaCode has also joined the club. Among ten tasks solved by around 5,000 users on the Codeforces website, AlphaCode's answers were in the top 54.3 percent on average. DeepMind estimates that AlphaCode is among the top 28 percent of users who have participated in Codeforces in the past six months.

As early as 2016, DeepCoder, an AI system developed jointly by Microsoft Research and the University of Cambridge, was able to fill gaps in program codes; and in 2021, the AI model Codex from the Californian AI company OpenAI was able for the first time to make code suggestions to programmers and give them feedback in real time during development, similar to what we know from auto-complete and auto-correct on our smartphones, but for programming.

So, will software programmers, who are the backbone of our technological progress, soon be displaced by their own programs? Maybe one day, but not in the near future. AlphaCode needs a team of AI experts, plus knowledge and experience in handling large AI models and a high-performance AI compute infrastructure to train the AI system. Even if you are lucky enough to find all of this in Germany, you still need to have the financial resources to cover the cost of development.

Humans learn so much more efficiently. We learn something new every day and can immediately use what we have learned in a seemingly infinite number of variations and situations. Programming is no exception. The moral of the story: investing now in computer science and thus AI education pays off twice.

In May 1997, the world chess champion Garri Kasparov played against the supercomputer DeepBlue — and lost. It was a turning point. Never had a computer been able to defeat a reigning world chess champion in a match. Perhaps we will soon witness a new showdown between top software programmers and AI systems. It would be great if Germany were in on the action — on both sides. In any case, Germany can do more than "Hello World" if politicians finally take AI seriously and don't just talk about digitization.

**Kristian Kersting** is Professor of AI and Machine Learning at TU Darmstadt, co-director of the Hessian Center for AI (hessian.ai), and winner of the "German AI Award 2019". His AI column "Aus dem Maschinenraum der KI" appears regularly in the German Sunday newspaper Welt am Sonntag.