

# Ophthherminator 3 - Rise of the Machines

## **"Bring back life form, priority one, all other priorities are rescinded."**

Film buffs will spot this as a chilling quote spoken by Ash (Ian Holm) from the classic sci-fi horror movie *Alien* (1979). Ash (spoiler alert) is a Hyperdyne Systems artificial intelligence (AI) android, who acts as an antagonist and sleeper agent throughout the movie. In this scene he reveals to Ellen Ripley (Sigourney Weaver) that his secret mission on the voyage is to bring back the alien intact at all costs and the crew and the cargo of the ship are "expendable".

I first watched this movie as a teenager, and it was one of the first of a succession of examples from both movies and television which have contributed to my pretty much unshakable view that AI is bad.

Other examples include *Westworld* (1973) which sees Yul Brunner's terrifying cowboy android in a futuristic Western-themed amusement park malfunction and start killing visitors.

In *War Games* (1983) Seattle high school student David Lightman (Matthew Broderick) uses his home microcomputer (IMSAI 8080) to hack into a US defence supercomputer known as War Operation Plan Response (WOPR). By playing the game 'Global Thermonuclear War' on WOPR, David almost brings about World War III as the computer does not understand the difference between reality and simulation.

And who can forget the classic movie *Terminator* (1984)? Arnold Schwarzenegger stars as a cyborg assassin sent back in time from 2029 to 1984 to kill Sarah Connor (Linda Hamilton), to prevent the birth of her son Kyle, who one day will save humanity from extinction by a rogue AI defence network (Skynet) in a post-apocalyptic future. The common theme amongst all these films is hostile, malevolent and uncontrollable AI systems.

Readers may say "Well what about the movie *Weird Science* (1985)?" Two geeky high school social outcasts hack into a government computer system and create Lisa (Kelly LeBrock), a beautiful and intelligent android woman with unlimited powers. Lisa then takes the boys on a journey where they gain confidence and street cred, hold a cool party, take revenge on their tormentors and get girlfriends. However, I would counter argue that because Lisa has magical powers performing acts like creating a Cadillac and a Porsche 928 out of thin air, this renders it not a believable android and therefore cannot be used as evidence against my argument that all AI is bad. Obviously, all other AI movies are totally believable.

## **AI in ophthalmology**

This leads me on quite nicely, in a Barry Norman kind of way, to AI in ophthalmology. "And why not?". When I first started in ophthalmology over two decades ago, there were no computers in the clinic rooms in the department, and I was accessing the internet via my PC from home with a frustratingly slow dial up modem (Gen Zers will need to Google) which kept on crashing mid page download. Since these Dark Ages there has been an exponential rise in computer dependence in clinical ophthalmology such that any prolonged spinning wheel buffering when performing simple tasks such as outcoming a patient on the appointments system results in much pounding of the keyboard with fists shouting "Just do it!".

More importantly, especially in my subspecialty of medical retina, there is a much greater reliance on medical photography and digital imaging. I have to confess, I did scoff at the pixelated graphics (which were worse than Manic Miner on the ZX Spectrum) on the images from the first Zeiss Stratus optical coherence tomography (OCT) machine when it pitched up in my department in 2006. However, since then the technology has developed so rapidly such that I am now blown away by the quality of the scans from the ubiquitous Heidelberg Spectralis OCT machine, which have rendered my Volk 78D macula lens ophthalmoscopy skills pretty much redundant.

There is no doubt that the advancements in imaging in ophthalmology have transformed our ability to diagnose and manage patients. Conditions which were previously hard to diagnose with a Volk ophthalmoscopy lens such as vitreomacular traction and perifoveal telangiectasia are now instantly recognisable on the OCT scan images. However, there are clouds on the horizon, as the gas attendant says to Sarah Connor at the end of film *Terminator*: "There's a storm coming...".

Ground-breaking ophthalmology related AI papers such as De Fauw, et al's 'Clinically applicable deep learning for diagnosis and referral in retinal disease' in *Nature Medicine* (arising from a collaboration with Google's DeepMind) are being published with alarming regularity. These papers are unsettling, not only because they highlight the inadequacies of the local research studies and case reports which I occasionally peddle to *Eye*, *Acta Ophthalmologica* and the *Journal of Last Resort* etc., but also because I perceive them

as potentially making my role as a clinician less viable. The AI is now so advanced that it can also perform tasks which the clinician cannot, such as determine a patient's sex from a fundal photo. Worryingly, we do not know how the AI can do this, it just can.

AI is now able to perform superhuman feats through deep learning. For example, Go is a complicated game of strategy invented in China over 2500 years ago that requires intuition, creative and strategic thinking. After several decades of limited success in creating a computer capable of playing Go to a reasonable level, Google's DeepMind lab created the program AlphaGo. Through deep learning techniques it was able to beat Ke Jie, the number 1 player in the world, three times in a row in 2017. However, the follow-up program AlphaGo Zero then became a Go master in just three days by playing 4.9 million games against itself in quick succession. In a brief amount of time the program had gained all the knowledge about the game which had been accumulated over 2500 years and also discovered things which were previously unknown to humans. It takes me at least a week of not very deep learning to remember to avoid a pothole on the road to work which I successfully hit on a daily basis much to the delight of my local car mechanic.

## **Will a robot take my job?**

I have three teenage children who I am hoping at some stage will have fulfilling and enjoyable careers and eventually come off the parental payroll. As they fill out their UCAS forms though, I am encouraging them to choose careers which are not likely to be replaced by robots. This can be checked on websites such as [willrobotstakemyjob.com](http://willrobotstakemyjob.com) I have always considered that my role as an ophthalmologist specialising in medical retina as being fairly safe but with the rise of AI, I am not so sure now.

AI machines may eventually be able to diagnose and formulate management plans for medical retina patients better than me. But I reassure myself that any potential future robot medical retina doctor will not have other skills such as be able to develop rapport with patients or show empathy. They will not be able at the same consultation to examine the small lid cyst bothering the patient, view the peripheral fundus looking for a cause for an intermittent flickering light and then list the best potential Celtic football manager replacements to a football mad Hearts fan patient.

But will future robot AI doctors be able to perform better clinically than humans and

also develop relationships with patients and show empathy?

Margiotta Food and Wine is an upmarket chain of minimarkets in Edinburgh. Recently they trialled a robot called Fabio, developed by a team from Heriot-Watt University, at their flagship store. The robot would greet customers, cracking jokes and offering hugs and direct customers around the shop to find items they were looking for. However, following initial successes, after a while they found the customers started to avoid the robot. Eventually, when the manager told Fabio it was fired, it replied "Are you angry?". More importantly though, the staff at the shop were upset and one started crying when the robot was boxed up and taken away, thereby showing that they had developed an emotional attachment to the robot.

Harry, both consultant VR colleague and cycling companion, would love to see my medical retina job plan replaced with a computer algorithm, so that I would then slide down the career snake and see out the rest of my days sitting on a perch in eye casualty consulting a steady stream of red eyes. In fact, he never loses an opportunity to wind me up about this and has even helpfully identified a potential location for a community hub in an out-of-town shopping centre for me to do some outreach "itchy, burny" red eye clinics.

So I would like to ask those carrying out research into AI in medical retina to please try and hold your horses and slow it down a bit, at least until I can retire to that nirvana of a villa in the sun that most of us dream about. I have already done my time (weekdays, weekends, bank holidays, etc.) back in the day seeing red eyes in eye casualty as a trainee. In the words of Uncle Pete (Charlie Chuck) from the TV show *The Smell of Reeves and Mortimer*: "Don't send me back to t'dark place". If not, I'll be coming after your medical retina android like Arnold Schwarzenegger's Terminator and uttering the immortal words:

"Hasta la vista, baby"

Postscript: *Ophthterminator 4: Salvation*

### The resistance

I recently discovered that my personal crusade against the AI robots to prevent a latter stage career change to Deliveroo cyclist may not actually be required. It appears the rise against the machines has already begun.

HitchBOT was a Canadian hitchhiking robot developed at Ryerson University, Toronto. Professor Zeller designed the robot "to learn about how people interact with technology and ask the question,

'Can robots trust human beings?'. The robot successfully hitchhiked across Canada, Germany and the Netherlands to international acclaim. However, its attempted hitchhiking traverse of the USA from Boston to San Francisco was prematurely cut short when it was "stripped and decapitated" in Philadelphia, Pennsylvania. It was destroyed beyond repair and the head was never found.

Maybe HitchBOT was just unlucky and this would not have had happened anywhere else. If the television series *It's Always Sunny in Philadelphia* is representative of the type of characters that populate the city then maybe I can believe that. But there is a small glimmer of hope that there is some resistance to a post-apocalyptic AI robot future.

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