Guest

Deep learning will be huge — and here's who will dominate it

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Artificial intelligence* is developing much faster than we thought. Just last month, Google's DeepMind AI beat Lee Sedol (http://venturebeat.com/2016/03/12/mark-zuckerberg-congratulates-google-for-historic-ai-achievement/), a legendary Go player, at

his own game in a defining moment for the industry. What enabled this win is a relatively new AI technique called deep learning, which is transforming AI.

Until deep learning was introduced, even the best AI systems were always highly tuned for specific problems and required many rules to operate successfully. But deep learning has changed that, causing many researchers to abandon classical AI approaches. Deep learning relies on simulating large, multilayered webs of virtual neurons, which enable a computer to learn to recognize abstract patterns (somewhat similar to the way a human brain operates). It can be used to solve any general-purpose pattern-recognition problem, which means that any activity that has access to large amounts of data can find it useful.

There is a huge investment opportunity with deep learning – not only because of the technology itself but also because of how it is leveraging other technologies to become more powerful: the volumes of data available due to the proliferation of online services, improvements in storage, advancements in GPU and computing power, abundance of cloud computing, development of cheap sensors, and the rise of new data generated by the Internet of Things (IoT). As a result deep learning has opportunities to solve challenges across all types of industries.

All the big software companies are investing heavily in building deep learning capabilities and incorporating it into many of their products. And these companies are not only pushing it for internal use; they are advancing the entire industry by releasing their software frameworks and libraries. Google recently announced (http://googleresearch.blogspot.co.il/2015/11/tensorflow-googles-latest-machine_9.html)that it is open sourcing its latest Machine Learning system, TensorFlow; Facebook is releasing (https://code.facebook.com/posts/1687861518126048/facebook-to-open-source-ai-hardware-design/), for free, the designs of a powerful new server intended to run AI software; IBM open-sourced its machine learning code, SystemML (http://researcher.watson.ibm.com/researcher/view_group.php?id=3174); and Elon Musk and others founded OpenAI (https://openai.com/blog/introducing-openai/), a nonprofit AI research group; among many other examples. The vast internal research done by these large software institutions already benefits startups.

What naturally follows is a new crop of startups that leverage AI to solve complex problems, which were unsolvable only a few years ago. What's perhaps most interesting here is that these startups are targeting almost every industry out there. The first layer is general-purpose AI platforms that get fed large amount of data and automatically discover interesting patterns such as Valley-based Ayasdi (http://www.ayasdi.com/), Germany-based Blue Yonder (http://www.blue-yonder.com/), or Israel-based SparkBeyond (http://www.sparkbeyond.com/).

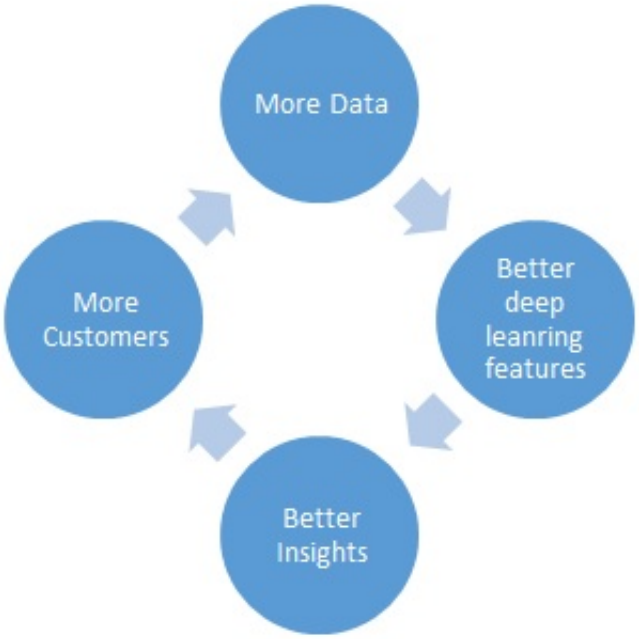
Then there are companies that sell AI-based products to enterprises. These include AI-based personalization and marketing tools such as Radius (https://radius.com/) and Dynamic Yield (https://www.dynamicyield.com/), sales and retention prediction tools such as 6sense (https://6sense.com/) and Gainsight (http://www.gainsight.com/), and AI-based customer support company Wise.io (http://www.wise.io/). But AI startups don't stop at the enterprise. They are disrupting many traditional industries such as ground transportation (Mobileye (http://www.mobileye.com/en-us/), Cruise (http://www.getcruise.com/)), agriculture (Prospera (http://prospera.ag/), Blue River (http://www.bluerivert.com/)), industrial (Imubit (http://www.imubit.com/)), and healthcare (Zebra Medical (https://www.zebra-med.com/), Deep Genomics (http://www.deepgenomics.com/), and Flatiron Health (http://www.flatiron.com/)).

In some ways, deep learning is following a course similar to that of big data in its early days. At the time, being a "big data" company was perceived as an advantage. But in the long run, it turned out that almost every company is a big data company – as they all need to store and analyze huge amounts of data. What distinguishes good companies from the rest is the ability to extract valuable insights out of the data and act on it. Similarly, we are seeing many new startups that claim their advantage is in deep learning. But over time, I believe every company will leverage deep leaning in some shape or form. And then what will distinguish the good companies from the rest are things like domain expertise, quality of the dataset, and the ability to find the right problems to solve.

At my investment firm, when we evaluate these new AI startups, we first try to understand which teams have really built top-notch expertise and are not simply relying on external APIs for their technology (Israel happens to be one of the top hubs for such

talent). We're seeing a big shortage today of strong AI teams, which is why larger players are quickly acquiring startups to improve their own AI capabilities (one example is GM's recent acquisition of Cruise).

In the long run, what interests us most as investors are companies that can leverage deep learning to build a data network effect. Here's what it looks like:



This approach enables companies to build a unique and proprietary dataset to better train the deep learning algorithm to deliver better insights. These insights should translate to more customers willing to share their data, which will improve the quality and size of the data set, resulting in a virtuous cycle. New competitors will confront the classic chicken and egg problem: Without customer data, it will be impossible to match the deep leaning algorithm, but without a better algorithm, they will not be able to get customer data.

Startups that both build top-notch AI expertise and also leverage it to build a positive data network as I've described will become extremely valuable over time. As the competition among AI startups heats up, this virtuous cycle will result in natural monopolies that lead to the creation of ominously large, powerful, artificially intelligent companies in the years ahead.

* The term *artificial intelligence* is commonly used for what is really machine learning (ML). I decided to stick with the AI term in this post to avoid confusion but acknowledge that many of these capabilities should be defined as ML and not AI.

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