Reboot! Session

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Preparing for a Neural Programming Revolution

Researchers have recently demonstrated intriguing results via the application of neural generative pre-training (GPT) language models to programming problems. Such models are trained on large quantities of source code, for example from GitHub. When presented with a prompt consisting of a header, signature, and docstring, the models can often generate correct code of considerable sophistication.

These early results in neural programming mirror, in some regards, those achieved earlier in machine translation and other natural language processing tasks, where neural methods have achieved remarkable successes. Thus, while early experiments in neural programming reveal challenges (e.g., a tendency to propagate errors in training data), as well as successes, we should surely be considering what it would mean if those challenges were to be overcome and programming were to be automated on a large scale.

Such a neural programming revolution would have profound implications for the science, teaching, and economics of software engineering—and indeed for the discipline of computer science overall, which while being concerned with much more than software, is closely aligned with computer programming, not least in the popular imagination.

AI Customized to Human Norms

Adverse outcomes increasingly result from technology that has been developed without explicitly incorporating societally beneficial or widely endorsed human norms. Social media is an example that already poses seemingly insurmountable challenges. But even those challenges are potentially dwarfed by those that could result from similarly myopic and large-scale adoption of artificial intelligence and autonomous systems. It is therefore critical that these technologies comply with human norms throughout their lifetimes.

This goal can be accomplished only by systematically understanding the norms of individuals, communities, and organizations that will utilize these technologies, customizing the technology to these norms in appropriate contexts, establishing trade-offs and synergies in the implementation of these norms, and revising the technology as well as the understanding of the norms which will likely adapt to the technology itself. The wide diversity in norms across nations, cultures, religions and political identities makes this particularly challenging. The extent of the interdisciplinary perspective necessary for this endeavor is beyond what is possible today in our existing structures for research, education, and governance.