Google Pathways ???? AI

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Google recently announced an important new artificial intelligence (AI) architecture known as Pathways. Google says that Pathways will make it possible for AI models to multi-task. For example, with Pathways Google can understand text, images and speech together in a single AI model.

More about Pathways

As Google discussed in a blog post, Pathways addresses a limitation with machine learning, a subfield of AI that gives computers the ability to learn without explicitly being programmed. As Google noted, machine learning models tend to overspecialize at individual tasks when they could excel at many. They rely on one form of input when they could synthesize several.

This is where Pathways comes in.

Pathways will enable a single AI system to generalize across thousands or millions of tasks, to

understand different types of data, and, says Google, to do so with remarkable efficiency. Pathways will advance us “from the era of single-purpose models that merely recognize patterns to one in which more general-purpose intelligent systems reflect a deeper understanding of our world and can adapt to new needs.”

As Google Senior Fellow and SVP, Google Research, Jeff Dean said at a TED Talk, with Pathways “[w]e’ll be able to engineer better medicines by infusing these models with knowledge of chemistry and physics; we’ll be able to advance educational systems by providing more individualized tutoring; we’ll be able to tackle really complicated issues like climate change, perhaps engineering of clean energy solutions.”

Dean elaborated in a blog post:

> We’d like to train one model that can not only handle many separate tasks, but also draw upon and combine its existing skills to learn new tasks faster and more effectively. That way what a model learns by training on one task – say, learning how aerial images can predict the elevation of a landscape – could help it learn another task -- say, predicting how flood waters will flow through that terrain.

In his TED Talk, Dean said Google Pathways could also dramatically shorten the machine-learning development process. He noted, “The grand challenge of AI is: How do you generalize from a set of tasks you already know how to do to new tasks, as easily and effortlessly as possible? If you can build these systems that already are infused with how to do thousands or millions of tasks, then you can effectively teach them to do a new thing with relatively few examples.”

Pathways: A Natural Evolution for AI

Pathways is a natural evolution for AI. Prior to the advent of the digital age, knowledge was compartmentalized. But in the digital world, everything we learn is getting interconnected. Knowledge sharing is no longer a linear process among human beings. Google Pathways is a natural next phase for knowledge sharing and processing among AI applications essentially catching up with the human brain.

Pathways reflects the way techniques are evolving for learning and sharing knowledge in academia. An increasing number of schools are adopting integrated, interdisciplinary ways of learning, with a wide range of competencies that are combined in a tissue of knowledge, not separately in subjects anymore. Pathways takes AI in this direction.

Pathways can indeed help achieve some important breakthroughs by improving the way we share knowledge. Everything we learn is getting interconnected, but collaboration in professional fields is not necessarily interconnected. For example, in the medical sector, different fields of study do not talk to each other. Dermatologists, oncologists, and cardiologists don’t share information as well as they should because they are specialized fields. Sometimes a condition with skin might affect how a different specialist treats their problem. AI could synthesize the same input (like an image of a skin) to treat another kind of condition. Pathways opens up a wider world of people to get a more powerful result to make our lives better.

Medicine works with patterns of data, such as symptoms. Physicians rely on symptoms from one field to treat another. No doctor diagnoses cancer on a first visit based on a sore throat. They may need to go through an entire process to disqualify less serious diseases (such as sore throat, which could cause a cold) to diagnose a more serious problem faster. There may also be data from other disciplines that contribute to it, like geo-location, environmental conditions or genetic factors .This is where AI can make a difference.

If we look at other applications of multi-modal AI, machine translation is another example. Language content may come in many different forms and inputs to the senses: picture, audio, video. Today, making that content accessible in different forms happens through separate AI models. Optical character recognition (OCR) translates image into text. Text to speech translates text to spoken content, and there are AI models that transcribe voice into text. What if you could merge all these forms of learning into one single model? It would be simpler and faster to train the engine. The effort and cost would be less. A business does not need to pay for all that effort separately.

But Pathways could also increase the risks of bias getting worse with AI. Unfortunately, using biased data for machine learning results in an AI application being less inclusive and even harmful by contributing to a world that suffers from rampant bias already. Pathways could accelerate that bias by, ironically, doing a more efficient job processing multiple sources of data. What happens if those data sources are biased? This does not mean we should refrain from using Pathways. It does mean, however, that organizations need a mindful approach to AI – an approach that includes a diverse team of human beings supervising the sourcing of data and the development of AI-based applications based on that data. To learn more about Mindful AI, please read this post.

Contact Centific

To adopt AI successfully and in a mindful way, contact Centific. We know the terrain. We understand how to implement AI effectively with the needs of people at the center.

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