Machine Learning and Database Management

RESEARCH REPORT

Nirosh | Data and information management

Table of contents

Abstract

We explore the significant synergy between machine learning (ML) and databases and data management in this study paper, revealing the revolutionary effects of their combination. Innovative answers are required by the evolving digital environment for effective data processing, analysis, and decision-making. To solve these issues and reshape data-centric paradigms, the integration of ML approaches with database administration emerges as a crucial factor.

We explain the importance of effective data processing in the beginning, emphasizing the shortcomings of conventional techniques when dealing with huge and complex datasets. The introduction of ML algorithms automates data preparation, assuring accuracy efficiency, and motivation by past data trends. This improvement extends to data integration, as ML-powered tools skillfully connect scattered records to provide thorough data consolidation. The streamlined data preparation that results maintains data integrity.

Following that, we will look at data analysis and pattern identification, where ML may help with the interpretation of large datasets. Clustering methods allow for uncovering hidden patterns ranging from customer segments to social network linkages. Classification algorithms categorize data, providing insights for a wide range of applications including illness diagnosis and tailored product recommendations. E-commerce stands to benefit the most since it can employ recommendation algorithms to increase consumer engagement.

Predictive analytics takes center stage as machine learning enables firms to make proactive decisions. Regression analysis moves us forward by forecasting numerical values and directing strategic strategy. When combined with historical data analysis, ML-driven decision support systems improve executives' choices, from resource allocation to healthcare optimization. As a result, data-driven empowerment crosses industries.

Another level where ML's capability finds a home is anomaly detection and security. Rapid detection of deviations from established patterns protects businesses ranging from banking to manufacturing. Intrusion detection systems improve cybersecurity, whereas anomaly detection protects product quality by detecting flaws before they reach customers.

The paper broadens its investigation to include Natural Language Processing (NLP) and text mining. ML approaches transform the way unstructured textual data is handled, enabling sentiment analysis, content classification, and entity extraction. Leading search engines utilize ML-driven text mining to improve user search experiences.

The scope of the article is expanded to encompass Natural Language Processing (NLP) and text mining. Unstructured textual data is transformed using ML techniques, which enable sentiment analysis, content categorization, and entity extraction. To improve user search experiences, leading search engines use ML-driven text mining.

Finally, combining Machine Learning with database/data management redefines data-driven paradigms. The detailed investigation in the paper demonstrates how this symbiotic connection enables organizations, changes decision-making, and drives industries ahead. As technology advances, the

prospect for deeper integration and even more dramatic effects looms, solidifying the position of machine learning as a critical pillar of modern data management.

Introduction

Machine Learning (ML) is a game-changing technology that allows computers to learn patterns and insights from data, allowing them to make predictions and judgments without being explicitly programmed. The symbiotic link between this technology and database and data management systems is apparent. Organizations face large datasets in an increasingly data-driven environment, necessitating efficient storage, retrieval, analysis, and decision-making. Integrating machine learning techniques with database administration provides significant answers to these difficulties.

Enhancing Data Processing

Effective database and data management relies on efficient data processing. Traditional data cleaning, transformation, and integration approaches have historically required enormous human effort and wasted significant time. The incorporation of Machine Learning (ML) techniques into database administration, on the other hand, represents a paradigm change in data processing.

ML algorithms demonstrate their abilities by automating data preparation chores, assuring accuracy as well as efficiency. These algorithms quickly find and correct errors, duplication, and missing values inside databases by drawing insights from past data trends. In the healthcare industry, for example, ML-driven data preparation has proved crucial in enhancing the precision of electronic health records, therefore minimizing mistakes with possible consequences for patient well-being.

Furthermore, the relationship between machine learning and database administration extends to sophisticated data integration techniques. ML-driven integration solutions adeptly connect records across diverse datasets by employing similarity metrics and probabilistic models, resulting in comprehensive and trustworthy data consolidation. This fusion speeds up data preparation while maintaining data integrity.

This automated data processing has far-reaching consequences. It frees data engineers and analysts from the shackles of manual data cleaning and integration, allowing them to devote their time and resources to higher-level activities. This efficiency is especially useful for businesses dealing with large and diverse datasets, allowing them to make quick and educated judgments.

Furthermore, machine learning-driven data processing maintains data integrity throughout the data lifetime. This is critical, particularly in highly regulated areas like healthcare and banking, where data accuracy and privacy are non-negotiable.

To summarize, the combination of Machine Learning and database administration transforms data processing. The ability of machine learning to automate data preparation not only speeds up activities but also improves data quality, allowing enterprises to make confident data-driven choices and solidify the foundation of successful data management.

Data analysis and pattern Recognition

The integration of Machine Learning (ML) with database administration ushers in a new era of data analysis and pattern detection. Clustering techniques like K-means and hierarchical clustering are critical in revealing hidden structures in data. These strategies facilitate activities such as market segmentation, consumer profiling, and social network analysis by grouping comparable data sets.

Another pillar of ML-powered data analysis is classification algorithms. These algorithms classify data points into predetermined classifications, allowing for a wide range of applications. ML models in healthcare categorize medical pictures to help in illness diagnosis. Classification algorithms are used in email management to detect spam emails and improve user experiences.

E-commerce, in particular, thrives on ML-powered recommendation systems. These systems rigorously examine consumer browsing and purchase history to forecast preferences and deliver customized product suggestions. Amazon's recommendation engine, for example, employs collaborative filtering approaches to increase user engagement and sales.

The capacity of ML-powered data analysis to handle large datasets with subtle patterns that human analysts may miss is what sets it apart. ML algorithms continually modify and enhance their models by learning from data, ensuring that their insights remain relevant over time. This flexibility is essential in today's data-rich world, where data volume and complexity are increasing.

Finally, combining ML and database management allows us to extract deeper and more nuanced insights from data. Clustering and classification algorithms reveal underlying patterns, aiding decision-making in a variety of disciplines. Recommendation systems improve user experiences and promote purchases in e-commerce. As we continue to traverse the data-driven world, the integration of ML with data analysis promises to yield ever more deep insights.

Predictive Analytics and Decision Support

Machine Learning (ML) - -powered predictive analytics alters decision-making by projecting future outcomes based on previous data trends. A core ML approach, regression analysis, predicts numerical values by modeling variable connections. In real estate, for example, it forecasts property values based on location, size, and amenities, influencing pricing strategies and investments.

Predictive analytics is taken a step further with ML-enhanced decision support systems. They examine past data to uncover trends and patterns, which aids in data-driven decisions. ML models in healthcare predict patient readmission rates, optimizing resources and enhancing treatment. They examine market trends and dangers in finance, driving investment plans.

Healthcare exemplifies predictive analytics' transformational ability. ML algorithms estimate individual patient health trajectories, detect disease outbreaks and optimize hospital resources. Better patient outcomes and cost savings result from proactive treatments.

Nonetheless, difficulties continue. Constant considerations include ensuring model correctness and removing biases in training data. Interpretability is vital for acquiring confidence, especially in critical fields such as healthcare.

Finally, data-driven decision-making is fueled by ML-powered predictive analytics and decision support. Organizations across industries use them to forecast trends, optimize resources, and improve outcomes. As machine learning advances, its ability to provide actionable insights and assist educated judgments cements its place as a critical component in modern decision support systems.

Anomaly Detection and Security

The combination of Machine Learning (ML) with database management provides enterprises with a powerful arsenal for anomaly detection and security reinforcement, ushering in a new era of data security.

Anomalies, or departures from known patterns, can indicate crucial events or potential security breaches. Machine learning approaches excel at automating anomaly detection, with models quickly identifying abnormalities by observing regular activity. In the financial industry, for example, ML systems examine transaction data to discover odd spending patterns and swiftly notify consumers of potentially fraudulent activities. Anomaly detection protects quality control in production by discovering faulty items before they reach customers.

One of the key advantages of ML-driven intrusion detection systems is cybersecurity. To identify illegal access attempts and possible threats, these systems methodically monitor network traffic and user activity. ML models enhance the defense against assaults by detecting anomalous patterns in real-time and protecting critical data and digital assets.

The significance of anomaly detection, however, goes beyond cybersecurity. ML assists in early illness diagnosis in healthcare by detecting abnormalities in medical pictures and patient data. It guarantees the integrity of products in transit in supply chain management by spotting deviations from predicted transportation patterns.

Nonetheless, while ML improves security, it creates new difficulties. Adversarial attacks, in which hostile actors modify data to fool machine learning algorithms, represent a substantial risk. As a result, continued research into adversary resilience is critical for preserving the efficacy of anomaly detection in security applications.

In conclusion, the combination of ML with database management enables enterprises to strengthen their security procedures and spot abnormalities quickly. ML-driven anomaly detection improves data protection, guaranteeing the integrity and confidentiality of key information in finance, cybersecurity, healthcare, and supply chain management. As security threats develop, the agility and resilience of machine learning models remain critical in protecting our digital environment.

Natural Language Processing and Text Mining

Through Natural Language Processing (NLP) and Text Mining, the marriage of Machine Learning (ML) and database administration has revolutionized the processing of unstructured textual data. This section dives into the technology's transformational power.

NLP approaches enable computers to grasp and analyze human language, paving the way for important insights to be extracted from massive textual collections. opinion analysis is a popular NLP tool that analyzes text data from social media and online reviews to determine public opinion toward products, services, or political events. This sentiment analysis is used by businesses to improve marketing efforts and assess client happiness.

Text mining techniques, on the other hand, extract priceless information from massive text corpora. Content classification, summarization, and entity extraction are all included. Leading search engines, such as Google, use ML-driven text mining to provide users with relevant search results, hence improving the user experience.

NLP and text mining are used in healthcare to examine medical literature and patient information in order to discover emerging patterns and improve clinical decision support. These technologies streamline document examination and legal research in the legal profession, saving time and money.

The difficulty stems from the intricacies of language and context, which need these technologies to be computationally costly and reliant on massive quantities of training data. Furthermore, questions of privacy and bias in text data raise ethical concerns.

Finally, the combination of ML with NLP and text mining affects how businesses use textual data. These technologies, which range from sentiment analysis to knowledge discovery, provide useful insights that improve decision-making across disciplines. As machine learning algorithms improve, their capacity to extract meaning and context from text offers enormous potential for data-driven innovation and efficiency.

Challenges and Opportunities

While the integration of Machine Learning (ML) with database administration has enormous promise, it is not without its problems and possibilities that define the data management and analytics environment.

Challenges.

Data Privacy and Security Concerns: Because ML models frequently require sensitive data for training, there are worries regarding data privacy and security breaches. It is a tricky balance to protect this data while allowing model growth.

Bias and Fairness: Inequalities in ML predictions can be perpetuated by biases in training data. To avoid biased outcomes, it is necessary to address prejudice and ensure fairness in algorithms.

Interpretability and Explainability: Many machine learning models, particularly deep learning models, are complicated and difficult to understand. Understanding and justifying model decisions is vital in mission-critical applications such as healthcare.

Scalability: As data volumes increase, scaling ML systems to efficiently handle huge datasets becomes a significant problem. To address this challenge, distributed computing and novel techniques are required.

Opportunities.

Federated Learning: This decentralized ML technique enables model training on distributed data sources while protecting privacy and security.

Differential Privacy: Techniques like as differential privacy give an extra layer of privacy protection to ML algorithms, guaranteeing that individual data stays private.

Explainable AI: Explainable AI seeks to improve the transparency and interpretability of complicated machine learning algorithms, allowing users to understand and trust their judgments.

Automation and efficiency: Machine learning automates time-consuming operations like data preparation, decreasing human effort and error. This efficiency allows data professionals to focus on higher-level activities.

Collaboration Across Disciplines: The pervasiveness of ML encourages collaboration among data scientists, domain specialists, ethicists, and policymakers, resulting in a more holistic approach to data management.

Finally, the problems and opportunities given by the combination of machine learning and database administration form the emerging landscape of data-driven decision-making. While issues like data privacy and bias remain, new solutions, more openness, and ethical concerns pave the path for a future in which machine learning improves our capacity to extract useful insights from data while retaining trust and integrity.

Conclusion

We've begun on an illuminating journey to investigate the symbiotic link between Machine Learning (ML) and database/data management, revealing the significant ramifications and revolutionary possibilities of this combination.

Our investigation began with the understanding of data management's critical relevance in modern companies across several industries. It provides the foundation for critical decision-making, innovation, and competitiveness. Traditional data management systems, however, typified by manual procedures, have proven insufficient in dealing with the ever-increasing amount, diversity, and velocity of current data.

Enter machine learning (ML), a powerful force that automates and augments data management operations, transforming how we interact with and extract value from data. Our quest began with discovering how machine learning simplifies data processing. It automates precise and efficient procedures that replace labor-intensive data cleansing, transformation, and integration operations. ML quickly discovers and corrects discrepancies by learning from prior data trends and maintaining data integrity. The merger of machine learning and database management ushers in improved data integration techniques, easing the strain on data professionals and allowing them to focus on higher-level activities.

In the age of big data, ML integration is a watershed moment. It enables enterprises to manage massive amounts of unstructured data with ease, increasing their ability to derive relevant insights. The advantages extend to data integrity, as machine learning not only meets but exceeds legal standards, building trust in data-driven decision-making.

As our trip progressed, it became clear that ML played a critical role in data analysis and pattern detection. Through clustering and classification algorithms, it provides categorization and useful insights. Predictive analytics informs important choices based on future forecasts, while recommendation systems driven by ML raise the standard of customer experience by anticipating user preferences.

Security and anomaly detection, two pillars of the digital era, have experienced significant advancements because of ML. ML improves data protection by automating the identification of abnormalities, whether in cybersecurity, banking, or manufacturing. It is especially important in Natural Language Processing (NLP) and Text Mining, which have revolutionized data processing by allowing computers to extract insights from unstructured textual material.

Nonetheless, our adventure presented us with many problems. Due to the sensitivity of training data, data privacy and security concerns loom large. The persistence of biases in machine learning algorithms raises concerns about justice and equity. Furthermore, the opacity of many ML models makes understanding their judgments difficult, particularly in mission-critical applications. Nonetheless, these issues serve as spurs for innovation, spawning solutions such as federated learning and differential privacy, as well as initiatives to make ML models more transparent and interpretable.

Finally, the combination of Machine Learning with data management has profoundly changed the data environment, providing enterprises with previously unimagined possibilities. It improves data analysis, speeds data processing, strengthens security measures, and revolutionizes the management of unstructured textual data. As ML evolves, its fundamental position in data management will drive innovation, allowing firms to fully realize the potential of their data for decision-making, innovation, and competitiveness. Our experience has demonstrated that the collaboration of machine learning and data management is a dynamic force set to change the future of data-driven enterprises in an increasingly complex and interconnected world.

The link for the video power point presentation is given below

https://youtu.be/frgZhE4pYYk

References

Enhancing Data Processing

1. Massachusetts Institute of Technology. (2022, December 20). *How AI is improving data Management | MIT Sloan Management Review*. MIT Sloan Management Review. https://sloanreview.mit.edu/article/how-ai-is-improving-data-management/
2. Mirzaei, A., Aslani, P., & Schneider, C. R. (2022). Healthcare data integration using machine learning: A case study evaluation with health information-seeking behavior databases. *Research in Social & Administrative Pharmacy, 18*(12), 4144–4149. https://doi.org/10.1016/j.sapharm.2022.08.001
3. Vivek, J. (2023, May 25). *Data Science & Machine Learning: Role of ML in Data SCEI*. Zuci Systems. https://www.zucisystems.com/blog/what-is-the-role-of-machine-learning-in-data-science/#:~:text=Machine%20learning%20analyzes%20and%20examines,to%20make%20real%2Dtime%20predictions.
4. Zhang, J. (n.d.). Data Engineering: Feature Selection with an Iris Dataset Example. *www.linkedin.com*. https://www.linkedin.com/pulse/data-engineering-feature-selection-iris-dataset-example-justin-zhang
5. Morgan, A., & Edward, E. (2023). Enhancing Data Integrity in Banking Applications using AI/ML Techniques. *ResearchGate*. https://www.researchgate.net/publication/373420571_Enhancing_Data_Integrity_in_Banking_Applications_using_AIML_Techniques

Data Analysis and Pattern Recognition

1. Taskesen, E. (2023, May 2). From Data to Clusters: When is Your Clustering Good Enough? *Medium*. https://towardsdatascience.com/from-data-to-clusters-when-is-your-clustering-good-enough-5895440a978a

2. NIX United. (2023). Machine Learning in Healthcare: 12 Real-World use Cases to Know. *NIX United – Custom Software Development Company in US*. https://nix-united.com/blog/machine-learning-in-healthcare-12-real-world-use-cases-to-know/
3. Javed, M. (2021, December 16). The best Machine Learning algorithm for Email Classification. *Medium*. https://towardsdatascience.com/the-best-machine-learning-algorithm-for-email-classification-39888e7b1846
4. Iqbal, K., & Khan, M. S. (2022). Email classification analysis using machine learning techniques. *Applied Computing and Informatics*. https://doi.org/10.1108/aci-01-2022-0012
5. Prijic, M. (2023). The role of machine learning in recommendation Systems. *IT Convergence*. https://www.itconvergence.com/blog/the-role-of-machine-learning-in-recommendation-systems/#:~:text=Recommendation%20systems%20deploy%20machine%20learning,each%20user's%20needs%20and%20preferences.
6. Di Stefano, A. (2022, August 3). Recommendation systems and machine learning: driving personalization. *machine learning*. https://www.itransition.com/machine-learning/recommendation-systems#:~:text=Machine%20learning%2Dbased%20recommendation%20systems%20are%20powerful%20engines%20using%20machine,personalized%20product%20and%20content%20suggestions

Predictive Analytics and Decision Support

1. Smolic, H. (2023, January 21). Unlock the Power of Data with Predictive Analytics and Decision Making | Graphite Note. *Graphite Note*. https://graphite-note.com/predictive-analytics-decision-making
2. *Predictive Analytics in Healthcare - Benefits & regulation*. (n.d.). ForeSee Medical. https://www.foreseemed.com/predictive-analytics-in-healthcare#:~:text=Predictive%20analytics%20is%20reshaping%20the,and%20accurately%20than%20ever%20before

3. Shepardson, B. (2023, June 1). The Power of Predictive Analytics in Real Estate: Unleashing the potential of Data-Driven Decision Making. *RealtyBizNews: Real Estate Marketing & Beyond*. https://realtybiznews.com/the-power-of-predictive-analysis-in-real-estate-unleashing-the-potential-of-data-driven-decision-making/98777353/

Anomaly Detection and Security

1. Brown, S. (2022, October 19). What is anomaly detection? Methods, examples, and more. *StrongDM*. https://www.strongdm.com/blog/anomaly-detection
2. Vanini, P., Rossi, S., Zvizdic, E., & Domenig, T. (2023). Online payment fraud: from anomaly detection to risk management. *Financial Innovation*, *9*(1). https://doi.org/10.1186/s40854-023-00470-w
3. Analyst, G. D. M. (2023). Anomaly detection and visual quality control—benefits. *Grid Dynamics Blog*. https://blog.griddynamics.com/how-anomaly-detection-predictive-maintenance-and-visual-quality-control-save-companies-time-and-money/#:~:text=Anomaly%20detection%20finds%20patterns%20of,product%20quality%2C%20and%20reduce%20downtime.
4. *What is Anomaly Detection? Definition & FAQs | Avi Networks*. (2023, May 25). Avi Networks. https://avinetworks.com/glossary/anomaly-detection/#:~:text=Anomaly%20detection%20is%20the%20identification,noise%2C%20novelties%2C%20and%20exceptions.
5. Sipes, T., Jiang, S. B., Moore, K. L., Li, N., Karimabadi, H., & Barr, J. R. (2014). Anomaly Detection in Healthcare: Detecting erroneous treatment plans in time series radiotherapy data. *International Journal of Semantic Computing*, *08*(03), 257–278. https://doi.org/10.1142/s1793351x1440008x
6. Keary, T. (2022). How companies in the supply chain are using anomaly detection. *Information Age*. https://www.information-age.com/supply-chain-anomaly-detection-11804/

7. Dremio. (2023, August 22). *Anomaly detection | Dremio*. https://www.dremio.com/wiki/anomaly-detection/#:~:text=Healthcare%20Monitoring%3A%20Anomaly%20Detection%20can,unusual%20patterns%20in%20user%20behavior.
8. Team, T., Team, T., Team, T., & Team, T. (2021). Exploring the advantages and disadvantages of machine learning. *TechVidvan*. https://techvidvan.com/tutorials/advantages-and-disadvantages-of-machine-learning/

Natural Language Processing and Text Mining

1. *What is Text Mining, Text Analytics and Natural Language Processing? Linguamatics*. (n.d.). https://www.linguamatics.com/what-text-mining-text-analytics-and-natural-language-processing#:~:text=Text%20mining%20(also%20referred%20to,machine%20learning%20(ML)%20algorithms.
2. Das, B. R., Sahoo, R., & Sahoo, A. K. (2023). Monitoring Social Media and Research Paper using Natural Language Processing. *ResearchGate*. https://www.researchgate.net/publication/370060678_Monitoring_Social_Media_and_Research_Paper_using_Natural_Language_Processing#:~:text=a%20professional%20level.-,Natural%20language%20processing%20(NLP)%20is%20one%20of%20the%20most%20promising,multiple%20sources%20in%20various%20formats.
3. Rai, A. (n.d.). Top 12 Commerce Project Topics & Ideas in 2023 [For Freshers]. *upGrad blog*. https://www.upgrad.com/blog/what-is-text-mining-techniques-and-applications/
4. Akash, S. (2023). How Natural Language Processing in Healthcare is Used? *Analytics Insight*. https://www.analyticsinsight.net/how-natural-language-processing-in-healthcare-is-used/#:~:text=NLP%20can%20be%20used%20to%20transcribe%20physician%20notes%2C%20which%20is,patient%20care%20instead%20of%20documentation.

5. Way2benefits. (2021). Advantages and disadvantages of natural language processing. *Way2Benefits*. https://way2benefits.com/advantages-and-disadvantages-of-natural-language-processing/#:~:text=Cons%20or%20Disadvantages%20of%20NLP%3A&text=The%20system%20is%20built%20for,is%20poorly%20worded%20or%20ambiguous.
6. GeeksforGeeks. (2023). Ethical considerations in natural language processing bias fairness and privacy. *GeeksforGeeks*. https://www.geeksforgeeks.org/ethical-considerations-in-natural-language-processing-bias-fairness-and-privacy/

Challenges and Opportunities

1. Frąckiewicz, M. (2023). The potential and risks of machine learning in privacy and data protection. *TS2 SPACE*. https://ts2.space/en/the-potential-and-risks-of-machine-learning-in-privacy-and-data-protection/#:~:text=Privacy%20Risks%20of%20Machine%20Learning%3A%20What%20to%20Look%20Out%20For&text=One%20of%20the%20primary%20concerns,personal%20details%20or%20financial%20information.
2. Fairness: types of bias. (n.d.). *Google for Developers*. https://developers.google.com/machine-learning/crash-course/fairness/types-of-bias#:~:text=Machine%20learning%20models%20are%20not,model's%20predictions%20susceptible%20to%20bias.
3. Bhatia, R. (n.d.). Bias & Fairness in AI. *www.linkedin.com*. https://www.linkedin.com/pulse/bias-fairness-ai-rishabh-bhatia#:~:text=What%20is%20fairness%3F,group%20based%20on%20their%20characteristics.
4. Johnson, J. (n.d.). *Interpretability vs Explainability: The Black Box of Machine Learning*. BMC Blogs. https://www.bmc.com/blogs/machine-learning-interpretability-vs-explainability/#:~:text=Interpretability%20has%20to%20do%20with,Nets%2C%20to%20justify%20the%20results.

5. Onose, E. (2023). Explainability and Auditability in ML: Definitions, techniques, and tools. *neptune.ai*. https://neptune.ai/blog/explainability-auditability-ml-definitions-techniques-tools#:~:text=The%20model%20might%20be%20interpretable,what%20explainability%20is%20all%20about.
6. Farah, L., Murris, J., Borget, I., Guilloux, A., Martelli, N., & Katsahian, S. (2023). Assessment of Performance, Interpretability, and Explainability in Artificial Intelligence–Based Health Technologies: What Healthcare Stakeholders Need to Know. *Explainability and Interpertability*, *1*(2), 120–138. https://doi.org/10.1016/j.mcpdig.2023.02.004
7. *What is ML Scalability - MLOps | MLOps Wiki*. (n.d.). https://censius.ai/wiki/ml-scalability#:~:text=Machine%20learning%20scalability%20refers%20to,users%20residing%20at%20global%20locations.
8. Solutions, C. (n.d.). What are some collaboration solutions that leverage AI or machine learning? *www.linkedin.com*. https://www.linkedin.com/advice/0/what-some-collaboration-solutions-leverage
9. Fathima, S. (2021, December 15). What is Differential Privacy? - Becoming Human: Artificial Intelligence Magazine. *Medium*. https://becominghuman.ai/what-is-differential-privacy-1fd7bf507049