Waiting for cyborg scientists

by Chris Willmott, Science Editor

From time to time there are innovations whose relevance catches you by surprise. I have to admit that, for me, the applications and implications of artificial intelligence for bioscience is a case in point. I consider that I am usually quite good at “horizon-spotting”, especially in areas with ethical implications, but in the case of AI I got this spectacularly wrong.

Perhaps as a consequence of watching too much science fiction, I languished under the false impression that AI was all about engineers and computer programmers attempting to develop a humanoid being. As such, I thought of AI as being primarily of interest to disciplines more closely aligned to physics. Of course, this IS one aspect of work on artificial intelligence. I now know that what I was picturing would be termed “strong” AI (aka “artificial general intelligence” and “full AI”), the attempt to replicate human characteristics such as reasoning and intentionality. (From my recent reading it seems that within the AI field inclusion of consciousness in this list is a moot point, so we’ll leave that there for now).

What I had completely failed to appreciate in my casual dismissal of biological AI was the applications of machine learning to specific tasks, via the capacity to evolve rules. In contrast to strong AI, these are known as “weak” AI or more often “narrow AI”, due to the focused nature of the tasks achieved. A common theme seems to be exploitation of machines to recognize patterns or characteristics in information, allowing them to screen data faster and/or more accurately than a human could achieve, although interpretation and/or validation of the findings still requires human intervention.

Over the past decade it is these kinds of uses that have begun to have major implications for bioscientists. For example, multiple aspects of genomic analysis, such as identification of promoters, enhancers and transcription start sites, all involve AI. Deciphering splice sites has been a particularly fruitful application of this technology. Similarly, screening of histological specimens and X-rays for disease diagnosis, and the design of clinical trials benefit from machine learning.

Elsewhere, deep learning is being used to probe phenotypic characteristics beyond the limited range of features that could be determined by eye (in the classification of butterfly subspecies in one case). I also saw recently that AI was being used to predict the behaviour of poachers (though, ironically, this pilot study seemed to be taking place in an area where it was acknowledged that tigers had already been wiped out).

Of course, there can be issues associated with “false learning”, such as the recent removal of various BattleBots videos of duelling robots which a YouTube algorithm mistook for footage of dog fighting. On balance, however, it seems that narrow AI is already a massive component of bioscience and is set to be ever more so. How long it will be before you are joined in the lab by a conscious humanoid assistant remains to be seen.