An introduction to the exponential value of computer vision

Your business is constantly looking to reinvent its competitive advantage, efficiency and productivity. Over the last few years, advances in computer vision have seen it demonstrating some impressive capabilities. They're allowing organizations like yours to look at the world, at business challenges and operational effectiveness in wholly new ways that deliver powerful transformations.

Computer vision is enabling humans in all sectors to achieve exponentially more, such as:

- Improving efficiency and accuracy within core business processes – for example, to detect manufacturing defects human eyes cannot
- Enhancing security – at major travel hubs and other venues
- Knowing more about the emotions and needs of consumers – facial recognition for game-changing customer experience and marketing research
- Delivering significantly improved outcomes to citizens – across defense, transportation, environmental protection and more

Computer vision is the artificial intelligence (AI) behind Amazon Go stores. It creates a completely frictionless retail experience that's putting physical stores back in contention with online. It is also the technology behind non-disruptive wildlife conservation, cancer progression monitoring and agricultural yield improvements.

A QUICK TOUR OF COMPUTER VISION

It's easy to get your organization interested in computer vision. However, to deliver success, it's really important that all stakeholders – from data scientists to CIOs, board members to line of business leaders – understand the essentials of how computer vision works. From there, they'll be able to assess appropriate use cases.

Computer vision is an application of AI that can train a computer to interpret and understand the visual world. Using digital images from cameras, videos, MRI instruments and more, machines can accurately identify and classify objects and then react to what they are effectively 'seeing'.

Computer vision could be right for your organization if your core activities and business decisions could benefit from human vision to the power of AI. Insurance advisors, for example, are supported to make faster and more accurate decisions about car accident claims thanks to computer vision assessing video and photos of damaged vehicles. Without copious image data with which to train your models, computer vision will deliver little value. Fortunately, thanks to smart phones, CCTV, MRI, infrared imaging and other sources, we're living in a highly visual era where millions of megabytes of image data are generated daily, and advances in computing power alongside the evolution of computer vision algorithms have improved its accuracy rate from 50% to 99% in less than 10 years.[1]

Computer vision: how does it work?

Computer vision has been designed to mirror how the human eye works. If you consider that some 50% of the human brain is dedicated to visual processing, you'll appreciate not only how complex this technology is but why it's so hotly in demand.

THE CALCULATION PROCESS

In computer vision, a convolutional neural network (CNN) breaks images down into a smaller matrix of pixels, called a filter. The CNN makes calculations that compare these filters to a specific pattern the network is looking for. In the first calculations, the CNN can detect basic features such as the edges of objects. As the CNN produces more and more calculations its accuracy improves so that it can identify objects such as faces.

VIDEO

To analyze video, we can break moving images into a series of frames. However, because CNN only processes spatial information, not time-based, it can't be used for video. Why? Because the images in the stills change over time and CNN can't calculate how each frame relates to the preceding one. Instead, we use recurrent neural networks (RNNs) because they are capable of retaining information about what they've already processed and use that in decision-making. We train an RNN by providing a sequence of frame descriptions and a label, and essentially it performs a similar learning process as the CNN.

THE LEARNING PROCESS

The CNN compares the image it is trying to identify to a large amount of labelled training data. Each time the CNN makes a prediction against this training data it uses an error or loss function to compare how close its prediction was to the image's actual label. Based on this error function the CNN updates its filter values and performs the process again, with each iteration performing more accurately.

NEXT STEPS

That's a brief overview of how computer vision works. Next, we recommend you explore how investing in computer vision can deliver value. Download our ebook to also read how it is already being deployed in ways that make an exponential difference to businesses and non-commercial organizations alike.

1 https://www.sas.com/en_us/insights/analytics/computer-vision.html

Want to know more about how computer vision works, the latest use cases, and how SAS can help you?

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