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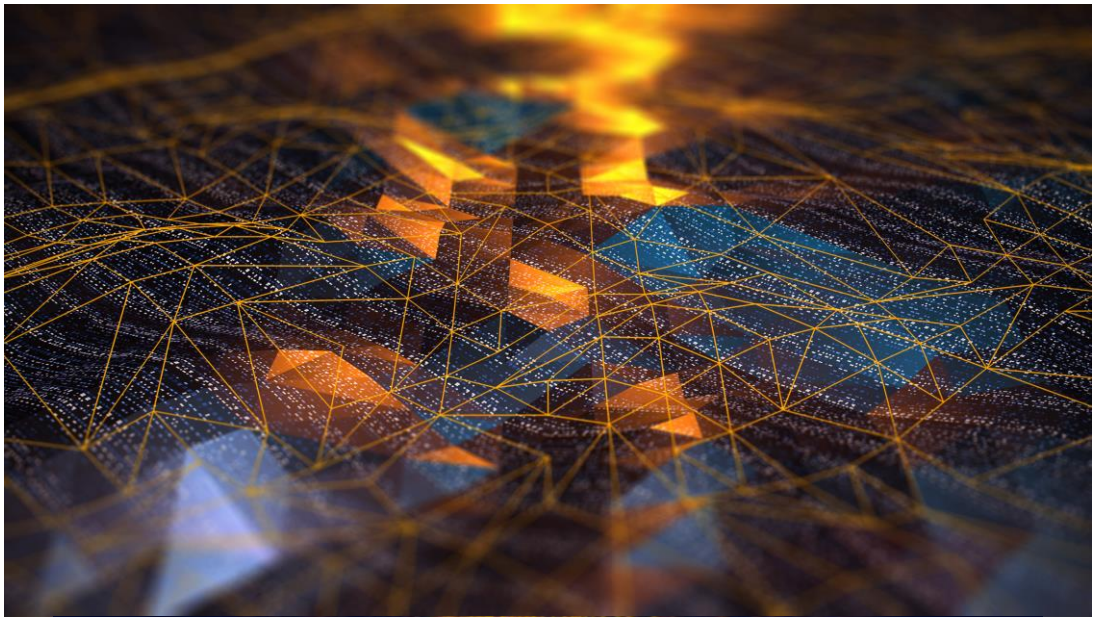
TOMORROW'S CHALLENGES



BEYOND ALGORITHMS: THE IMPACT OF AI AND ML ON ORGANIZATIONS

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As companies are increasingly seduced by the siren call of data science, there is a strong need to understand what it does and what is does not contribute to business.

There is definitely interesting work taking place in the areas of machine learning (ML) and artificial intelligence (AI) to bring effectiveness and efficiency improvements to many different types of businesses. While the ideas look impressive, many of them do not live up to their promise. There are at least three reasons that this is the case: (1) ML/AI marketing is ahead of actual capabilities; (2) ML/AI have been so hyped that customer expectations are unrealistic; and (3) ML/AI developers do not understand and/or address the organizational implications of their technological ideas.

In the remainder of this paper, we address the third aspect. Specifically, we address four key issues: (1) Technology is not the same as a product; (2) A product is not the same as value; (3) Value depends on where one sits; and (4) One needs to distinguish between products that replace versus products that enhance human performance.

Technology is not the same as a product

An algorithm or neural network does not equal a product, no matter how sophisticated it is. For example, Zebra Medical has developed sophisticated technology that allows it to recognize bone fractures in radiology scans and suspicious lesions in mammography. They perfected this technology by scanning tens of millions of images so that machines could learn to correctly identify fractures and lesions. In doing so, they developed more than 100 algorithms. Most radiologists and doctors, however, will not be able to use them—the algorithms first need to be turned into products.

For an algorithm to become a product it needs to seamlessly fit into the work environment of the radiologist or doctor. This means, at a minimum, that an application needs to be developed that functions on the equipment of any given medical center. The application needs to be easy to use and generate output that is meaningful to the user. In terms of Zebra Medical, this meant that the application generated output that told the radiologist the location and type of fracture/lesion.

A product is not the same as value

While Zebra Medical indeed created an application to handle identification in the user's environment, that in itself does not generate value. They did find, however, at least two ways to create value. The first one was efficiency. The application they developed can review many more scans and mammograms than any radiologist or doctor, with greater speed. So, the first great value the technology brings is efficiency.

The innovation Zebra Medical developed is an algorithm to rank order the scans and mammograms by level of urgency. The development of this algorithm needed extensive inputs from radiologists and doctors as to what constitutes a normal, an urgent and a very urgent issue. Once that work was accomplished, not only was Zebra Medical able to provide scans and mammograms, it was able to rank order them so that radiologists and doctors could attend to the most urgent cases first. This is where the product added great effectiveness to the workflow as well as to the lives of the patients.

Value depends on where one sits

While the above technology may sound extraordinary to some, it does not necessarily do so to those who are radiologists, doctors, hospital administrators, insurance companies and regulators. Radiologists and doctors worry about the quality and reliability of fracture and lesion identification. They are even more concerned about Type 1 and Type 2 errors: A Type 1 error is when the patient is identified as injured or sick when, in fact, he/she is not; a Type 2 error is when the patient is identified as healthy when, in fact, he/she is not.

Radiologists and doctors may further worry that they might be replaced by machines. While we do not preclude this as a future possibility, we do need to distinguish between identification and diagnosis.

While hospital administrators may have mixed feelings about the new products, they will likely be excited about the potential efficiency and quality improvements. On the other hand, they may also worry about Type 1 and 2 errors—not just from a quality perspective, but also from a liability perspective.

Insurance companies may be excited about potentially lower health care costs due to efficiency and more preventative interventions thanks to early detection.

Regulators will want to understand which variables the algorithms actually use to arrive at their identification labels. The issue with learning through neural networks is that even the programmers often do not know how their programs arrive at their conclusions. And a further question is who now is responsible for the diagnosis and treatment. Is it the hospital, the doctor, the radiologist, the algorithm company, the programmer or the algorithm itself?

And that brings us to the last aspect of the impact of AI/ML on organizations.

Products that replace versus products that enhance human performance

For now, we seem quite far away from machines conducting diagnosis, designing medical treatment, prescribing medical interventions and following up with patient care. All these steps, for now, rest firmly with medical doctors. That said, fracture and lesion identification can already significantly enhance human performance in terms of efficiency in scanning, workflow organization and the timely identification of urgent cases.

When AI/ML companies truly understand the challenges of their potential customers, they can create products that add real value in terms of efficiency and/or effectiveness in the that customer’s environment. As one can see above, creating such value is more difficult than it sounds, especially in the medical field, as the needs and concerns of the various stakeholders will vary and sometimes conflict. That said, while human replacement is far into the future, when done right, AI/ML can greatly enhance human performance.