Chapter 36
A Critical Analysis of Machine Learning's Function in Changing the Social and Business Ecosystem

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Abstract Machine learning is an automization based technique that learns automatically about something without specific programming of the task. It is used in a variety of fields. The capabilities of Data-driven modeling (DDM) have recently been expanded by advances in machine learning, allowing artificial intelligence to infer system behavior by correlating computing and exploiting between variables that were observed within them. The use of auto-generated high volume business data can be enabled by machine learning algorithms and aided by applying models of ecosystem services across scales, allowing the flow of these services to be analyzed and predicted to disaggregated beneficiaries. Machine learning is a very advanced field with numerous applications in a wide range of business environments. Currently, in the field of information science, data processing techniques such as machine learning have been developed and applied in a variety of areas for practical applications.

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36.1 Introduction

No one can deny that ML is the most influential and powerful technology in today's world. It is critical that we recognize and comprehend the potential of machine learning. Without a doubt, machine learning will continue to make headlines in the coming months and years. The information is converted into knowledge using a tool known as machine learning. Data has exploded in the last fifty years. If these data are not analyzed and we are unable to discover the hidden patterns in the data, this mass of data will become completely useless. Machine learning techniques were used to automatically detect the valuable and hidden patterns that exist within the complex data. Without the use of machine learning, it would have been extremely difficult to discover this data. The future events can be predicted by using hidden patterns, and the decision-making process can be facilitated by having knowledge of the problem.

Machine learning has become a mainstay of the IT sector over the last two decades, and it has also become a central and hidden part of our lives. Because the amount of data available to every sector is increasing by the day, it is becoming a very good reason to say and believe that smart data analysis will become more prevalent. Because of the abundance of data available, it is becoming an essential component for the advancement of technologies to intelligently analyse it. The tasks that are performed because of system changes and are associated with "artificial intelligence" (AI) are typically referred to as machine learning. The tasks that are referred to as machine learning involve recognition, diagnosis, planning anything, controlling the robot, and predicting anything. Changes in the system because of machine learning can be improvements to the performance of existing systems or the synthesis of new systems. It can be more precisely explained as displaying the architecture of a traditional "artificial intelligence agent." The agent perceives and models the environment, and the actions are appropriately computed; perhaps the effects are also anticipated by the agent. Changes made to any component of the system can be categorized as machine learning. Different learning mechanisms can be applied to the system, depending on the subsystem in which the changes have been made. Work in machine learning is converging from a wide range of sources. Different traditions bring different methods and vocabulary, which are then assimilated in a much more disciplined discipline. Figure 36.1 shows the process and mechanism of machine learning.

Machine learning is classified into four types: "supervised learning", "unsupervised learning", "semi-supervised learning", and "reinforcement learning". Dey [1] discovered that, whether we realize it or not, we are all in the habit of using machine learning today, from getting a recommendation for a specific product while shopping for it online to updating our status on social networking sites. There are different approaches for each type of machine learning, all based on the same underlying process and theory. Supervised learning: Supervised machine learning algorithms always require external assistance. The input data set is divided into train and test data sets. The variable output of the train set of data must be predicted and classified. The algorithms learn all kinds of patterns from the training set of data and then apply

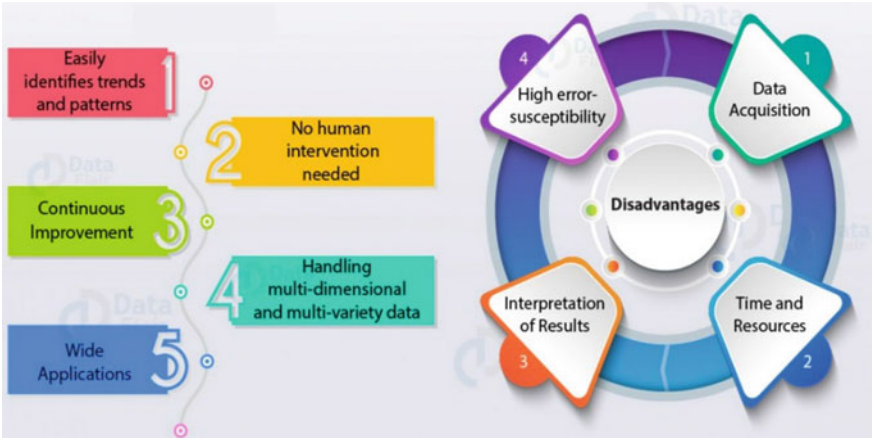

Fig. 36.1 Mechanism of machine learning

them to the test dataset for prediction and classification. Unsupervised Learning: In unsupervised learning, the algorithm learns only a few features from the data, and when new data is introduced, it uses the previously learned feature to recognize the new class of data. The main application of unsupervised learning is feature clustering and reduction.

Semi-Supervised Learning: The semi-supervised learning algorithm combines the powers of supervised and unsupervised learning. There are some areas of machine learning and data mining where there is already a large amount of unlabeled data and the process of obtaining new labeled data is time-consuming. In these cases, semi-supervised learning can be very useful. Figure 36.2 shows how data is managed and processed through machine learning.

Reinforcement Learning: In this, actions are taken based on decisions made to achieve a more positive outcome. Until and unless a learner is presented with a situation, he lacks the knowledge to act. The learner's actions, as well as their future actions, can have an impact on the situation. There are only two criteria on which reinforcement learning is solely dependent; these are trial and error and delayed outcome. Multitask Learning: The simple goal of multitask learning is to assist other learners in performing better. When the multitask learning algorithm is applied to a task, it remembers how it solved this particular problem previously and reached the conclusion. Ensemble Learning: Ensemble learning is the combination of various types of individual learners to form a single learner. In supervised learning, there is a target or an outcome variable or a dependent variable for which prediction must be made using the predictors of a given set or independent variable. These variables are used to create a function that maps the inputs to the desired output. Unsupervised learning is used in the clustering of different groups in order to segment customers into different groups for intervention in a specific manner, e.g., Apriority algorithm, K-means. The reinforcement learning algorithm is used to train the machine to make the

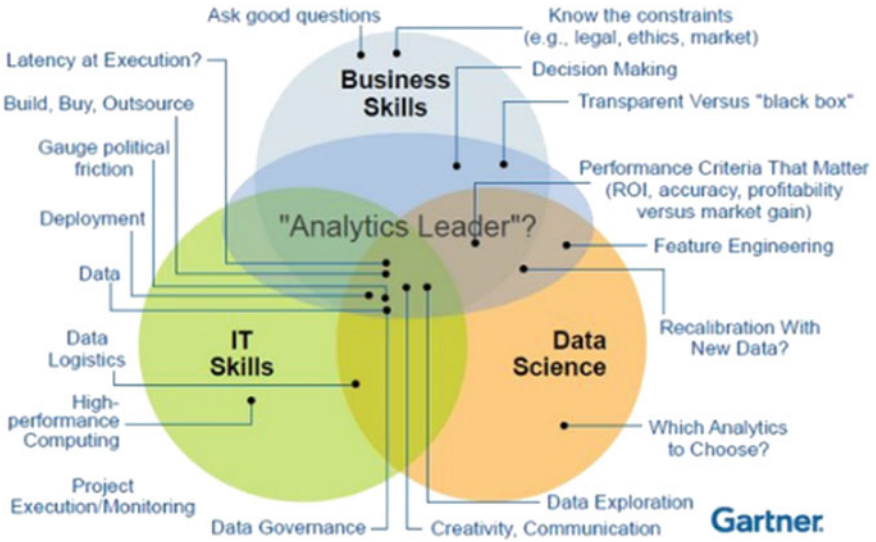

Fig. 36.2 Skills and responsibilities of data science leader. *Source* Data Science Learning

appropriate decisions. When exposed to any environment, the machine continuously trains itself using trial and error in the process of reinforcement machine learning. This type of machine has always attempted to capture the knowledge that is best for it in order to make accurate business decisions by using its previous or previous experiences, for example, the Markov Decision Process.

36.2 Applications of Machine Learning

Traditionally, weather forecasting was done using physical models of the atmosphere; however, these physical models were very unstable to perturbations, so forecasting was inaccurate for a long time. For a long time, weather forecasting has been done potentially by machine learning techniques for more accurate forecasts because machine learning is more robust to perturbations. The physical model is governed by a system of ordinary differential equations, which is unstable under perturbations, and the initial measurements of atmospheric conditions had uncertainties, and the accuracy of weather forecasting is inaccurate and limited to a period of ten days due to incomplete understandings of the complex atmospheric system. Machine learning, on the other hand, is relatively resistant to perturbations, and there is no need to fully comprehend the physical processes that govern the atmosphere. As a result, machine learning represents a viable alternative to these physical models in weather forecasting. Jakaria et al. [2] discovered that machine learning models accurately predict weather features and that they are accurate enough to compete with existing

traditional models. The weather in any given area can be easily predicted by using historical data from the surrounding areas. This method of forecasting is far more effective than focusing solely on the area for which forecasting is required.

Many scientific disciplines are taking integrative approaches to the problems of the planets, and this number is growing by the day. The problems of the planets include global climate change, food security, and human migration. There are numerous methods for miming data and analyzing it, and many of these methods make use of machine learning algorithms. The process of fitting a model to a set of data using learning and training is known as machine learning algorithm. Willcock et al. [3] concluded that data-driven modeling (DDM) plays a clear role when the services of modeling ecosystem are helping to produce interdisciplinary models and providing holistic solutions to the complex issues of socioecology. Recent advances in machine learning have expanded the capabilities of data-driven modeling (DDM). Recknagel [4] discovered that machine learning techniques are inductive and deal with data-driven modeling approaches. Machine learning techniques, which can be represented by machine learning techniques for ecological issues, require a reasonable complex database. Artificial Neural Network (ANN) techniques have been shown to be very effective for nonlinear ordination and visualization, as well as for multiple regressions and time series models. It can also be seen that ANN is effective for image recognition and classification. The trained ANN model, in conjunction with sensitive analysis, reveals the nature of the relationship between the driving and output variables in an ecosystem. GA techniques can be used to hybridize deductive ecological models. This GA technique allows the causal rules to evolve and process the equations, as well as optimize the process parameters. The adaptive agents provide a novel framework for discovering and forecasting the emergent structures of ecosystems and their behaviors in response to environmental changes. Rana and Miller [5] discovered that no policy has an average impact on local contextual conditions. There is significant heterogeneity, which has a conditional impact on the local context. The region under study is influenced by a variety of climatic and biophysical factors, which are shaped by different policies for joint forest management. Cooperative forest management, on the other hand, performs better in areas where existing grazing-based livelihoods are preserved. Instead of having so much potential, the approaches have so many restrictions and limitations, such as no estimation of valid precision for heterogeneity estimates and issues with stability estimates.

Traditional and common methods for protecting against fraud were used in the banking industry; these methods were used where the rules were defined by humans. It is a fact that nearly 90% of the banking industry and financial institutions rely on and follow these riles and methods. Because traditional methods may not be scalable and sustainable in the future, and the number of frauds in the banking and financial industry is increasing daily, there are many people and banks adopting new technologies to protect themselves from fraud. Every day, customers of the banking sector file a large number of complaints about false-positive fraud. False-positive frauds are non-fraudulent transactions that appear to be fraudulent. As a result, there is a loss of millions of dollars in transactions, and the rule-based method is a major contributor to this type of problem. Furthermore, the pattern of the fraud is not constant, and it

changes its behavior over time, making a rule-based system cumbersome and quickly obsolete. Shirgave et al. [6] reviewed a number of machine learning algorithms that can detect fraud in credit card transactions. All of these techniques' performance is analyzed and tested using accuracy, precision, and specificity metrics. Random forest supervised learning techniques are used to classify alerts as either fraudulent or authorized. These classifiers will be trained using feedback and delayed supervised samples. In order to detect the alerts, each probability will be aggregated. It is proposed that the approach be ranked by learning and that the priority be used to rank the alerts. This proposed method will resolve the class imbalance as well as the concept drift problem. Semi-supervised learning methods will be used in the future to classify alerts in FDS. Lima [7] discovered that the implementation of rule-based or supervised learning-based algorithms is impractical because the number of scenes with the possibility of fraud is growing by the day. The modern fraud detection system will be able to react in real-time, and this modern fraud detection system will provide more accurate results for new types of fraud scenarios. The unsupervised algorithm, like deep learning algorithms, can detect this new type of fraud because it does not require any human classification and can ingest a large volume of data. This study focuses on DL algorithms such as autoencoders, which are the most promising, and restricted Boltzmann machines, which focus on anomaly detection rather than misuse detection. Saragih discovered that credit and debit card fraud is increasing every day over the last few years. It has been observed that there are numerous incidents of fraud occurring as a result of a lack of knowledge about credit cards and their use. Credit card users frequently share their personal information, credit card information, and even their one-time password with bogus and unknown calls. The money from the appalling loss of the fake trades is used by the individual in a blackmail activity, whether honestly or indirectly, and the owner even considers this to be a trade. These types of frauds and cheats are committed on a regular basis using credit or debit cards. Because the security structure is very weak, these types of frauds are taking place.

Machine learning is used to discover patterns and data on its own and to derive conclusions from them. Machine learning has the potential to enable personalized care, also known as precision medicine. The field of healthcare is advancing daily thanks to the use of machine learning methods. Machine learning is expected to bring about significant change in the healthcare sector within the next few years. Machine learning and Artificial Intelligence have the potential to transform the entire healthcare system; however, the quality of machine learning and the decision support system of Artificial Intelligence must address the issues that patients and health experts face in the effective diagnosis procedure. According to Jabbar et al. [8], it is not possible to have a spontaneous increase in efficient healthcare providers.

With the use of machine learning and artificial intelligence technologies, healthcare costs can be reduced, more patients can be served in less time, and healthcare outcomes can be improved. According to Bhardwaj et al. [9], the healthcare sector is the fastest growing in today's economy because more and more people require healthcare, which is becoming increasingly expensive. Now, the government is spending a lot of money on the healthcare sector, and there is a need to connect patients and

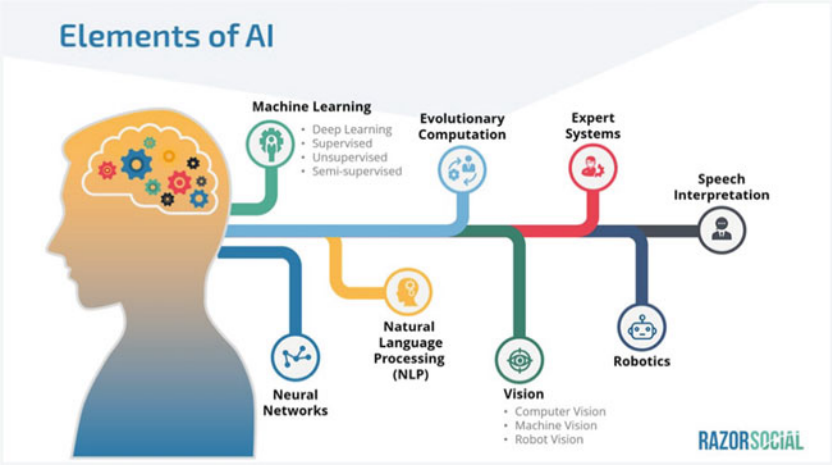

Fig. 36.3 Machine learning as an elements of AI. *Source* RazorSocial

doctors. Big data and machine learning technologies had the potential to provide all the assistance required for patients and healthcare providers to provide and receive better care at lower costs. There are numerous companies and organizations that have entered this industry and begun assisting patients by assisting them with transitions and demonstrating patient-centered care to them. There is so much data already available there that one must figure it out and interpret it in a specific channel. Companies are stepping forward to take that single step to gain a better understanding of it (Fig. 36.3).

Tziridis et al. [10] discovered that by analyzing historical fare data, it is possible to predict flight fares. The results of the experiments show that machine learning models are a good tool for predicting airline prices. It is critical to collect data and select features for airfare prediction to draw some conclusions that will be useful for this process. Wang et al. [11] discovered the effectiveness of machine learning algorithms and techniques; they also compared the performances of different machine learning classifiers and discovered the best machine learning algorithm for the prediction task of airfare prices by leveraging information from the DBIB and T-100 data sets. There are numerous factors that influence the price of airline tickets, such as the distance of the flight, the time of purchase, the price of fuel, and so on. Each carrier has its own set of proprietary rules and algorithms in place to determine its airfare. Because of advancements in machine learning and artificial intelligence, it is now possible to make price variations by interfering with their rules and model. According to Lu [12], to solve some specific problems, Ada Boost Decision Tree Classification is said to be the perfect model, and it also performs well. Ada Boost Decision Tree Classification outperforms others in the random purchase strategy by nearly 61.35 percent, and it has a small performance variance relative to the other eight routes. Companies also prefer the Uniform Blending Classification and Q-learning methods due to their high performance.

Kanavos et al. [13] presented various methodologies for the prediction and modeling of purchasing in the supermarket using machine learning techniques. To be more specific, two sets of data were used for this purpose: a supermarket database and an Amazon database containing all of the customer's purchase information. The Amazon data set was analyzed, and a model was developed to predict new products based on the category for each customer and the supermarket customer's preferences. Ramesh et al. [14] investigated grocery store sales patterns. Machine learning is thought to be a highly advanced field. Machine learning is said to be able to enable applications in programming after analyzing its implementations in so many business environments. Machines are used in procedures such as data mining and predictive modeling. The use of machine learning techniques in the real world identifies trends, forecasts behavior, and makes facts based on recommendations. Machine learning provided a plethora of algorithms based on which data sets were analyzed. The data is predicted using machine learning algorithms to predict the sales of a grocery store in the third month of the year. After implementing various algorithms on the given sets of data, it is discovered that linear regression produces the best results, indicating that data from the previous month can be used to predict grocery store sales for the coming month.

According to Thessen [15], machine learning methods provide a wide range of techniques that can be accessed by researchers individually. These arrays of techniques are ideal for the complex sets of data generated by earth and ecology science. More accurate models are provided, and scientific progress is accelerated because these machine learning models have the potential to improve the quality of research in a scientific manner. These machine learning methods widen the necks of the bottles, fill gaps in the data, and improve understanding of the system's operation. If society wants to reap the benefits, the applications of these methods in ecology and earth science must be expanded. Encourage the use and adoption of these methods, communication should be improved, interdisciplinary collaboration should be encouraged, formal and informal education should be expanded, and machine learning researchers should be supported. The best source of knowledge transfer is collaboration between companies and organizations that demonstrate an interest in environmental issues. Random forest is an excellent and introductory machine learning method. The random forest is simple to implement and produces excellent results. Willcock [3] concluded that data-driven modeling can be used to scale up ES models so that they can provide more policies and make more relevant decisions. Data-driven modeling allows big data to interact with one another, as well as the creation of interdisciplinary models and the provision of holistic solutions to complex socio-ecological issues.

Machine learning is a very advanced field with numerous applications in a wide range of business environments. At the moment, we all use machine learning in our daily lives, whether knowingly or unknowingly, whether while shopping online or surfing social networking sites. Today, machine learning has applications in almost every field. It is significantly reducing the burden of workload in the processing of bid data. Currently, in the field of information science, data processing techniques

such as machine learning have been developed and applied in a variety of areas for practical applications.

Machine learning is useful in the healthcare sector for improving healthcare and lowering costs, in the prediction of sales in supermarkets and grocery stores, in protecting the banking sector from financial frauds, and weather forecasting is done potentially by machine learning techniques for more accurate forecasts because machine learning is more robust t The capabilities of Data-driven modeling (DDM) have recently been expanded by developments in machine learning; machine learning is said to be a satisfactory tool for predicting Airfare prices. Machine learning is producing fruitful and satisfactory results in all sectors.

36.3 Conclusion

Machine learning is a very advanced field and it has many implementations with so many aspects of business environments. At present each and everyone is using the machine learning in our day to day life knowing or unknowingly, whether while shopping online or during our surfing on the social networking sites. The machine learning has its applications in each and every field today. It is playing a great role in lowering the burden of workload in the processing of bid data. At present, in the field of information science, the techniques of data processing such as machine learning were developed and applied in different areas for practical uses.

The machine learning is useful in the healthcare sector for improving the healthcare and lowering down the expenses, in the prediction of sales in the supermarkets and grocery stores, in protecting the banking sector from the frauds of financial issues, weather forecasting is done potentially by the techniques of machine learning for more accurate forecasts since machine learning is more robust to the perturbations. The capabilities of Data-driven modeling (DDM) were expanded by the developments in machine learning in recent days, machine learning is said to be a satisfactory tool for the prediction of Airfare prices. The machine learning is giving the fruit-full and satisfactory results in all the sectors.

References

1. Dey, A.: Machine learning algorithms: a review. Int. J. Comput. Sci. Inf. Technol. **7**(3), 1174–1179 (2016)
2. Jakaria, A.H.M., Hossain, M., Rahman, A.: Smart Weather Forecasting Using Machine Learning: A Case Study in Tennessee Conference Paper. Tennessee Tech University Cookeville, Tennessee (2019)
3. Willcock, S., Martínez-López, J., Hooftman, D.A.P., Bagstad, K.J., Balbi, S., Marzo, A., Athanasiadis, I.N.: Machine learning for ecosystem services. Ecosyst. Serv. (2018)
4. Recknagel, F.: Applications of machine learning to ecological modelling. Ecol. Model. **146**, 303–310 (2001)

5. Rana, P., Miller, D.C.: Machine learning to analyze the social-ecological impacts of natural resource policy: insights from community forest management in the Indian Himalaya. Environ. Res. Lett. **14**(2), 024008 (2019)
6. Shirgave, S.K., Awati, C.J., More, R., Patil, S.S.: A review on credit card fraud detection using machine learning. Int. Conf. Sci. Technol. Res. **8**(10), 1217–1220 (2019)
7. Lima, S: Deep Learning for Fraud Detection in the Banking Industry. Human IST Institute, University of Fribourg, Switzerland (2018)
8. Jabbar, M.A., Samreen, S., Aluvalu, R.: The Future of Healthcare: Machine Learning. Int. J. Eng. Technol. 7 (4.6), 23–25 (2018)
9. Bhardwaj, R., Nambiar, A.R., Dutta, D.: A study of machine learning in healthcare. In: 2017 IEEE 41st Annual Computer Software and Applications Conference (COMPSAC) (2017)
10. Tziridis, K., Kalampokas, Th., Papakostas, G.A., Diamantaras, K.I.: Airfare prices prediction using machine learning techniques. In: European Signal Processing Conference (2017)
11. Wang, T., Pouyanfar, S., Tian, H., Tao, Y.: A framework for airfare price prediction: a machine learning approach. In: International Conference on Reuse and Integration for Data Science, pp. 200–207 (2019)
12. Lu, J.: Machine learning modelling for time series problem: Predicting flight ticket prices. Computer Science, EPFL (2018)
13. Kanavos, A., Iakovou, S., Sioutas, S., Tampakas, V.: Large scale product recommendation of supermarket ware based on customer behaviour analysis. Big Data Cogn. Comput. **2**(2), 11 (2018)
14. Ramesh, K., Mathew, J., Hemalatha, N.: Machine learning approach for the predictive analysis of sales in grocery store. Int. J. Latest Trends Eng. Technol. 095–098 (2017)
15. Thessen, A.E.: Adoption of Machine Learning Techniques in Ecology and Earth Science One Ecosystem, pp. 2–38 (2016)