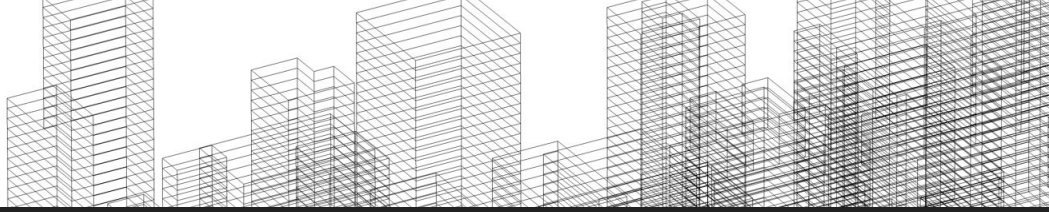


How can Emerging Technologies be deployed to transform Sustainability?

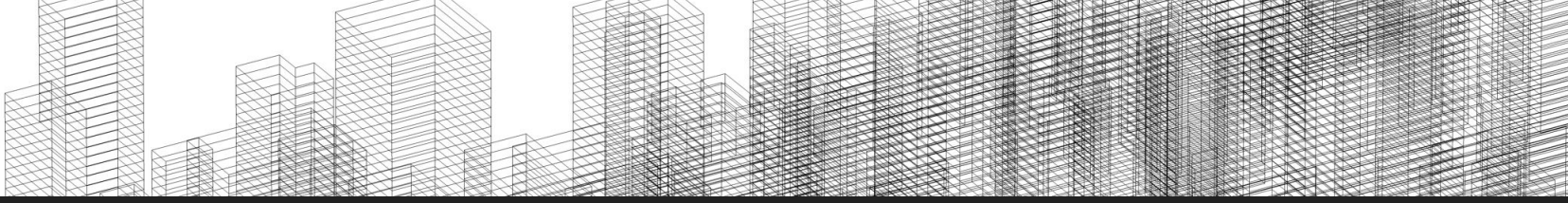
Harvey Green, Year 13



Artificial Intelligence

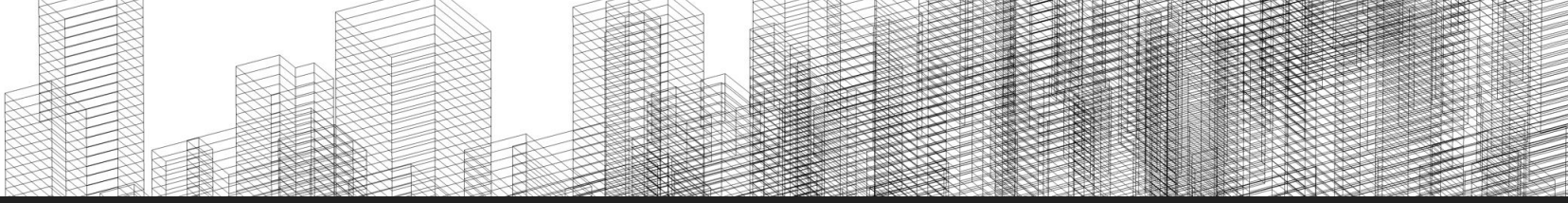
Fig.1

AI is one of the biggest and fastest growing news headlines in recent years. The ability to have a human-like approach to problem solving, at a higher degree of accuracy and speed is something all companies are striving for. Crunching massive amounts of data to spot trends, potential hazards or even to increase profits have all been taken over by powerful computers to increase efficiency. Real life examples include using AI to improve the accuracy of a weather forecast or predicting energy consumption patterns. Although a lot of AI technologies are still being updated to allow them to be fully integrated, AI is most commonly used to scan environmental effects, such as detecting change in land use or tracking endangered whales to monitor their mating cycle. My personal favourite AI integration is automatic fire detection systems (Fig.1), which compares images to detect smoke and can alert emergency services before the trees themselves are alight, saving lives of both wildlife and humans.



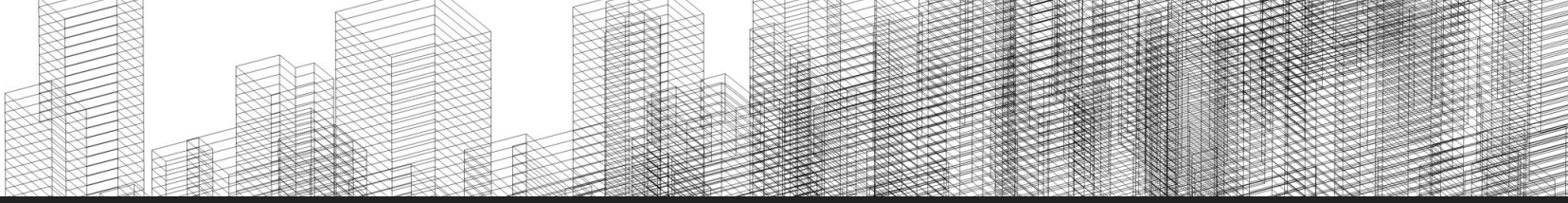
Reusable **R**ockets

Although Elon Musk is most famously known for his work in development of electric vehicles with Tesla, the sister company SpaceX has increased in popularity after its successful launch of Falcon 9. Falcon 9 is the first orbital class rocket capable of reflight, it is a two-stage rocket that is designed to return the most resource expensive parts of the rocket. It has an incredibly advanced computer system that allows the rocket to return to spot determined by the control room, this is unique, as weather conditions have been known to impact the landing of international rockets ; this reduces the risk of damaging rockets and ensures the rocket can be reused. The other key part of its computer system is the advanced gyroscopes that can monitor the angle, speed and altitude of the rocket to guarantee the safe landing of the rocket. The main sustainability factors of this is incredible, all of the waste that would otherwise end up in orbit can be returned to be reused. It also reduces the need for more material to be manufactured. Overall the impact from reusable rockets will be one of the most significant jumps in history to a more sustainable future.



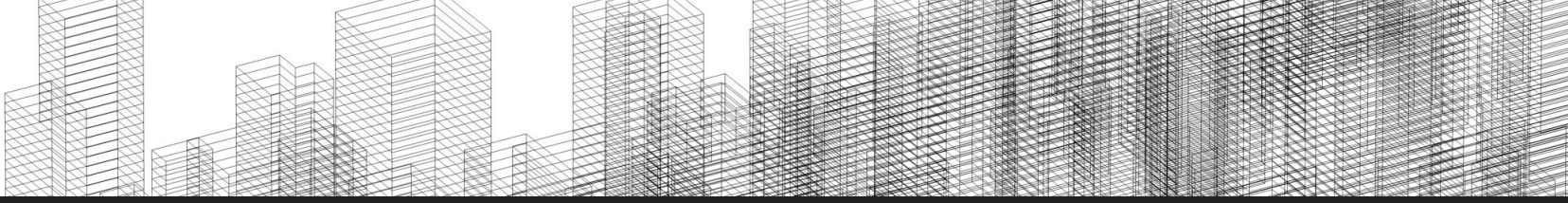
Electric and **H**ydrogen **V**ehicles

A somewhat overlooked technology is the complete integration of electric and hydrogen powered vehicles, opposed to the stereotypical petrol and diesel engines. The limitations are long at this current time unfortunately, however in the coming years I am hopeful that they are outweighed by the benefits to this transition. Issues like range, resource gathering and reliability are always raised with this topic. However, with electric vehicles getting more and more limelight, I worry that eTrucks are slowly being pushed to one side of the global news. An average truck drives ~108,000 miles per year, whereas the average car does less than 10,000 miles per year. Although the technology is still in development to create efficient, reliable, fast charging electric trucks, if even half the UK trucks were replaced there would be a significant decline in CO2 emissions from transport - and this stretches to other large transport vehicles, such as buses or vans. Although electric cars are an important part of development, the integration with the shipping industry would be a crucial passing point on our journey to lower CO2 emissions.



Google's **W**ater **C**ooled **S**ervers

The biggest environmental impact for large corporations are their emissions, not only from heating facilities, but also from cooling. Google has some of the largest data centers in the world, and with the rows upon rows of server racks, you can imagine how hot it becomes. Not only is this an environmental problem itself, but the heat requires parts to be replaced sooner, and for components to run poorly, therefore having to allocate them more power. This is where Google's exclusive water cooling facilities come into their own ; they have multiple contracts across the globe to pump water from lakes and oceans to more cleanly and efficiently cool their machines. Up to 539 million gallons of water per year are being used, however how is it actually being "used"? The slightly warm water is quickly mixed with cold water to bring it back down to the water body's temperature, and then released back with minimal wastage. Although you could argue the existence of these facilities themselves have a negative environmental impact, it is crucial that companies find the most efficient and cleanest way to cool their facilities. Google is at the cutting edge of this development after the integration of TPU 3.0 required so much cooling that air simply couldn't provide.



Conclusion

The points I have highlighted in this presentation are but a handful of the upcoming technologies that can transform sustainability. All of these technologies are starting to be implemented, however as always, there is always room for improvement and making the programs more efficient. Big companies, like Google and Tesla are the ringleaders for massive technological advancements in everyday life that greatly contribute to a more sustainable future. AI is for me the most important advancement we can have soon, as the majority of companies could use it, even if is just to monitor their CO2 emissions and how to reduce them. Updating the public transport system and shipping vehicles will lead to a massive drop in greenhouse gas emissions and we can use the increasingly more intelligent AI services to monitor the output and identify which areas have an increased level of emission. In conclusion, these emerging technologies can be used in a variety of ways to not only transform sustainability but also completely reinvent sustainability in a way we have never seen before.