

Do the potential positive benefits outweigh the potential negative consequences of Artificial Intelligence on society?

Artificial intelligence is a field which combines computer science and robust datasets, to enable problem-solving. It is the intelligence of machines or software, as opposed to the intelligence of human beings. So why is it such an important topic? AI has been one of the biggest topics in modern times due to the rate at which AI is affecting the global economy as well as rising concerns with fear of job redundancies and safety. People are afraid that AI will replace their current jobs and safety concerns relating to fraud are a worry across many businesses and multinational companies. I believe it is important we develop an understanding of the future potential of AI and its possible impacts on certain industries and in turn society. For the benefit of this report, the areas I will be focusing on will be:

- The Labour Market.
- Stock Markets.
- Medical industry.

Following initial research, I believe these three topics will certainly be affected by AI as they have huge potential benefits and negatives.

These are not the only areas that AI could affect. For example, industries connected to military and defence, such as naval applications, cybersecurity and the application of drones will also have potentially huge impacts. Military application will also carry many possible negative and positive effects, but this is only one part of the economy. Areas such as the labour market and medicine will have greater consequences than other fields due to potential larger effects on the global economy. I also believe that the effect on the stock market is underestimated. There is the possibility of income inequality and how AI may play a part in a recessionary bear market.

I will be measuring the extent of the positive and negative consequences on each industry by applying the following criteria:

- The number of people that will be affected by the consequence.
- The implications for society.
- The future potential of the consequence.
- The amount of time the consequence will take to influence society.

I will also be taking into consideration specific parts of each topic that is special to that field, such as in medicine, and how practices should be conducted.

The impact on the labour market

The first main concern of Artificial intelligence is the ability to replace an existing workforce. Artificial intelligence is likely to replace low skilled labour first. 'Pretty much every job involving paperwork should be automatable,' (Ben Goertzel 2023). As Artificial intelligence replicates the intelligence of a human brain, AI can perform algorithms using a neural network to complete tasks and make jobs such as paperwork involved tasks automated. As an example, the type of job that is likely to be replaced is a Call Centre Operator (Fiona Jackson, Stacy Liberatore 2023). This is because of the power of AI chat bots

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being used by big companies such as Mastercard and Spotify can automate this position and have customers talk to a generated bot, this is all done with the use of Language modelling which is a technique that predicts the order of words in a sentence using machine learning algorithms that continuously learn and train with data (Code.org YouTube, 2023). This is just one example; many other occupations are at risk too, such as teachers and cashiers.

Teachers are at risk because of the introduction of personal tutors and online learning. Personal AI created tutors can learn the syllabus using a cognitive human like neural network. The AI tutors can then store data that students get wrong and amend the education style to their weaknesses (Ethan Mollick, 2023). This can be shown with the growth of Duolingo which is an educational application to teach people new languages and AI is implemented in various parts. Cashiers are being replaced in real time, corporations such as Tesco's have made 1,750 jobs cut (Zoe Adams, 2023) and are being replaced by self-checkouts that use algorithms and software to check out a customer. However, this is not all bad news as some jobs are at the moment irreplaceable by machines because presently AI cannot surpass the cognitive ability of a human. This is due to an inability at present to complete complex multistage reasoning like a human brain can do. AI cannot perform variation-oriented jobs when a human completes many different tasks. However, with this fast-growing technology if these issues are overcome in the future and AI progresses to perform more complex tasks, more forms of employment could be at risk.

According to Goldman Sachs, an investment banking company, an estimated 300 million jobs could be lost or diminished as a result of AI application. (Mark Talmage, 2023).

What are the beneficial consequences for the Labour market?

This potential loss of 300 million jobs is likely to be from low skilled labour, but the benefits might outweigh the negatives. One benefit is job creation, although AI has a risk of replacing workers it also has a huge beneficial consequence of creating many jobs such as software engineers, to create AI algorithms for large companies like Amazon. This will inevitably have knock on effects on society; if more jobs are created the population has more disposable income and thus living standards improve. An often-overlooked benefit of AI on the labour market is the replacement of labour that people are unwilling to do, the main two for this benefit are dangerous jobs and low skilled jobs like cleaners. Dangerous jobs such as crane operators could be automated soon (willrobotstakemyjob.com, 2022). Often operators must climb ladders all the way to the top which can be exhausting and unsafe. Due to their height cranes are exposed to wind and greater physical forces are placed on the structure, so both points create a large risk for crane operators with an average of 42 deaths happening per year between 2011 to 2017 relating to crane accidents. (Anesilaw, 2018).

Automating these jobs using AI algorithms that can learn and adapt to the requirements of the job using machine learning to predict certain aspects of the task can significantly reduce the number of fatalities and overall benefit society. Google is crediting AI for boosting profits in the first quarter of 2024 of \$20.7 billion dollars and a revenue of \$86.3 billion. This has been achieved with AI filling many former human held positions. For example, with ad sales, unit staff machine learning is being leveraged to generate

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marketing ideas and copy for advertisers. The AI tools used for this specific job have large revenue and profit margins and are low cost compared to human ad sales unit staff (ETech, 2024). This is an example of how AI is helping firms gain market share and revenue which can be seen as positive for their business and is helping corporations to expand. However, it inevitably will make jobs redundant and thus worsen the economy. On the other hand, this consequence may create more jobs, if firms are able to expand, they may require more workers on jobs which require human intuition like front end developers. Front end developers focus on the graphical user interface which is what the user sees when they open websites. AI presently lacks this level of creativity, and this can result in reduced aesthetically pleasing interface creation. One of the main positives will therefore be the creation of jobs that require a different skill set.

What are the negative consequences for the labour market?

The main negative consequence of AI on the labour market is firstly job redundancies, if jobs are replaced faster than the creation rate there may be a break in the current job model. One way to tackle this would be supporting career changes as AI will bring a wave of new opportunities. (Mark Talmage, 2024) However, this can lead to huge negative consequences, workers face job uncertainty and also there is a decrease in productivity if workers are unhappy with new working conditions and job roles. There could be great economic uncertainty with a huge question needing answering; how will people earn a wage? This uncertainty was evident when thousands of technology leaders signed an agreement to put a hold on any AI development due to a risk to humanity and employment. This hold could also have a negative knock-on effect to companies that have planned to utilise AI and potentially lose revenue and investment for the firms. Furthermore, we can see that already in May 2023 3900 jobs were lost that were directly attributed to AI. AI is the seventh largest contributor to job displacement, and this also results in costs for governments increasing as spending on benefits increases. (Seo, 2024)

Another drawback is AI applicability. AI cannot be utilized in every job and may not be reliable in certain sectors. A good example would be Directors, managers, and CEOs. These roles are based on managing the company's team and managing investments. However, investors are likely to feel uncomfortable investing with robots and AI algorithms rather than a person that has acquired years of knowledge on the company's role and functioning and understands the team well and profitable investments, CEOs are also prominently well known for having a good track record of return on investments and market knowledge and thus are more likely to be trusted by investors when compared to AI. AI is unlikely to replace this job in the near future as AI is not a leader, it is an algorithm trained on large amounts of data. Although this a drawback or negative for big business it is certainly a positive for the retention of Human facing jobs.

The future of AI is unpredictable, which is a sole reason for the growing concern. Countless predictions are made year to year and society is becoming skeptical about future changes globally. MIT stated that two million manufacturing jobs could be lost by 2025. (Mark 2024) This is a worrying statistic especially for anyone withing the manufacturing field. We could see a future full of manufactured goods made by AI that has similar cognitive behaviors and reasoning to that of a human. However, this is long term and

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is unlikely to be 100% accurate, many claims have been made prior to this and have been found to be thus far untrue but some claims are particularly accurate. Today we have seen applications globally and AI is being used across many fields, currently AI is being implemented by law firms to boost productivity by using AI algorithms to fill in work. Autocompletion is another feature that is being implemented, this is when machine learning and large language models are combined to predict a sequence of words. Algorithms that can fill in mass paperwork for barristers and judges can save huge costs.

In the UK regulators closely examine the use of AI in applications and the risk posed by the implementation. However, there is a huge problem with the concept of AI developing faster than the implementation of regulation. Many public officials are unaware of the effects and potential risks AI poses and therefore are unable to create regulation revolving around the predicted risks. Currently the steps taken by the UK government are to promote AI research (Michelle Donelan MP, 2023). By deep diving into the specifics of AI and gaining a better understanding, governments globally can create more targeted approaches towards AI risks. The time scale of these consequences is varied, the current worry of job redundancy with low skilled labour is almost certain within the near future and this is supported by the current applications of AI algorithms to complete tasks. However, some consequences may not even happen if there are agreements by governments to pass laws to limit the extent of AI applications for the future.

Do the positive beneficial consequences outweigh the negative?

I believe that there are significant beneficial consequences to the implementation of AI on the labour market which may outweigh the negative consequences. This is because although AI is likely to replace many workers AI it is also likely to create more jobs. Throughout the development of society there have been four industrial revolutions, and these four revolutions changed the role of the labour market in its entirety by both destroying certain sectors and creating new sectors. I believe AI will have a similar effect and change the structure of the labour market rather than remove sectors without replacement. However, in the short term the negative consequences will have larger effects than the beneficial consequences. People are instilled with fear because of job security and there is a huge concern with the functionality of society if AI is used by MNCs globally instead of human labour and there is a worry that greater company's revenue can strengthen monopoly power and further divide income equality globally. However, I do believe that the beneficial consequences counteract this, particularly replacing often avoided work, so therefore I believe that the application of AI in the labour market will have a more beneficial consequence rather than negative over time. As with the industrial revolution, the labour market changed, and society moved forward just as it inevitably will with AI.

The impact on the stock market

The stock market is a collection of publicly listed companies. Their shares are listed on stock exchanges around the world, which act as a trading platform for investors to meet to buy and sell shares. In the past you would have been required to contact a brokerage firm which acts as a middleman between the IPO and the investor. More recently trades became electronic with the introduction of the internet,

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brokerage firms took the steps to place their platform online. Investors also changed the way that they invest using programmable high-level language algorithms that would act as indicators to determine whether a trade is profitable or not. Nowadays AI implementation in the stock market is becoming so commonplace with almost every trading platform making use of AI whether its bots or assessing performance. AI is currently affecting stock trading using order execution; Order execution algorithms consist of a set of trading rules that have the objective of dividing a large order into smaller ones in order to minimise market impact and thus obtain a better average fill price. To fully grasp an understanding of this AI tactic to achieve better average fill prices, limit orders and market orders need to be understood. Limit orders allow traders to set a maximum price for the stock or asset they want to purchase, and they can also choose a minimum price for selling assets, they can be thought of a price floor and price ceiling. A market order allows traders to sell a specific number of shares at an uncertain price. So, LP has a better average price as the price is known but this is at the cost of an inability to fulfill desired quantity. But this depends on how aggressively placed the market price is to the limit price. Order executions can use an AI algorithm to get the best of both LP and OP whilst still fulfilling order quantity.

The first type of Order execution is Volume-Weighted Average price which aims to use volume AI algorithms to determine trades. When there is a high volume of trades, naturally the demand increases for the stock thus price increases. By utilising AI algorithms investors can gain an insight to a prediction of volume to make optimal profit. Taking in parameters in the AI algorithm such as the time of the day, the day of the week and any special days, AI uses lots of historical data to base trades of and VWAPs are based on historical data. (Marty MK, 2024). Another implementation of AI algorithmic trading is Implementation shortfall algorithms, an implementation shortfall is when an order is committed but there is a delay in the execution of the order and thus giving a different price when the order is created which is known as the Implementation shortfall. An IS algorithm objective is to minimize the execution cost, there are two sections to IS algorithms a positive and negative alpha, a positive alpha means that there is a positive slippage vice versa (Adam Hayes, 2023). AI is also affecting the stock market with high frequency trades (HFTs) which is when large number of orders are committed within seconds, this is useful to allow an easier trading experience with large order creation using AI algorithms. As well as this technical indicators can be used which analyses all the market data including price data, volume data and liquidity using large amounts of data.

What are the beneficial consequences of the use of AI in the stock market?

Using algorithms to commit trades can greatly reduce risk caused by human cognitive bias, which is when a person is unaware or aware they are rooting for one stock. So, by using AI algorithms the risk can immediately be eliminated which can increase profits for investment firms and lower costs which is a beneficial consequence for those using it. AI algorithms used in trading also eliminate emotional decision making and fatigue when trading. By using VWAPs trades are made automated rather than manually by humans, this reduces human interaction and helps minimise fatigue effects which is extremely beneficial as optimal trading choices are made rather than impulsive ones, helping new firms entering the market achieve profitability. Another beneficial consequence, which is mainly for larger

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firms using AI in trading, is HFTs, this is because large firms can create millisecond trades which take advantage of millisecond market discrepancies to make a profit, this also allows smaller firms to scale up and manage larger diverse portfolios to expand which could potentially create new jobs for workers (Michael Ligon, 2023). An often-overlooked beneficial consequence of using AI in trading is risk management, AI can identify anomalies in new trade data by weighing them up against historic trade behavior (Ines Robledo Costales, 2023) and allows for mitigation of fraudulent activity using machine learning algorithms. All these features create market integrity, this allows markets to operate fairly and safely to encourage confidence to invest.

What are the negative consequences of the use of AI in the stock market?

There are huge downsides to using AI algorithms in stock trading and at present it's not regulated enough. There is a huge ethical worry and a cause for concern about how it could increase the wealth divide. This is because few large firms can capitalise on second market discrepancies using the methods of implementation of AI explained earlier to gain market share and a large quantity of stocks relative to smaller companies without access to these tools. The wealth divide will worsen, and this is evident today with firms such as BlackRock holding \$10 trillion worth of assets under management and fidelity holding an estimated \$7 trillion. Other ethical concerns involve the high costs involved with AI trading platforms, further exacerbating income inequality.

Additionally, AI may be over optimized and does not account for unforeseen events or intricate dynamics of the market (Micheal Ligon, 2023). A good example of this was in 2020 when the covid pandemic caused uncertainty within markets and plummeted prices of not just the stock prices, but other markets such as cryptocurrency as well. Therefore, trades are based on historical data which means that trades are not made with consideration of a sudden market change that does not align with historical data (Ines Robledo Costales, 2023) which could lead to market volatility and risk to firms created by inaccurate predictions and significant financial losses. (Nasdaq, 2024)

One of the main issues with AI across the board in every field is data quality. These systems are only as good as the data they are trained on so bias information can cause trading strategies that have poor trading performance based on subjective bias data held within large data sets. Another negative consequence of AI in the stock market is that it's developing so fast, and regulators are unable to keep up. A key idea is accountability in the context of AI powered trades, who is accountable when a bad trade is conducted? Or when fraudulent activity is based with AI attacks? such as mass DDOS. It can be hard to trace through the creators of the trades, machine engines develop independently and there are elements and outcomes which stretch out of their control (Ines Robledo Costales, 2023) so new regulation is required. This difficulty in regulatory action is strengthened by a lack of transparency particularly in deep learning models. AI models and algorithms can be difficult to interpret thus opaques the logic behind AI technology. (Bernard Marr, 2023 Forbes).

So, this leads to the question of how many people are likely to be affected by AI use in the stock market. Although it's unclear as regards the specific effect and amount of people that will be affected in the stock market, following my research I would say anyone that trades within the stock market is affected

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whether its indirectly by large firms making use of HFTs or individual parties making use of simpler implementations of AI. The impact is global and is likely to be increasingly disruptive to the stock market in the future. In the future we could also see more control around the issue and regulatory involvement to prevent manipulation of stock prices and fairness between companies allowing smaller companies access to AI powered tools, but the current regulation is minimal. However, the government is conducting meetings related to AI research. Recently Rishi Sunak met with technology leader Elon Musk to discuss safety of the implementation of AI generally. Although jobs are being replaced, this is not a major negative consequence with the stock market, I would say more jobs are being created due to the increase in demand for programmers and software developers coding algorithms for AI related tasks. The time scale for these consequences is varied, I believe that ethical worries e.g., inequality are more long term because the inequality divide is not as severe in developed economies where AI is being used. In terms of market volatility, I believe this is long term as well because many unforeseen events are required. For risk management and algorithmic trading, these implementations of AI are already in use by firms such as JP Morgan, other investment banks, technology firms and more.

Do the positive beneficial consequences outweigh the negative?

I believe that the negative consequences outweigh the beneficial consequences for the application of AI in the stock market. I do not see any true beneficial consequences for the economy, and they are not on par with the negative consequences. This is because although AI can create greater revenues for firms and remove human cognitive bias which will allow for greater trade accuracy, I believe that the negative consequence of AI not being able to adapt to market conditions will cause market volatility and will negatively affect trade accuracy even more. Also, data quality is a huge issue not just in the stock market but across the board, so AI is likely to cause unreliable predictions if using biased data. However, there is a huge beneficial consequence of potentially preventing fraudulent activity and better overall integrity within the market, this could prevent a lot of fraud which will overall have a positive societal impact and job creation is likely to occur as AI implemented into the stock market has been relatively new. Overall, the ethical worries are the largest negative factor that sway my opinion; large firms are currently taking advantage of every market discrepancy and its greater dividing income equality and is currently seen by today's largest asset firms such as state street black rock. So, for this reason the negative outweighs the beneficial consequences.

The impact on Medicine

Currently AI is being used widely within medicine and some examples of areas include medical imaging. Currently the main medical imaging scans are X-Rays, CT scans, MRIs, ultrasounds and radiology, AI is currently used in all. MRIs are used to scan tissue such as in the brain or heart scans by using magnetic fields and radio waves to produce these images. AI can firstly produce a contrast free imaging to produce clarity within MRIs then use technology called "virtual native enhancement" which is an AI-Powered algorithm which combines images with motion information and enhances the pathological signals in them to reveal details such as scars (Dr Qiang Zhang, 2022, oxford). Deep learning can use

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multiple layers to progressively extract higher level features from raw images, it allows machines to produce an abstract image which removes all unnecessary details. Deep learning algorithms learn from large datasets for example they can use patient information to retrieve CT scan volumes and predict risks of lung cancer. (NIH, Xiaoli Tang, 2020). AI also helps with surgery by absorbing vast amounts of information from data sets instantly as opposed to specialists who would have to undertake years' worth of education watching many surgeries take place to acquire the same knowledge. However, AI algorithms can take in recordings and remember the first surgery with equal amount of precision to the last (Joseph Nathan 2023) and the algorithms can then give suggestions. These implementations of AI in medicine are some examples of how AI is currently implemented and around 90% of hospitals have AI strategies in place. Traditionally, before the implementation of technology and AI algorithms, human judgement was used combined with years of hard work and specialist training, however, times have now changed with the development of AI systems.

What are the beneficial consequences for medicine?

As discussed before medical imagery contains beneficial consequences and has proven an average sensitivity of 84% and specificity of 61.5% (Daniel I, 2022). However, there are many more beneficial consequences. We have seen a rise in health integrated wearables such as smart watches companies such as apple have used ECG and detection of atrial fibrillation within devices which can be shared with practitioners through a smartphone. Atrial fibrillation is a condition of irregular heartbeat, and an ECG can be used to record the electrical activity of heart rates. Spotting these conditions early can be life saving for thousands of people and stop potential heart related issues.

This is not the only application that could prevent heart issues, AI has been applied to patient records to predict the risk of cardiovascular disease also. Apart from cardiology, AI can also be integrated within neurology, specifically epilepsy, by using detection devices in which AI uses ambulatory monitoring to improve seizure management (Giovanni Briganti, 2020). Histopathology is the diagnosis and study of diseases of the tissues and Paige.ai is the first ever company to receive FDA approval for computer assisted diagnostics for pathologies, they have built an AI based algorithm that is capable of diagnosing cancer in computational histopathology with great accuracy (Giovanni Briganti, 2020). This breakthrough marks a revolution in medicine, FDA approval will now save millions of lives across the globe, not only this but the amount of time saved by doctors will be increased and this huge beneficial consequence will allow doctors to allocate more time in other sectors of work which are not ready for AI integration.

AI surgical navigation systems is shaping surgery in three ways, the first of which is preoperative planning this combines how deep learning is used for scans as explained earlier and how deep learning recurrent neural networks can predict failures in real time such as bleeds in cardiac surgery. AI can also make predictive claims based on patients' history with other health related issues and state this in preoperative planning stage. Within intraoperative stage, AI can provide accurate tracking of tissue deformation using learning frameworks algorithms that identify potential deformations (Dr Liz Kwo, 2021).

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What are the negative consequences?

There are also negative consequences of the use of AI in medicine, the first of which is in my opinion the largest. Some forms of AI lack basic and continuing education, with the first version of Chat GPT AI merely passing the USMLE medical exam (Dr Lee, 2023), this is a worrying statistic and shows that there is a clear threat of misinformation with AI. Although with the newest release of GPT 4 scoring 90%, 10% missed by AI is a significant figure. AI has not had years of first-hand experience within this field and potential biased information from used data can potentially lose lives and sway a practitioner into use of a treatment that is not optimal for patients. AI is known to contain bias as many healthcare officials and institutes such as Office of minority health claim that there is a lack of diversity in the data used to train AI algorithms and can contribute to biased results (Caleb J, 2023). Biased results could lead to unequal fairness in medical treatment as AI can treat people with specific demographic factors different from others.

There are also huge ethical worries which is another negative consequence. For AI to be effective in the preoccupation or general practice, it goes through many medical histories which may leave patients feeling uncomfortable as they may feel that it is an invasion of privacy. AI can only be used in a very specific setting in clinical practice and is not yet fully developed to be applicable to every sector in medicine. From my research I can infer that AI is only useful in certain fields, it is also very hard to get FDA approval for the use of AI in hospitals. The very first medical device to get FDA approval integrating with AI was IDx-DR scans which is an AI powered platform that analyses CT scans, this was only very recently on the 27th of April 2023 (Knobbe martens, 2023).

Do the positive beneficial consequences outweigh the negative?

The effects of AI have already shown to be global, patients around the world are likely to be affected. Whether its CT scans or surgical navigation tools, AI is constantly being implemented into today's society and currently it is saving thousands of lives, MedTech predicts that an annual 380,000 to 403,000 lives could be saved every year (MedTech Europe) which is a phenomenal contributions to the beneficial effects of AI, I truly believe that AI will have remarkable effects in the future and further digging into future possibilities I found that GP practitioners may be replaced by automated AI bots that are able to diagnose patients. For these consequences to take place I believe it will be more long term to have a significant contribution to society because right now there is no variety towards implementation.

However, I am unsure as to whether the beneficial consequences outweigh the negatives for the application of AI in medicine. This is because there are great applications of AI but at huge costs. For example, AI in medicine can speed up many sectors of healthcare such as the preoperational stage by scanning through patient's records, providing surgical assistant tools which can save money and time for governments also thousands of lives are currently being saved by identifying health issues early on with the use of deep learning AI in scans. Although this is potentially globally life changing, AI also contains bias which can be extremely dangerous. Furthermore, only very specific settings in clinical practice benefit from the application of AI in the healthcare field. However, I do believe that in the long-term AI can develop to be used in more varied sectors within healthcare and will be able to learn from data that

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has inherent bias removed. Although not fully at present, I believe the beneficial will outweigh the negative consequences in the near future.

Conclusion

After accounting for the beneficial and negative consequences for the three chosen fields, in my opinion I believe the beneficial consequences do outweigh the negatives. Although there are huge downsides to the application of AI in the stock market causing income and wealth inequality. The beneficial consequences of AI in the labour market long term and the potential life changing impact on healthcare outweigh this inequality and even though job replacement is a highly possible negative consequence, I believe we will undergo a structural change to labour in all three fields where jobs will be replaced, and new jobs will be created levelling out this negative. I do believe we are heading in a direction that will see the implementation of AI into our everyday lives and a trajectory of positive societal impacts rather than negative.

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