

# What is GeoAI and Why Should I Care?



Artificial Intelligence (AI) is everywhere - it seems every gadget, every application is somehow going to change the world as we know it, because it is using some form of AI. Certainly, the pace of technology change is accelerating to the point that even the smartest are struggling to keep up – for a good read on this subject, I suggest 'Thank you for being Late' by Pulitzer prize-winning author, Thomas L

Friedman. But is AI the reason?

## Reassurance

It seems unlikely that human beings as decision-makers are going to be replaced by AI-powered robots anytime soon. The most credible debunk I've heard recently of that theory was a speaker at INTERGEO in Frankfurt (Jurgen Mayer) who summed it up as (to paraphrase) "to create machines capable of being sentient – you would first have to program in the seven deadly sins: envy, gluttony, greed, lust, pride, sloth, and wrath that we all exhibit to varying extents. However, no one to my knowledge is being funded to do research into how the mix of those informs our actions". Whilst it is true, that IBMs Deep Blue can beat a chess grandmaster, this is a narrowly-defined specific problem. Few current applications are capable of taking on a wide range of unrelated problems - what is referred to as General AI.

## Convergence of Software Technologies

In practice, it is a combination of neural networks, cloud computing, computer vision and machine learning that are enabling the most exciting advances relevant to our domain. Professor Jurgen Dollner from the Hasso Plattner Institute gave a fascinating presentation, also at INTERGEO, on 4D point clouds and machine learning. He explained how algorithms from predictive data analytics, massively parallel arrays of processors, specialised Graphics Processing Units (GPUs) and machine learning were being used to "heal" gaps in images resulting from shadows, in real-time.

Machine learning is possibly the most important facet of the current convergence. It is a method of data analysis that automates analytical model building, so systems can learn from data, identify patterns and make decisions. Machine learning algorithms need training, the approach is usually to create a training dataset, run the algorithm with an initial set of rules, human experts then examine the results and identify faults or enhancements to the machine logic and then re-run. The head of AI at NatWest speaking at the O'Reilly AI conference in London in October, revealed that one of the most important current limitations is getting enough time from sufficiently experienced experts to analyse the machine-produced results. If you are interested in understanding more about the underlying technology and data science in general, then I suggest subscribing to the O'Reilly newsletter ([www.oreilly.com/emails/newsletters/index.html](http://www.oreilly.com/emails/newsletters/index.html)).

## Processing Power Enables Real-time Image Processing

A recently heard estimate was that it would require eight million people doing nothing but looking at satellite imagery 24/7 in order to ensure every photo now taken each day is just viewed, let alone analysed. So, the revolution in processing power and algorithms for filtering is important since it allows meaning to be extracted from "dumb" images at speeds and with levels of success which seemed unimaginable even two or three years ago.

The "secret sauce" here is not some black magic for which you need a PhD in data science to understand, but rather the more prosaic application of techniques well known to remote sensing such as pattern recognition and image classification, but applied across large arrays of processors which communicate in a conceptually similar way to how the brain acts to filter and infer information, and are therefore dubbed neural networks.

Although there's a new Moore's law which states that storage capacity is now doubling every 14 months, we are clearly now producing far more data from our drones, satellites, and LiDAR sensors than we can sensibly manage. This is where one of the other "newbie" terms - edge computing - becomes relevant. This concept, at its simplest, is about using GPUs to process data on the "edge of the cloud" i.e. as close to the data source as possible. The GPU filters the data and then only transfers what is meaningful to the neural net.

## Applications in FinTech

Where this gets really interesting is that these technology and data innovations are coming together to enable near real-time applications in markets that haven't in the past been able to spell geospatial let alone invest in it. At the O'Reilly AI conference, one of the best attended sessions, resulting in an impromptu "teach in" on remote sensing to the AI cognoscenti, was by ex-NASA scientist James Crawford, CEO of Orbital Insight.

Orbital Insight are specialists in the application of Earth Observation to financial market prediction. A few concepts struck me particularly from his presentation. They don't own any imagery, but extract features such as cars in parking lots whenever a satellite overflies one of the 3,600 shopping malls they track. The number and location of vehicles within the parking lots enables them to estimate footfall in US shopping chains and use it as a "proxy" for sales volumes. They are also enhancing this analysis by correlating with mobile phone location data. In other words, the product of their work is just the answer to the customer's question – the insight. Many believe insight services are the future of data analytics more generally (<https://orbitalinsight.com/products/consumer/>).

The information they can supply to hedge funds and other financial institutions give advanced indications of profit trends, allowing their customers to beat the markets and is potentially worth billions to their investors.

A second FinTech application is found in the energy market. UK-based Geospatial Insight ([www.geospatial-insight.com/about/](http://www.geospatial-insight.com/about/)) has ex-Blom senior executive Dave Fox at the helm and provides estimates of oil and gas reserves by measuring storage tank capacity using 3D imagery. The capacity is a proxy estimate for oil reserves and this enables their customers to better predict future movements of oil prices on global markets.

Key to both these applications is the need for frequent satellite revisits and change detection.

## Relevance

So why is this important to the geo-community?

After a period in which the shine of new technology has largely worn off for geospatial, the not-so-new kid on the block Earth observation is finding application in that most lucrative of markets - finance. Further, many of the techniques we know and love are vital ingredients for the AI that underpins this new market.

Well, I guess if calling it AI means some of us can retire to the Bahamas, then to quote Shakespeare "A rose by any other name would smell as sweet". So perhaps I will embrace the term GeoAI in future and swallow my semantic pride.

*This article was published in Geomatics World January/February 2019*

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