Luminance

SUMMER SEMINAR 2019

The Luminance Summer Seminar: Machine learning and the art of subtlety

Dr James Loxam, CTO and Co-Founder

*This month, we held our flagship **Summer Seminar** event at Rosewood Hotel in London. The afternoon opened with a talk by **Chief Technology Officer and founder** of Luminance, **Dr James Loxam**, who has shared some of the insights from the talk on the beginnings of machine learning, its challenges and the art of subtlety.*

Nowadays, machine learning and AI technology are widespread in our daily lives. From a Netflix film recommendation to an Amazon book suggestion, all such capabilities are informed by algorithms.

Technologies like Luminance show how machine learning technology is capable of truly extraordinary things by its ability to interact intelligently with humans and the world we inhabit.

This has not always been the case. Early computers were, essentially, big calculators. The advent of general purpose computing has extended this, bringing about an era of digital automation – the so-called 'fourth revolution'. Much of this has been predicated on the binary system which delivers based on simple data - true or false, yes or no, on or off. This allowed us to build a computer that was reliable and robust because, at a low level, the electronics only have to work out the difference between 1 and 0, rather than myriad other states. Robust and predict able, computers were trusted by humans – especially their capacity to work all hours! Combining these "bits" into bytes, kilobytes, megabytes and even larger data sets then allowed computers to process the rich world around us today from text to images, music and videos.

Whilst the binary system is one of the biggest strengths of modern computing, paradoxically it is one of the biggest weaknesses. Computers are trusted and reliable simply because they follow instructions and rules to the letter (or byte), but how useful is this?

Take, for example, a company that sells paddling pools. It sold 1,000 in one year or 2.5 per day, and their supplier has a lead time of 4 days, so it seems reasonable to suggest that the company should re-order when the stock levels dip below 10 to make sure supplies don't run out. Or does it?

A simple rule does not mean it is an effective one. In this system, the company will carry stock throughout winter when there is likely to be zero demand and yet won't be able to meet increased demand in the summer. It falls short on both counts. The rule must be able to build in some nuance. However, even if the rules were changed to re-stock when levels are below 20 from March until October, this still doesn't account for other variables. For instance, in hot summers or school holidays the company is likely to sell more, but in unpredictably cool summers it's not. There are many factors, indeed too many factors to build into the rulebook. The problem doesn't lie with the computers following the rules, but in creating and managing the rulebook.

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The equivalent approach in the field of text processing is a keyword search. As an example, a lawyer might be looking for the change of control clause in a huge set of contracts – a keyword search might start with the words "change of control" which brings back 19% of Change of Control clauses. If we search again, this time for "change of control OR change in control" 43% are identified. This search can be expanded further by looking for "Change {of, in, in the} Control" which brings back more but the rules are harder to maintain. So, we simplify the rules to search for "Change NEAR/2 Control" but then false positives come back, for instance "change control processes". It's a balancing act. What's more, there are many different ways of wording clauses, without even considering different forms of the above: different nouns (e.g. "change in ownership"), different verbs ("transfer of control") or both (e.g. "transfer of 51% or more of shares"). These elements make maintaining rules impossible, and that's before you go beyond the English language.

Machine Learning fundamentally changes the equation. Techniques like artificial neural networks (in all their forms) provide frameworks where the computers can learn the rules for themselves. Think about humans – we don't know the difference between a chair and a stool because someone gave us a detailed description of each (exercise to the reader – try to define a chair in a way that distinguishes it from a stool or a sofa or a futon!) but because when we encountered them, people gave us the label or corrected us when we got it wrong. This is the essence of machine learning.

Prevalent in the news from driverless cars to computer chess players, it's easy to be nonchalant about machine learning technology and think it's straightforward. But to make something that works, quickly, robustly, accurately – is a completely different ballgame. Unless your system is able to understand the subtleties and the learning that humans observe and acquire, it won't produce anything revolutionary. With an in-depth understanding and application of these proprietary AI techniques,

Luminance is able to go above and beyond what is achievable with simpler techniques, to a new level of understanding the subtleties.

Luminance extracts meaning from the words alone and through this is able to provide the insight lawyers require to perform their job.

This is just one layer of the machine learning built into Luminance – with other techniques able to understand the patterns that exist through documents and data set which power other functionalities from anomalies and beyond.

There's no doubt that we have come a long way since the days of early computers and the advent of machine learning. AI can now understand the subtleties in text as humans do, giving lawyers more insight, control and speed in their work than ever before. At Luminance, technology is still at the forefront. Luminance brings true machine learning to the legal profession, letting lawyers be lawyers.

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