The Future Just Arrived

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What if a computer were actually smart? You wouldn't have to be an expert in a particular application to interact with it – you could just talk to it. You wouldn't need an advanced degree to train it to do something specific - it would just know how to complete a broad range of tasks.

For example, how would you create the following digital image or "button" in a traditional computer program?

I have no idea because I can't code. But a new computer program (called GPT-3) is so smart that all you have to do is ask it in plain English to generate "*a button that looks like a watermelon*." The computer then generates the following code:

```
<button style={{backgroundColor: 'pink' ,
border: '2px solid green' ,
borderRadius: '50%' , padding: 20,
width: 100, height: 100}}>Watermelon</button>
```

And voila – it's done!

Broad Applications

If you think this is just a neat trick for a niche application, consider that the program isn't specifically designed for creating digital images or web coding. It is a general-purpose natural language processing model. The interface is "text-in, text-out" that goal. but while the input is ordinary English language instructions, the output text can be anything from prose to computer code to poetry. In fact, with simple commands, the program can create an entire webpage, generate a household income statement and balance sheet from a description of your financial activities, create a cooking recipe, translate legalese into plain English, or even write an essay on the evolution of the economy that this strategist fears could put him out of a job! Indeed, if you talk with the program, you may even believe it is human.

But can GPT-3 pass the Turing test, which assesses a machine's ability to exhibit human-level intelligence. The answer: GPT-3 puts us a lot closer to that goal.

Data is the Fuel

The technology behind this mind-blowing program has its roots in a neural network, deep learning architecture introduced by Google in 2017.[i] However, the creators of GPT-3, a startup called OpenAI, which was co-founded by Elon Musk, gave it a lot more data to learn from than other natural language programs. GPT-3 "read" billions of web pages and was able to learn 175 billion parameters or attributes that help it understand and respond to natural language commands or questions. That is a huge leap from the previous version, GPT-2, which had 1.5 billion parameters, and it is more than a 1,500-fold increase from the first GPT, which had a mere 110 million.

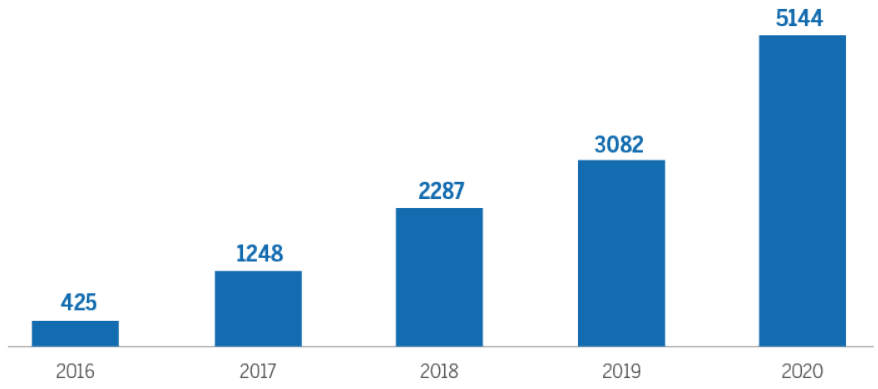
Importantly, increasing the data available to the program seems to produce continued quality or "intelligence" improvements, implying that future versions are likely to be much smarter. As one of the pioneers of the architecture, Noam Shazeer of Google, remarked recently "I don't see any end in sight."[ii]

A New Technological Revolution

We have previously written about the current technological revolution, which we call the Age of Connected Intelligence. This revolution is driven by ubiquitous and pervasive computing, which is generating big data that is analyzed in the cloud and interpreted with the help of artificial intelligence. While we cited the 2017 AI program AlphaGo Zero as a potential "big bang" for this revolution, GPT-3 may be just as important. AlphaGo Zero, introduced in 2017, was able to beat the best human and computer program in the world at the ancient Chinese game of Go after just a few weeks of practicing without using any data from actual human games or being taught any specific strategies. It was given only the rules of the game and allowed to practice a lot. This kind of self-learning was a watershed moment because it means that computers are capable of developing skills without being bound by the limits of human teachers. However, AlphaGo Zero was not a natural language model and so was much less broad than GPT-3, which can become more adept at various subjects because it can draw upon a vast library of human knowledge.

In a recent survey, Deloitte found that three-quarters of company executives believe that AI will transform their organizations within the next three years. That may explain why companies are talking about AI more and more (Figure 1). In fact, Google CEO Sundar Pichai has said that AI is more profound than electricity or fire. Given the early results and applications for GPT-3, it is easy to see how important this kind of technology can be, not only to businesses and the economy, but to our entire society.

Figure 1: **Artificial Intelligence Mentions by S&P 500 Companies**



Source: FactSet
Data is for trailing 12-month periods ended July. Mentions include transcripts, investor presentations, filings, press releases, and news.

[i] The Transformer architecture which utilizes the self-attention mechanism for natural language processing is described here: https://arxiv.org/pdf/1706.03762.pdf

[ii] https://blog.deeplearning.ai/blog/the-batch-nlp-special-issue-powerful-techniques-from-amazon-apple-facebook-google-microsoft-salesforce

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