



Ethical Challenges and Fairness in Modern Data Science

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Ethics in Data Science

Data scientists have the responsibilities of ensuring that people's data is handled in a respectful manner, without crossing any boundaries. In the field of data science, different biases need to be considered, and precautions need to be implemented to ensure the safety of data and its connection to people. Ethical considerations like privacy & security concerns can have significant impacts in data science. Data scientists play a major role in society as they help many industries that use data such as the financial, business, healthcare and government departments. Data scientists help these industries thrive by assessing their risks and strengths. They also ensure privacy and security, through collecting and analysing their data. Through these functions departments are strengthened and can thrive and maximise profits. This impacts society as it ensures that the departments they use will have stronger security measures and better service to its customers.

Security & Privacy Risks

Security risks are ethical considerations that can occur in the field of data science such as malware, which could affect major departments (financial, business, healthcare and government). Malware such as dangerous viruses and worms are dangerous software that are created to disrupt databases and gain access to personal information from patients, which will harm their privacy. This will give hackers and other cybercriminals access to personal data of patients and will allow them to carry out harmful acts which are common amongst cybercriminals such as identity theft, bank account theft or even demand for a ransom. This shows that personal information from patients will all be at risk. This shows how much responsibility on the shoulders of data scientists because they need to ensure that personal privacy concerns are not violated. Data scientists from major departments could also pose a risk that could harm patients' data and can affect individuals privacy rights. These risks include programming errors, weak passwords and poor data entry. Programming errors made by data scientists could weaken a company's digital security as it may allow people to have access to unauthorised data such as the patient's data. Poor data entry from data scientists could harm the patient's data itself. This will also harm the digital security of a company because incorrect patient data could lead to privacy breaches. To ensure the safety and integrity of patients' data, stronger security measures need to be implemented by data scientists. Data scientists have an impact on society because they are responsible for the data of individuals and companies from major industries.

Real Word Incident

An incident that occurred because of poor encryptions and security measures was in July 2023. Where there was a data breach at HCA Healthcare in Tennessee, USA (Johnson, 2023). This data breach included the theft of 11 million patients' personal

data which were from across 20 states. Cybercriminals stole these patients' personal data such as their email, phones, addresses, gender and age. These cybercriminals threatened to sell this data if their demands were not met. This shows the severity of the events that may occur if data scientists do not carefully monitor and structure the digital security of these departments.

Algorithmic & Sampling Bias

A primary ethical concern associated with data is algorithmic and sampling bias. Sampling bias in data analysis occurs when a training dataset isn't reflective of the population it will be used in, meaning that it will struggle to assess the population as a whole and might favour a certain group that it's familiar with. Algorithmic bias is when algorithms make negative decisions that affect a certain factor or group. This bias is developed and retrieved from data that is limited or skewed, favouring one sort of group, such as a certain race or gender.

Algorithmic and sampling bias can make harmful decisions in a major department such as healthcare by making crucial decisions over which patients get treatment first, what type of treatment the patient gets, and how this service is given to the patients based on its gender or race. Another issue that can occur with algorithmic bias is within the healthcare workers, where it would treat workers unequally based on a certain feature, or only hire healthcare workers into the workforce that it favours. Algorithmic and sampling bias could pose a threat to the healthcare department, because it could be a decision between the life or death of a patient and could also change the way the hospital functions.

Important of Fairness & Transparency

Implementing fairness in algorithmic systems is crucial because it prevents algorithmic bias and ensures justice, equity and no discrimination in the algorithm. There are a few challenges that may occur when implementing fairness in algorithmic systems, one of them being biased data in machine learning. This occurs when algorithm systems give biased results which cause problems like algorithmic and sample bias. This creates a problem in acquiring fairness and equity because these biases favour certain individuals with a specific feature, which can cause many issues in areas that AI have control over.

Another challenge that may occur is the machine learning algorithms being too complex. This makes it difficult to understand the decisions and actions the machine learning algorithm is making and identify any biases that may be present in its actions. When we are not able to understand why machine learning is making decisions, then it

is difficult to implement fairness or improvements within the system. There have been incidents where bias in algorithms caused unfairness.

Real Word Incident

Facial recognition systems which use machine learning algorithms can cause problems when there is bias. Studies have found that facial recognition models had a higher chance of mistakenly identifying the wrong individuals if they were Asian or dark skinned compared to white people. In 2020, Robert Williams, a black man was wrongfully accused of stealing thousands of watches when a facial recognition model matched an ID of him to a blurry image that was recovered from cameras on the scene (Harwell, 2021). This man was arrested in front of his daughters and was detained for 30 hours. Another example of algorithms that has encountered bias is healthcare systems. The Healthcare department is a very delicate area which deals with patients who are unwell. Healthcare systems have been criticised for being unfair to minority groups due to the algorithmic bias. These issues can be addressed by identifying bias in algorithms and making machine learning algorithms more transparent so it can be understood and strengthened.

Culture and Data Science

Culture can also have an influence on how data is collected, analysed and interpreted. In data science, cultural factors include social interactions, events, and behaviours (Kumar, n.d.). Cultural values and practices can influence data collection, because some cultures would be less willing to share information due to their norms or language barriers. This affects the reliability of data, collected through surveys and interviews. Culture norms may cause bias and leave inconsistencies because due to these barriers. Some cultures may have rules that restrict them from being interviewed or being spoken to by an outsider. As a result, data collection is affected as it may be biased or skewed, since it does not fully represent a selected population. Cultural bias may also influence how data is analysed. This could occur if the analysis method that is used may be better suited for different group, making this analysis method inaccurate when used with this cultural group.

Cultural differences may cause problems with the interpretation process of data science. This could happen if responses from people that are influenced by their culture are perceived differently by the interviewer because their cultural norms don't align with the interpreter, which could lead them to interpret this response inaccurately. If the interpreter is influenced by its own cultural values, then it may also cause a misinterpretation, because they might interpret the response based on their own culture bias instead of considering the perspective of the respondent or data's purpose.

Cultural factors like Language barriers and culture norms are clear reasons on why cultural biases may affect data science projects. These can be avoided if the data collected is diverse, meaning it is from people of different areas, languages and cultures.

Conclusion: The Data Scientist's Responsibility

We live in a data driven world where data is a significant part of our daily lives. Data scientists have a responsibility of ensuring the safety of people's personal data and wellbeing of industries that function with data. To provide this safety, considering ethics, bias and fairness help to avoid harmful consequences that can occur such as security risks, discrimination and inaccurate results. Incidents like the Robert Williams facial recognition shows us the negative effects data biases can have on a person's life, leaving a mental toll on him. These incidents clear indications on why data scientists need to apply ethical and fairness methods to their data collection, analysis, and interpretation practises. This creates a safe environment for individual rights and paves a way for the growth of our society.

Reference

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