Artificial Intelligence & Sustainability

2023

Opportunities | Applications | Risks

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Introduction: Market Opportunities

As Artificial Intelligence (AI) became more prevalent in 2023, we saw an increasing number of enquiries around how this influences our portfolios and, more broadly, how AI can contribute to and enable a more sustainable future.

The potential for AI is enormous, with some estimates suggesting that the market size could expand twenty-fold to reach US$2.7 trillion in ten years time.[1] AI technology has reached a point of rapid change – with performance improvements, ease of accessibility and greater public awareness. Using AI has the potential to have substantial benefits for organisations in the form of higher revenue and/or lower costs, given the positive effect it will have upon productivity and efficiency.

AI can be understood as a wide-ranging branch of computer science that is concerned with building smart machines capable of performing tasks that previously would require human intelligence. Whilst having multiple approaches, advancements in machine learning and deep learning are, in particular, driving the revolution.[2]In the development of this technology, the so-called "hyperscalers", such as Amazon, Microsoft and Google are in a strong position as they have exposure to all elements within the AI stack. This includes Hardware & Software, Infrastructure and Modelling.[3]

For reasons we have documented extensively, we avoid exposure to the FAANG companies for ESG concerns, namely social issues, including data misuse, anticompetitive behaviour, and aggressive tax practices. Where portfolios might have exposure to developers is in the cybersecurity sector, where vendors have been leveraging this technology for a long period of time. What is particularly interesting for our investment thinking and portfolios is the emerging applications of AI in the real economy.

AI will enable humans to harness vast amounts of data and make breakthrough advances across various industries. It has the potential to enable significant progress towards sustainable development, through both environmental and social improvements. But with this will come complex challenges and questions around how this technology will affect society and how it can be used equitably. We need to think beyond the technology itself, and consider the need for ethical frameworks, evolution of laws, education, training and much more, so that its benefits can be felt universally.[4]

Environmental Applications

It has been established that human activity has caused significant harm to the planet by rapidly increasing emissions of greenhouse gases and destroying nature and biodiversity.[5] The challenges that we face as a result require us to start living within planetary boundaries, which can be helped by more effective monitoring, modelling and management of Earth's natural systems. At the same time, populations and consumption are expected to increase significantly. What is clear is that we need to produce more from less. It is in doing that which the use of AI has the potential to make significant gains through optimising the use of inputs, increasing output, and automating manual and routine tasks to improve efficiency.[6]Agriculture, energy, and water are three vital sectors for human society where AI-enabled advancements have the potential to positively impact upon the environment.

Predictive AI: A Boost for Water Management

In the face of climate change and growing water scarcity, AI can be used to enable greater conservation of natural resources. According to the World Data Lab, almost a third of the world's population is estimated to be living in water-scarce areas.[7] Through AI-enabled demand monitoring and prediction, suppliers can pre-empt water demand, minimising wastage and shortage. This is particularly an issue in large cities with dense populations, many of which experience water scarcity and inequitable access. Data such as reservoir flow, weather patterns, and industrial or residential consumption levels can be used to predict peak demands and identify shortfalls.[8]

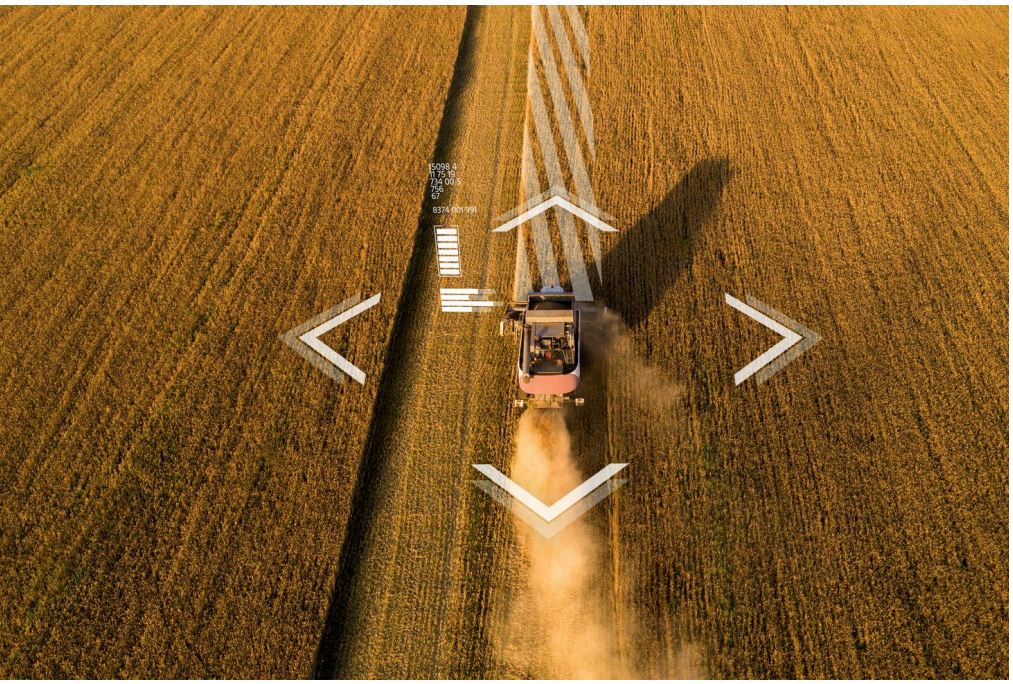
As part of an industry trial, portfolio company Severn Trent is leveraging AI to predict weather conditions, forecast maintenance of key infrastructure, and control waste flows. For example, if heavy rain is predicted, the network will automatically optimise storage ready for the extra flow – diverting away from overflow areas and hot spots to reduce the risk of flooding and pollution.[9] The forecasting of maintenance is a key potential gain; real-time monitoring of infrastructure and prediction of faults can have huge optimisation benefits for water systems, in particular reducing the risk of wastage and contamination.[10]

Like the agricultural sector below, the effectiveness of AI in making efficiency gains within water systems will depend upon the implementation of data infrastructure. In this case, there is a need to deploy innovative solutions and infrastructure for underserved communities in developing countries. This means that functionality requirements can be incorporated from the start, whereas developed countries with existing infrastructure may need investment in upgrading works.[11]

AI in the Field: Boosting Food Supply

Agriculture is a core area where AI is expected to boost production whilst lowering costs and inputs. AI can facilitate precision monitoring of environmental conditions such as crop moisture, soil composition, and temperature to enable farmers to increase yields by taking better care of their crops, whilst using the most efficient amount of water and fertiliser.[12] Portfolio company Lindsay Corporation, for instance, offers a solution that combines science and experience with cloud computing, remote sensing, and machine learning to provide farmers with field and crop specific irrigation recommendations.[13] AI can also improve the monitoring of crop, soil, and livestock health – monitoring and identifying pests in real time to inform the use of pesticides including volume needed and specific locations to target.[14]

The key to these solutions is access to data and connection to the Internet of Things to continually pull in masses of information and data. For the benefits of AI to be felt, there will need to be a focus on developing the infrastructure required for this, given many rural areas still face limited connectivity, alongside the education of professionals on how to maximise its use.[15] This development of infrastructure will be particularly important for developing nations to take advantage of the gains that AI can bring to agricultural production. The use of AI in agriculture can lower costs and enhance production, contributing to the fight against food shortages whilst reducing the environmental impact of the sector. While development of the technology is a crucial step forward, investment into the infrastructure surrounding agriculture to enable farmers to implement AI is just as critical.



Optimising the Clean Energy Revolution

Another way in which AI can help to work towards a more efficient use of our planet's resources is through its implementation into the energy sector. One way in which it can do this is through increasing the operational efficiency of renewable energy assets. Portfolio company Vestas Wind Systems, for example, undertook a project with Microsoft partner minds.ai to minimise the wake effect in wind farms to increase energy production. Wind turbines cast a wake that can slow downstream turbines. Using wake steering, whereby rotors are turned to deflect the oncoming wake, energy can be recaptured. This is done using high-performance computing and reinforcement learning, a form of machine learning – whereby AI can interact with and learn from the environment in real-time.[16]

As well as improvements in renewable generation, AI will allow more accurate demand forecasting and grid optimisation, a key factor that will become increasingly important as energy systems become more decentralised. It will facilitate more effective management of energy demand, optimising consumption and intelligently distributing resources to where they are needed while reducing waste.[17] However, these gains will require the processing of vast amounts of data in combination with the Internet of Things. Its effectiveness, therefore, in the transition to Net-Zero will not depend upon the technology alone. Large amounts of data processing require large amounts of computing power. Therefore, AI can only gain its full potential as we green the energy sources that power it. Whilst AI can make green energy more attractive by reducing its cost through efficiency gains, the clean energy revolution requires policymakers and companies to phase out fossil fuels and implement renewables into the energy systems powering AI.

Social Risks and Opportunities

AI is a powerful technology with the potential to transform the world we live in. It is already being used to streamline operations, automate processes, and make decisions. As AI continues to develop, it is expected to have a major impact on the workforce – both in terms of job displacement and creating new jobs that might not exist today. The need for workers to navigate new skills to utilise AI tools is a challenge, particularly in countries where access to digital infrastructure and education is limited. Therefore, AI tools designed for easy integration into workflows and use in underdeveloped areas are at an advantage. The potential social dangers of AI are a serious concern for investors – including data bias, discrimination, and invasion of privacy. To minimise exposure to these issues, investors can seek out AI-related investments with robust governance practices.

Impact on the workforce

AI is projected to be a major cause of job displacement in the next five years. A recent report by the World Economic Forum (WEF) found that nearly 75% of companies plan to adopt AI in the next five years, and 50% expect it to create job growth.[18] Jobs that are routine, repetitive, and predictable – such as those in manufacturing, customer service, and data entry – are at higher risk of being replaced by AI. At the same time, AI is predicted to generate new jobs in areas such as AI development, data analysis, and creative content creation.

Beyond changing the number of jobs on the market, AI could change the very nature of work. Through task automation, data-driven decision making, and enhanced personalisation, AI can complement and enhance human capabilities.

AI offers ways to perform complex, integrated tasks more efficiently. We could see major advancements in the medical industry by leveraging AI to analyse patient histories, increase speed of diagnosis, and create tailored treatment plans. For example, portfolio company Renalytix has successfully engineered an AI-enabled solution that detects under-recognised kidney disease in adult patients with type 2 diabetes by using proven biomarkers.[19] By enhancing diagnostic precision, Renalytix is poised to transform how the healthcare industry approaches renal care.

However, underserved communities often have limited access to medical facilities – let alone those which utilise these AI-powered diagnostic tools or treatment plans. AI can be used to enhance telemedicine, bringing medical care directly to those who need it. This benefits those living in rural areas who may prefer more flexible home-based arrangements. For example, Butterfly Network (not held in portfolios) has developed AI-powered ultrasound devices allowing healthcare providers to bring rapid, remote prenatal scanning to detect pregnancy-related complications for women in Nairobi, Kenya.[20]

Barriers to adoption

One of the key challenges will be integrating AI into workflows, with workers having to navigate the new set of skills needed. AI tools which can be used with limited training and are easily integrated into existing processes will face lower barriers to adoption. For instance, Renalytix's AI-enabled kidney disease prognostic is designed for easy integration with clinical workflows in independent practices and large-scale systems.

Developing countries may struggle to balance investments into information and communication technologies (ICT) infrastructure with other pressing priorities such as eliminating poverty and boosting food production. These barriers can lead to a digital divide, as gains are seen by countries already leading AI-enabled economic opportunities while others are left behind. To help bridge the gap, the World Bank invests in research and development initiatives which boost adoption of AI technologies in Ethiopia and other African countries.[21]

Social dangers of AI

AI systems are trained on data, providing the chance for unconscious biases to creep in. In turn, this could result in decisions that are unfair towards certain groups of people. For example, a facial recognition AI system trained on inadequate or biased data may be more likely to wrongly identify people from specific racial groups.[22] To minimise such occurrences, it is crucial to evaluate AI systems for bias and utilise datasets which are representative of the population.

With AI being trained on large amounts of personal data – such as photos, medical history, location data – there is enormous potential for abuse and misuse. Businesses must be transparent about data collection and usage by implementing clear governance policies to safeguard user privacy. AI products can be specifically designed to help organisations protect data from external threats of abuse and misuse, further mitigating the risk of data breaches.

Cybersecurity is a sector where we see investable opportunities into AI developers themselves. As the world becomes increasingly digitalised, effective cyber-security becomes vital for a sustainable future. In an increasingly interconnected world, cyber-attacks which expose vulnerabilities in digital infrastructure are a key concern.[23] Portfolio company Darktrace is a cyber-security platform that uses machine learning and AI algorithms to neutralise cyber threats. Their technology constantly learns and adapts to autonomously defend organisations against a diverse range of cyber-attacks.

Governance Considerations

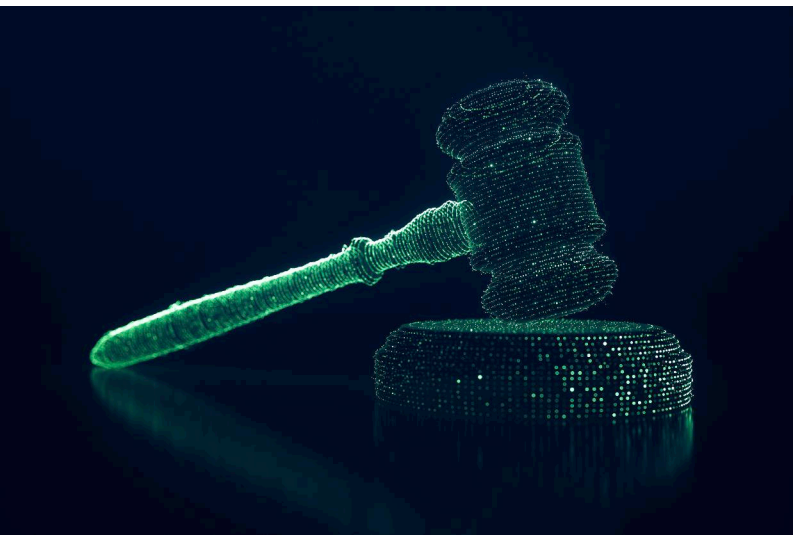
Within AI, ethics and regulation has been a source of debate, with several developers themselves calling for urgent implementation. Regulations play an important role in driving innovation whilst ensuring the safety of AI systems. However, it is unlikely that they can keep up with the pace of AI innovation. In addition, rules that are impractical and difficult to comply with could slow down the adoption of AI in specific regions.[24]

In many jurisdictions, regulations are under development, and their aim has been to protect the rights of citizens but also to attract new industries and minimise the flight of intellectual property. It is therefore in the interests of both businesses and policymakers to ensure innovation, growth, and trust in AI which can be achieved through effective regulation and strong governance frameworks.[25]

In June 2023, the EU adopted its negotiating position on the AI Act, expected to be finalised by the end of the year.[26] The Act sets out rules for generative AI firms to publish summarised versions of copyrighted data used for training. The Act also bans intrusive and discriminatory uses of AI deemed to violate privacy rights, such as untargeted scraping of facial images to create facial recognition databases.[27]

The National AI Act of 2020 (NAII Act) is a major milestone in the United States' efforts to promote the responsible use of AI. As a leading force in AI development, the US has great potential to influence the industry on a global scale. The US is now in the early stages of implementing the NAII Act. It specifies in certain provisions to coordinate research and development at the federal level and requires the development of ethical guidelines for AI based on fairness, transparency, accountability, and robustness.

Singapore's National AI Strategy sets out a roadmap to develop and deploy AI solutions with the aim of generating economic gains and improving lives.[28] The Strategy emphasises the importance of building public trust. To this end, the government will work with stakeholders to create a regulatory framework for the development and use of AI.



Good governance in AI-related investments

Trust is the essential foundation for the widescale adoption of transformative AI solutions. Investors can look out for the following in assessing governance practices of companies.[29]

Governance Structure	Operations Management	Stakeholder Interaction
· How does the firm's governance structure enable its plan for responsible AI? · How are roles and responsibilities to manage AI risks defined?	· How has the firm identified potential dangers linked to business operations, which includes adequacy of training data and potential bias?	· How has the firm made AI policies known to users? · What are the avenues and processes for those with grievances and disputes?

As well as building trust in the technology as a whole, good governance practices will have financial benefits on companies. Robust practices can help build international recognition, allowing businesses to tap into new markets without being tied up by growing regulatory hurdles. Investing in AI compliance measures such as hiring ethics experts or data bias assessments may temporarily increase costs. However, these measures can safeguard firms from poor business practices and reputational damage due to criminal investigations and data breaches. Improved customer satisfaction and loyalty from good customer service can also boost revenues.

Conclusion

It is clear that AI can be a real force for good as we look to develop a digital and sustainable economy that produces more at a lower cost to the planet. AI has the potential to positively impact People, Planet, and Profits (3Ps) through improved optimisation, efficiency, and waste reduction. It will facilitate technological advancements in sectors such as healthcare whilst transforming the workplace and the nature of work for the better.

But AI's power to do good is not down to the technology alone, and there are key risks that must be considered. To allow more people to experience the benefits of AI and digital transformation, further infrastructure development is needed in digitally disconnected regions. This needs to be accompanied by the reskilling of those who face job displacement, and mitigation of the potential negative environmental impacts large quantities of data processing has. It will also become increasingly important to take steps to protect society from personal data and privacy threats. Effective regulation and good governance practices is the final necessity for building trust and facilitating further innovation, enabling AI to be used most effectively towards a sustainable future.

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