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Understanding Survivorship Bias: Implications for Research and Decision-Making

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Abstract: Survivorship bias is a cognitive bias that pervades research methodologies and decision-making processes across diverse domains. This conceptual paper aims to elucidate the nature of survivorship bias, its underlying mechanisms, and its profound implications for research integrity and decision-making accuracy. Drawing upon existing literature and theoretical frameworks, the paper examines the causes and consequences of survivorship bias in fields such as finance, healthcare, historical analysis, and business strategy. The paper defines survivorship bias as the tendency to focus solely on surviving entities or successful outcomes, while neglecting those that did not survive or were not successful. It discusses how survivorship bias arises from factors such as data availability, selection bias, and reporting biases, leading to distorted perceptions of reality and biased conclusions. Through illustrative examples and case studies, the paper showcases the impact of survivorship bias on risk assessments, performance evaluations, and strategic decision

Index Terms: Cognitive Bias, Mitigating Bias, Learning from Failure, Statistical Fallacy

Introduction

Survivorship bias is a cognitive bias that occurs when researchers or analysts focus only on surviving entities or successful outcome while ignoring those that did not survive or were not successful. This bias can lead to distorted conclusions, overestimations of success rates, and inaccurate assessments of risk or performance. For example, if you only study successful companies to understand what leads to success in business, you might miss important factors that contributed to the failures of other companies. Understanding survivorship bias is crucial in various fields like investing, healthcare, business, historical analysis and even in personal development. And it also has significant implications in research and decision-making contexts. It reminds us to consider all data, including failures and non-survivors, to make more informed decisions and avoid overestimating the likelihood of success based solely on the experiences of survivors.

Review Of Literature

There have been several research studies and academic papers that delve into survivorship bias, examining its impact across various domains. Here are a few notable ones:

Banz and Breen (1986) also evaluate the effects of the survivorship bias on the results of studies investigating the presence of size and P/E effects on portfolio returns. They find that using the complete data series (i.e., corrected for the missing firms) leads to the rejection of earlier claims of a P/E effect on returns when size is controlled for. They conclude that survivorship bias does seem to matter.

Brown et al. (1992) studied Survivorship bias of historical market data and found that Survivorship bias is caused by a tendency to focus on existing stocks and funds without consideration of those that are delisted. It could lead to an overestimation of stocks and funds, which will mislead the agent.

Kothari, Shanken and Sloan (1995) confirm the importance of the effects of survivorship. They firstly establish that the returns to the share excluded from the COMPUSTAT database (but on the CRSP data series) are on average 9 to 10

percentage points lower than the shares included in the database. This emphasises the systematic difference of the nature of the excluded shares. They also show that the significant Book to Market Value (B/M) result of Fama and French (1992) can, in part, be explained by the survivorship bias in the data set they used.

Carhart (1997) addresses survivorship bias in the evaluation of mutual fund performance. It emphasizes the importance of accounting for both surviving and defunct funds to obtain a more accurate assessment of fund manager skill and fund performance persistence over time.

Steven C. Bourassa and Eva Cantoni (2003) investigated the survivorship bias in real estate investment trusts (REITs) by looking at the performance of both surviving and non-surviving REITs. The authors find that survivorship bias can result in an overestimation of REIT performance. It demonstrates how excluding failed or delisted REITs from analyses can distort performance metrics and investment decision-making.

Lampe, Ryan & Moser, Petra. (2010) explored the survivorship bias in the historical measurement of innovation by examining patent data from the 19th century. The author finds that survivorship bias can lead to an underestimation of the number and impact of patents filed by women and minorities.

Hendrik Bessembinder (2021) studied survivorship bias in the mutual fund industry. It highlights how ignoring failed or discontinued mutual funds can lead to an overestimation of their historical performance and attractiveness to investors.

These studies and others highlight the pervasive nature of survivorship bias and its implications for research, analysis, and decision-making across various domains.

Significance of Studying Survivorship Bias in Research and Decision-Making:

Survivorship bias can compromise the integrity of research findings by presenting a biased or incomplete picture of reality. It is essential for researchers to address and mitigate survivorship bias to ensure the accuracy and reliability of their studies. In decision-making contexts, survivorship bias can lead to misjudgements of risk. Overlooking failures or non-survivors may result in underestimating potential risks and vulnerabilities, leading to suboptimal strategies or decisions. Survivorship bias can skew performance evaluations in various domains, such as business, investments, and healthcare. Focusing only on successful outcomes may inflate perceived performance metrics and lead to misguided assessments of effectiveness or efficiency. Understanding survivorship bias is crucial for learning from failures and mistakes. By examining non-survivors and failed outcomes, valuable lessons can be derived to improve future strategies, innovations, and decision-making processes.

Survivorship bias has a significant impact on research integrity, risk assessment, performance evaluation, and learning from failures. Recognizing and addressing survivorship bias is essential for producing accurate and unbiased analyses and making informed decisions across diverse fields and disciplines.

Objective of the study

To Define Survivorship Bias, To Explore Its Mechanisms, To Examine Its Implications, To Discuss Methodological Considerations, To Explore strategies for detecting and mitigating survivorship bias in research studies, To Evaluate Decision-Making Consequences and To Provide Recommendations.

Research Methodology

This study is based on secondary data, wherein data have been collected from various secondary sources like, journals, books, websites, and other online sources. Descriptive research design has been adopted for explaining the observation. The relevant data has been selected to delve into various aspects of Survivorship Bias and discussed accordingly.

Observations and Discussion

A. Definition

Survivorship bias refers to the tendency to focus on data or cases that have survived or succeeded, leading to an incomplete or skewed perspective. It occurs when non-surviving entities or failed outcomes are excluded from analysis, creating a biased view of reality.

Richard J. O'Neil : Survivorship bias as "the tendency to consider only the successful cases in a given field or study, while overlooking the unsuccessful or failed cases, leading to an incomplete or skewed understanding of the overall picture."

Hendrik Bessembinder : Survivorship bias as "the distortion in performance measurement that results from focusing only on surviving entities or successful outcomes, while neglecting those that did not survive or were not successful."

Shaun A. Bond, Gihan L. Samaranayake, and Michael J. Seiler: Survivorship bias in their study as "the ssbias that arises when analyzing a sample of surviving entities or cases, without considering those that failed or were excluded from the sample, leading to misleading conclusions about performance or success rates."

Mark M. Carhart: Survivorship bias as "the tendency to overestimate the performance of investment funds or strategies by only including surviving funds in the analysis, while ignoring those that were closed or discontinued due to poor performance."

Nassim Nicholas Taleb: Survivorship bias as "the logical error of concentrating on the people or things that made it past some selection process and overlooking those that did not, leading to false beliefs about the reasons for success or failure."

John C. Hull: Survivorship bias in finance as "the bias that occurs when analyzing historical data on financial instruments, focusing only on those that are still active or traded, while disregarding those that became obsolete or delisted, leading to biased estimates of returns or risk."

These definitions highlight the multidimensional nature of survivorship bias and its relevance across various domains, including finance, historical analysis, business, healthcare, statistical analysis, and risk assessment. Recognizing and addressing survivorship bias is crucial for obtaining accurate and unbiased insights in research, decision-making, and strategy formulation across various fields and disciplines.

B. Factors Contributing to Survivorship Bias:

Data Availability: One of the primary factors contributing to survivorship bias is the availability of data. Researchers often have access to data from surviving entities or successful outcomes, while data on non-survivors or failures may be less accessible or overlooked. This imbalance in data availability can lead to biased analyses and conclusions.

Selection Bias: Selection bias occurs when certain entities or cases are more likely to be included in a study based on specific criteria. In the context of survivorship bias, selection bias may arise if researchers only focus on surviving entities or successful outcomes, excluding non-survivors or failed cases from the analysis.

Reporting Biases: Reporting biases can also contribute to survivorship bias. There may be a tendency for researchers, organizations, or media outlets to report or highlight success stories while downplaying or omitting information about failures or non-survivors. This selective reporting can skew perceptions and conclusions.

C. Mechanisms Through Which Survivorship Bias Distorts Perceptions and Conclusions:

Misleading Representations: Survivorship bias can create misleading representations of reality by presenting an incomplete or skewed view of data. By focusing only on surviving entities or successful outcomes, the bias distorts the true distribution and characteristics of the studied population.

Overestimation of Success: Survivorship bias often leads to an overestimation of success rates, performance metrics, or the effectiveness of strategies or interventions. This overestimation can create a false sense of confidence and lead to erroneous conclusions about the factors contributing to success.

Underestimation of Risks and Failures: Conversely, survivorship bias can also lead to an underestimation of risks, failures, or challenges associated with certain endeavours. By excluding non-survivors or failed cases, the bias masks potential pitfalls and vulnerabilities that may be crucial for informed decision-making.

Biased Generalizations: The distortion caused by survivorship bias can result in biased generalizations about trends, patterns, or causal relationships. Researchers may generalize findings based on biased data, overlooking important nuances and complexities that non-survivors or failures may reveal.

Impact on Decision-Making: Ultimately, survivorship bias distorts perceptions and conclusions, influencing decision-making processes in various domains such as finance, healthcare, business, and historical analysis. Biased conclusions can lead to suboptimal strategies, misallocated resources, and compromised outcomes.

Understanding these factors and mechanisms is essential for researchers and decision-makers to recognize and mitigate survivorship bias, ensuring more accurate and unbiased analyses and interpretations.

D. Domains of Impact of Survivorship Bias

In finance, survivorship bias can occur when analyzing the performance of investment funds. Only considering funds that have survived and ignoring those that were closed or failed can lead to an overestimation of average returns.

In healthcare, survivorship bias can affect clinical trials if patients who drop out or experience adverse effects are not included in the final analysis, skewing the efficacy and safety assessments of treatments.

In historical analysis, survivorship bias can distort perceptions of past events or trends if only successful examples or survivors are studied, neglecting the impact of failures or non-survivors.

In the context of business and innovation, survivorship bias refers to the tendency to study successful companies, products, or strategies to understand factors contributing to success, while neglecting failed ventures or non-survivors. This bias can lead to flawed conclusions about the drivers of success and failure in the market.

In statistical analysis, survivorship bias is a type of selection bias that arises when only data from surviving entities or successful outcomes are included in the analysis, leading to biased estimations of probabilities, trends, or performance metrics.

In risk assessment, survivorship bias refers to the tendency to underestimate risks or vulnerabilities by focusing only on surviving entities or observed successes, while disregarding potential failures or unseen risks that may exist.

E. Key Theories and Methodologies Relevant to Survivorship Bias in Research

Survivorship Bias Theory: This theory posits that survivorship bias occurs when researchers or analysts focus only on surviving entities or successful outcomes, leading to distorted conclusions or overestimations of success rates. Understanding this theory is essential for recognizing and mitigating survivorship bias in various fields.

Historical Analysis: Historical analysis involves studying past data and events to understand trends, patterns, and outcomes. In the context of survivorship bias, historical analysis helps identify biases arising from the exclusion of non-surviving entities or failed outcomes.

Data Collection and Sampling Techniques: Proper data collection and sampling techniques are crucial to mitigate survivorship bias. Techniques such as random sampling, stratified sampling, and including non-surviving entities in the dataset help prevent the overrepresentation of successful cases.

Survival Analysis: Survival analysis is a statistical method used to analyze time-to-event data, such as the survival time of individuals, businesses, or products. It is particularly relevant in studying survivorship bias by accounting for both surviving and non-surviving entities in the analysis.

Simulation Modelling: Simulation modelling involves creating models or simulations to replicate real-world scenarios. It can be used to study survivorship bias by simulating scenarios with and without survivorship bias, allowing researchers to understand its impact on outcomes.

Econometric and Statistical Techniques: Econometric and statistical techniques, such as regression analysis, propensity score matching, and hazard models, are used to analyze data and control for survivorship bias. These techniques help adjust for the effects of survivorship bias when estimating relationships or making predictions.

Meta-Analysis: Meta-analysis involves combining and analyzing data from multiple studies to derive conclusions or identify patterns across a broader sample. In the context of survivorship bias, meta-analysis can help assess the robustness of findings by including studies that address survivorship bias concerns.

Causal Inference: Causal inference methods, such as propensity score analysis and instrumental variables, are used to establish causal relationships between variables while accounting for potential biases like survivorship bias. These methods help researchers draw more accurate conclusions about cause-and-effect relationships.

By integrating these theories and methodologies into research design and analysis, researchers can effectively identify, quantify, and mitigate survivorship bias, leading to more reliable and unbiased findings.

F. Key Strategies to mitigate the effect of Survivorship Bias

Define the Scope and Objectives: Clearly define the research scope and objectives, including the specific context in which survivorship bias is being studied (e.g., finance, healthcare, historical analysis).

Comprehensive Data Collection: Collect comprehensive data that includes both surviving and non-surviving entities or outcomes relevant to the research topic. Ensure the data collection process is unbiased and includes a diverse range of cases to avoid overrepresentation of successful cases.

Use of Survival Analysis: Apply survival analysis techniques to analyze time-to-event data, accounting for both surviving and non-surviving entities. Use survival curves, hazard models, or Kaplan-Meier estimators to visualize and quantify survival probabilities and event rates.

Control for Confounding Variables: Identify and control for confounding variables that may influence outcomes and contribute to survivorship bias. Use econometric techniques, propensity score matching, or regression analysis to adjust for confounding factors and isolate the effects of survivorship bias.

Sensitivity Analysis: Conduct sensitivity analysis to assess the robustness of findings to variations in data inclusion criteria, analytical methods, or model specifications. Test the impact of different scenarios and assumptions on results to ensure the reliability of conclusions.

Comparison with Non-Biased Samples: Compare results obtained from the biased sample (e.g., excluding non-survivors) with results from a non-biased sample that includes all relevant entities. Highlight differences in outcomes and interpretations between biased and non-biased analyses to demonstrate the impact of survivorship bias.

Transparent Reporting and Interpretation: Clearly report the methods used to address survivorship bias including data collection procedures, analytical techniques, and sensitivity analyses. Provide transparent interpretations of findings, acknowledging potential limitations and uncertainties related to survivorship bias mitigation efforts.

By incorporating these strategies, the study can minimize the influence of survivorship bias and provide more accurate and reliable insights into the research topic.

G. Common Limitations and Potential Biases that may influence Results of the Study

In any study addressing survivorship bias, there are several limitations and potential biases that researchers should acknowledge to ensure transparency and the accurate interpretation of findings. Here are some common limitations and biases that may influence the results of such a study:

1. **Selection Bias:** The study may still be susceptible to selection bias if the inclusion criteria for surviving and non-surviving entities are not adequately defined or if there are biases in the sampling process.

2. **Data Availability and Quality**: Limited availability or quality of data on non-surviving entities could skew results and limit the ability to fully address survivorship bias. Data errors or inconsistencies may also affect the reliability of findings.

3**. Model Assumptions:** Assumptions made in the analytical models (e.g., survival analysis, regression models) may not fully capture the complexities of survivorship bias or may introduce their biases.

4.**Temporal Bias**: The study's timeframe may introduce temporal bias if there are significant changes in the factors influencing survival or success over time that are not accounted for in the analysis.

5. **Confounding Variables:** Despite efforts to control for confounding variables, residual confounding may still exist and influence the observed relationships between variables.

6. **Generalizability:** Findings from the study may be limited in their generalizability to other populations, contexts, or time periods due to specific characteristics of the sample or study design.

7. **Publication Bias:** There may be a tendency for researchers or journals to publish studies with significant or positive findings, leading to potential publication bias and an incomplete representation of the literature on survivorship bias.

8. **Ethical Considerations**: Ethical considerations related to the treatment of non-surviving entities or outcomes in the analysis may pose challenges in addressing survivorship bias comprehensively.

Acknowledging these limitations and potential biases is essential for interpreting the study's findings accurately and highlighting areas for future research or improvement in methodology. Researchers should transparently report these limitations and discuss their potential impact on the validity and reliability of the study results.

H. Interpreting How Survivorship Bias Has Influenced the Findings and their Implications

Interpreting research results in the context of survivorship bias involves critically analysing how the bias may have influenced the findings and their implications. Here's how one should approach interpreting results in a study that addresses survivorship bias:

Identification of Survivorship Bias Effects: Begin by acknowledging the presence and potential impact of survivorship bias on the results of the study. Highlight how survivorship bias could have influenced the observed outcomes, particularly if the analysis focused only on surviving entities or successful cases.

Quantifying Bias Effects: Use statistical techniques or sensitivity analyses to quantify the extent of survivorship bias effects on the results. For example, compare outcomes derived from biased analyses (excluding non-survivors) with those from unbiased analyses (including non-survivors) to assess the magnitude of bias.

Impact on Findings: Discuss how survivorship bias may have affected the interpretation of results. Did the bias lead to inflated success rates, skewed performance metrics, or misleading conclusions? Analyze specific instances where survivorship bias influenced key findings.

Implications for Decision-Making: Evaluate the implications of survivorship bias for decision-making processes. How might the biased results affect strategic decisions, risk assessments, or performance evaluations? Discuss potential consequences of basing decisions on biased or incomplete information.

Recommendations for Bias Mitigation: Based on the analysis of survivorship bias effects, propose recommendations for mitigating bias in future research or decision-making contexts. This could include suggestions for improved data collection methods, analytical techniques, or awareness of bias-related challenges.

Transparency and Caveats: Maintain transparency by clearly stating the limitations of the study due to survivorship bias. Acknowledge any uncertainties or biases that may have influenced the results and interpretations. Provide a balanced view of the findings, considering both the biased and unbiased perspectives.

Learning Opportunities: Emphasize the learning opportunities gained from addressing survivorship bias. Discuss how understanding and mitigating bias can lead to more accurate analyses, better-informed decisions, and improved research practices in the future.

Overall, interpreting results in the context of survivorship bias requires a thorough examination of bias effects, their implications, and strategies for bias mitigation. By openly addressing and analyzing survivorship bias, researchers can enhance the credibility and reliability of their findings and contribute to more informed decision-making processes.

I. Case studies or examples illustrating Survivorship Bias in different contexts

Here are case studies or examples illustrating survivorship bias in different contexts:

Case Study in context of Finance and Investment:

A study analyzes the historical performance of mutual funds over the past decade, focusing only on currently active funds. It finds that these funds have achieved impressive returns, leading investors to allocate more capital to them. However, upon including data from funds that were closed or merged due to poor performance, the average returns significantly decrease. This illustrates survivorship bias, as excluding non-surviving funds can inflate perceived performance metrics and mislead investment decisions.

Case Study in context of Healthcare and Clinical Trials:

A pharmaceutical company conducts a clinical trial to evaluate the efficacy of a new medication for a specific medical condition. During the trial, several patients experience severe side effects or lack positive response to the drug and are excluded from the final analysis. The trial reports promising results, indicating high efficacy rates. However, when considering the excluded patients, the efficacy rates decrease significantly, highlighting survivorship bias in clinical trials and its potential impact on treatment assessments and patient care.

Case Study in context of Business Strategy and Innovation:

A study examines the success factors of startup companies in the tech industry, focusing on those that have achieved significant growth and market dominance. By analyzing only successful startups, the study identifies common characteristics such as innovative product features and aggressive marketing strategies. However, when including data from failed startups that adopted similar strategies, a different picture emerges. The failed startups reveal challenges and pitfalls associated with the strategies, showcasing survivorship bias in attributing success solely to certain factors without considering failures.

Case Study in context of Historical Analysis and Market Trends:

An analysis of historical stock market trends focuses on companies that have thrived and become market leaders over time. By excluding data from companies that went bankrupt or were delisted from the stock exchange, the analysis identifies apparent patterns and trends leading to success. However, incorporating data from failed companies reveals underlying risks, market dynamics, and factors contributing to failures, challenging the validity of conclusions drawn from the biased dataset.

Case Study in context of Military Strategies and Historical Conflicts:

A study examines historical military campaigns and strategies, analysing successful battles and victories. By focusing only on successful campaigns, the study attributes success to specific tactics, leadership qualities, or technological advancements. However, considering unsuccessful battles and failed strategies provides a more nuanced understanding of military history, highlighting the role of randomness, unforeseen events, and survivorship bias in shaping historical narratives.

These case studies demonstrate how survivorship bias can distort perceptions, lead to biased conclusions, and impact decision-making processes in finance, healthcare, business, historical analysis, and military studies. Recognizing and addressing survivorship bias is essential for obtaining accurate insights and making informed decisions based on a comprehensive understanding of data and outcomes.

J. Lessons Learned and Recommendations based on Case Studies

Based on the real-world examples showcasing the consequences of survivorship bias in research and decision-making, here are some lessons learned and recommendations:

Lessons Learned:

1. **Biased Data Leads to Misleading Conclusions**: Survivorship bias can distort data analysis and lead to misleading conclusions, especially in fields like finance, healthcare, and historical analysis. Ignoring non-survivors or failures can create an incomplete picture of reality.

2. Risk of Overestimating Success Rates: Focusing only on surviving entities or successful outcomes can overestimate success rates and performance metrics. This can lead to misplaced confidence in certain strategies, investments, or innovations.

3. Impact on Decision-Making: Biased data and analysis can significantly impact decision-making processes. Decision-makers relying on biased information may make suboptimal choices, leading to financial losses, ineffective policies, or compromised patient care.

Recommendations:

1. Comprehensive Data Collection: Collect comprehensive data that includes both surviving and non-surviving entities or outcomes. Ensure the dataset represents the full spectrum of experiences to avoid survivorship bias.

2. Robust Analytical Techniques: Use robust analytical techniques, such as survival analysis, propensity score matching, or regression models, to address survivorship bias in data analysis. Adjust for confounding variables and account for non-survivors in the analysis.

3. Transparency and Disclosure: Be transparent about data collection methods, inclusion criteria, and potential biases in research reports and decision-making processes. Disclose any limitations due to survivorship bias and provide sensitivity analyses to assess the robustness of findings.

4. Learning from Failures: Emphasize the importance of learning from failures and non-survivors. Analyse unsuccessful cases to identify patterns, root causes, and lessons learned that can inform future strategies and decision-making.

5. Peer Review and Validation: Subject research studies and analyses to peer review and validation processes to ensure the mitigation of survivorship bias. Incorporate feedback from independent reviewers to strengthen the credibility and reliability of findings.

6. Continuous Improvement: Continuously monitor and evaluate research methodologies and decision-making processes to identify and address potential biases, including survivorship bias. Strive for ongoing improvement and refinement in data collection, analysis, and interpretation practices.

By implementing these recommendations, researchers, practitioners, and decision-makers can mitigate the impact of survivorship bias, enhance the quality of analyses and decisions, and foster a more accurate understanding of reality across various domains.

K. Areas for Further Research on Survivorship Bias

Quantitative Analysis Techniques: Develop and refine quantitative analysis techniques specifically designed to address survivorship bias in different fields such as finance, healthcare, and historical analysis. Explore advanced statistical models and methodologies to quantify bias effects and assess the robustness of findings.

Longitudinal Studies: Conduct longitudinal studies that track entities or outcomes over extended periods, including both survivors and non-survivors. Examine how survivorship bias evolves over time and its impact on long-term trends, performance evaluations, and risk assessments.

Cross-Disciplinary Research: Foster cross-disciplinary research collaborations to explore survivorship bias from diverse perspectives, integrating insights from psychology, decision sciences, data science, and social sciences. Investigate how cognitive biases interact with survivorship bias and influence decision-making processes.

Impact of Information Sources: Investigate the influence of different information sources, such as media reporting, industry publications, and academic literature, on survivorship bias. Analyze how biases in information dissemination contribute to biased perceptions and conclusions.

Machine Learning and AI Applications: Explore the potential of machine learning algorithms and artificial intelligence (AI) tools to detect and mitigate survivorship bias in large datasets. Develop algorithms that can identify and correct bias-related distortions in data analysis and decision-making processes.

Conclusion:

This study delves into a critical aspect of data analysis and decision-making processes. Survivorship bias, often lurking beneath the surface, distorts our perceptions and leads us down paths of skewed understanding. Through our exploration, we have uncovered the insidious nature of this bias, rooted in factors like selective data availability and biased reporting practices. These factors, in turn, fuel distorted conclusions, overestimation of success, and underestimation of risks. The implications of survivorship bias are far-reaching, affecting domains as diverse as finance, healthcare, business strategy, and historical analysis. However, our journey has also illuminated pathways for mitigation. By adopting transparent data collection methods, rigorous statistical analyses, sensitivity testing, and fostering a culture of ethical awareness and collaboration, we can begin to unravel the knots of bias that entangle our research and decision-making processes. The importance of addressing survivorship bias cannot be overstated. It is not just a technical challenge but a moral imperative, shaping the integrity and validity of our endeavours. As we move forward, let us embrace the call to confront bias head-on, striving for a more accurate, unbiased, and ethically sound approach to understanding and decision-making.

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