



Deep Learning Systems Integrated into the Digital Strategy of a Company Involved in e-commerce

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ARTICLE INFO

Article history:
Accepted January 2022
Available online April 2022

JEL Classification
O32, M15

Keywords:
Artificial Intelligence, deep learning, digital memory, digital transformation, e-commerce

ABSTRACT

The digital transformation is the current challenge of society, and especially in the conditions generated by the events of the last two years, this transformation has become somewhat indispensable. For some areas the digital transformation is still in the testing and controversy stage, for other areas this transformation has proven to be effective over time. Starting from this idea of digital transformation, this study will not only list the advantages and disadvantages of this phenomenon, but we will try to go into detail in the field of digitization and see a number of mechanisms that set these processes, more precisely we will try to identify how deep learning influences the digital transformation, based on a case study on a company involved in e-commerce, which tested the functionalities of AI Media, a platform able to perform analyzes in image recognition, geolocation and hypertexting.

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1. Introduction

Given the fact that technology is constantly evolving, there are currently a number of tools and possibilities for integration with deep learning systems. The disadvantage of entrepreneurs compared to digital giants such as Compania de e-commerce, Google, Facebook is that businesses that are now launching online do not have individual resources for integration with deep learning systems and are conditioned by providers of AI solutions.

However, the digitization of processes not only positively influences the external activity of companies by increasing the number of sales but also the internal activity by increasing the satisfaction of employees at work and at the same time increasing productivity. In order to observe how the digital strategy is mapped inside a company involved in e-commerce, an interview was conducted with its employees.

2. Literature review

When we try to define the notion of deep learning we have to start from the idea that this is a branch of artificial intelligence, and if defining this type of intelligence we mentioned a simulation of a human neuron, this is also Deep Learning (DL) - a system learning that communicates to computers recurring examples and information based on which they create a set of data based on which the system will be able to simulate the behavior of the human brain, being able to generate decisions and connections (Zhang et al., 2021).

In addition to the contribution that DL brings to the technological world, offering consumers automated processes, providing managers with automatically managed systems without the need for direct human involvement, DL trends tend to create such data sets that in future programmers should be able to direct the behavioral mechanisms of systems without having to write a single line of code (Yarkoni and Westfall, 2017). Commands and responses in deep learning are generated by connections, and many of them are called layers, we will use these terms to exemplify the most concise systems of deep learning (Howard and Guggen, 2020).

Thus, depending on the number and type of connections, ie depending on the type of Layers, there are various types of deep learning. The simplest layers are the ones that are fully connected, although due to the large number of connections that need to be established it seems more difficult, in the long run it seems easier to use, because it is often easier to set up direct connections using simplified functions and commands (Chollet, 2017). you set up abstract connections that are based on algorithms, which involves defining and calculating these algorithms in advance. A fully connected layer turns a list of inputs into outputs, and each of these elements is interdependent, which is why they are called fully connected layers.

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The second type of layer is the convolutional one - this is most often using in relation to the images, the principle of representation of this layer is based on the fact that the neighboring inputs as space are semantically similar so they can be analyzed and communicated (Bayar and Stamm, 2016). Images through the connection are established at the pixel level, due to the fact that they are close, transmit similar information from one to another, thus forming the image (Gao and Mosalam, 2018).

As we progress in detailing the types of layers we can see that they are becoming more complex and that depending on the complexity of the connections it also offers a special degree of learning possibilities, and the most advanced in this respect is the connection layer, which allows connections to learn from input sequences. This layer is based on the theory that inputs evolve, changing following a defined update rule, which can be taken from the data (Patterson and Gibson, 2017). So recurring layers can learn updates applied to data set inputs. As a result, the RNN Layer allows the use of the technique in functions such as language modeling. To convince ourselves that we are already interacting with these possibilities of deep learning we can use the example of Google, which has included in the mailing system the function of predicting words, and this is possible due to the fact that a combination of words has been used several times. and by repeating the input, the connection learned how to behave when recognizing certain letter combinations to suggest continuations of sentences that are as appropriate to reality as possible (Ramsundar, and Zadeh, 2018).

Deep Learning is associated with online stores and other information processing systems, but also in sales management. E-commerce retailers can come up with tailored and automated offers to attract as many customers as possible and increase their conversion rate (Chaudhuri et al., 2021).

Deep learning systems are compatible with many types of management, from human or material resources to sales or quality management. In the corporate sector, deep learning algorithms are used to improve employee satisfaction and retention, and in the sales sector, machine learning techniques aim to create products and product suggestions that are as personalized as possible for each individual or similar consumer group. Predictive analysis, iterative evaluations help managers manage the causes of dropout, the level of employee satisfaction, and thus be able to adapt decisions to prevent the loss or demotivation of employees (Thomas et al., 2019). Due to deep learning systems such as CRM (Customer Relationship Management) or ERP (Enterprise Resource Planing) reduce the time spent by employees for data storage and analysis, so they can be much more efficient in other functions they perform. Dead time is also eliminated, thus eliminating the time spent at work, being streamlined and optimized in order to be oriented towards obtaining results and applying decisions for the development of the company (Shi and Wang, 2018).

As machine learning systems become increasingly applicable in a variety of fields and for a variety of processes and functions, we realize that Deep Learning will not stop there, and a digital learning strategy will be a necessity and even a criterion for placing on the market compared to competitors in the future (Ahmed et al., 2010). In the e-commerce, deep learning algorithms for product recommendation strongly improve the conversion rate and thus increase the product sales. Through the records that clients have browsed and purchased, e-commerce retailers understand consumer needs more accurately (Zhou, 2020).

A digital strategy based on deep learning systems will have to focus a lot on automating the internal processes of companies and use the possibilities of deep learning in as many areas of activity as possible. Current forecasts and studies introduce deep learning techniques in areas such as pharmaceuticals - for predicting the toxicity of a drug, for example, or in the field of legislation so that on the basis of recurrences and juxtapositions a correct decision is made in court without Be influenced by the human factor, as well as in many production companies, or service providers, a digital strategy based on deep learning can generate ingenious decisions and solutions that can quickly develop the world we live in. The facial and voice recognition systems that some people now use on personal devices will be a way to monitor employee attendance at work or a way to count store visitors and a way to create a consumer or employee profile (Abdullah et al., 2021). All these aspects of deep learning can be evolutionary, but also worrying at the same time, because at some point we may live in a world where we feel pursued, but we will have to choose very carefully the companies we work for, the online stores where we shop to ensure that our data and information about us and about us are used ethically and for evolutionary purposes (Agag et al., 2016).

3. Method

We have conducted a qualitative survey, using an interview guide and data have been processed with the digital memory – TheBrain (<https://www.thebrain.com/>). The interview guide consisted of ten questions, of which the first three were about information about the interviewee, and how long he or she has been employed by the e-commerce company and in which department he or she works, and the other questions are about details on how to integrate deep learning systems in the internal management of the e-commerce company.

The first stage in conducting the interview was a preliminary discussion with the respondents, in order to convey information about the context of the interview and to establish the form of conduct - online, written, physical. Following the discussions, it was unanimously decided that these interviews should be conducted anonymously in writing. The interviewees were contacted by email, as well as by email they received the interview and sent the answers to the questions. It is also important to mention that the

participants in the interview are employed by the Romanian e-commerce company and the answers are strictly related to their experience and opinions. Given the fact that the interview was one with free answers, its purpose was to observe how much emphasis is placed on deep learning systems within the management of the Romanian e-commerce company. There is a possibility that some answers may not be proven, however they provide information about the experience of employees within the company.

The interviewees are part of the IT executive department, so the management department did not have their knowledge about the degree of monitoring through deep learning systems, so some respondents knew more details others less details regarding the internal management system. We will analyze the answers to the questions in order to better understand the perception of the employees of the e-commerce company on the deep learning systems integrated in the internal management. TheBrain digital memory offers visual insights on the relationships between the ideas shared among the interview. From qualitative analysis perspective, this digital memory enables innovative thinking and graphically reveals interconnections between a high number of ideas generated during the discussion with respondents.

The first questions following the answers can be concluded that the interviewees have on average 2-3 years of activity within the company, and their field of activity is web development and software engineer. To the third question regarding the degree of knowledge of the concept of deep learning, the answers show that the employees of the e-commerce company know in general what deep learning is and where these systems can be applied.

4. Findings

Digitization is the phenomenon of the century, and the e-commerce company analyzed is among the companies that digitize each department. Internal systems involving automable tasks are constantly being improved. The e-commerce company hires top IT architects to provide the most reliable and high-quality digital solutions not only for the internal environment, but also for external customers through the digital platform. The digital environment of the e-commerce company constitutes an entire ecosystem, with a high-performance data center and with top technologies and processes.

We notice from this answer that one of the respondents compares the company with a technological ecosystem in which all types of software solutions can be found. From the cumulative analysis of responses, employees believe that the digital strategy is geared towards automating systems to increase online sales and reduce costs and processing time for orders. We can deduce from these answers that the strategy is really aimed at ensuring a good customer experience.

The e-commerce company is a very large one, where manual data analysis is not feasible. For this reason, various digital tools are used for data analysis and processing. These systems are based on machine learning (not only deep learning, but also other concepts). Even the AWS platform adopted by the company offers web services, based on machine learning, which can be used by customers in their applications. We note from this answer that the integration of the e-commerce company in the field of machine learning is not limited to deep learning systems and that they are indispensable to ensure the analysis of large amounts of data. We can be convinced that the activity of the e-commerce company is correlated with deep learning concepts not only for internal organization and sales management, but also for the implementation of innovative solutions necessary for customers to facilitate their interaction with the online environment.

The main functions of the deep learning algorithms in the e-commerce system of the analyzed company are, according to the ideas debated during the interview: price optimization, inventory management, sales force automation, customer lifetime prediction and image recognition (Figure 1).

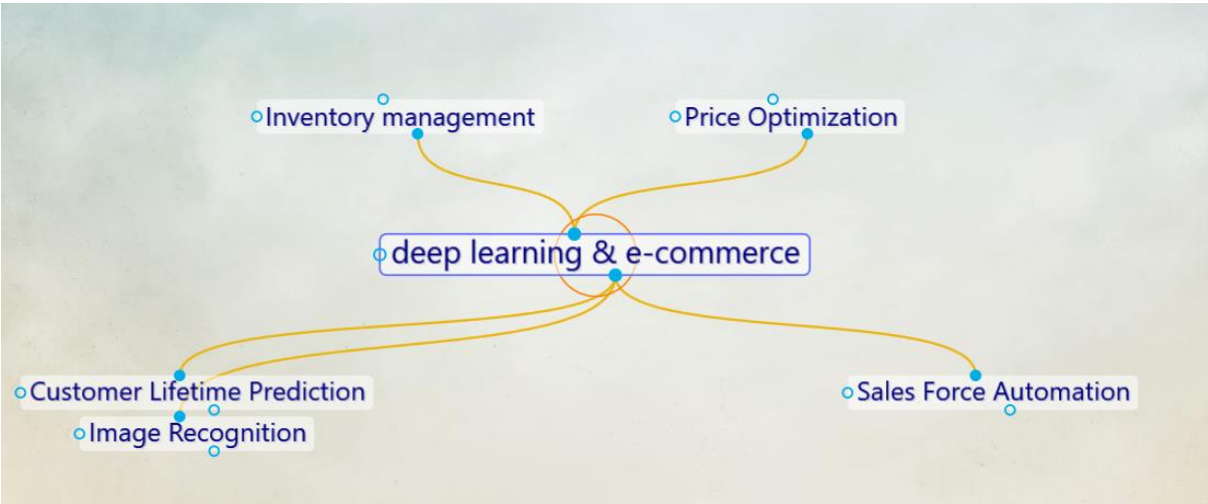


Figure 1. Features of the deep learning algorithms in the e-commerce system
Source: TheBrain software output

From a managerial point of view, the respondents consider that the processes and decisions in the company are made with the help of deep learning systems. Tools for monitoring and optimizing the digital strategy, based on deep learning, are used, namely: digital tools for big data processing and task execution monitoring (Figure 2). Globally, in order to establish the general management of the company and the measures / salaries / benefits granted to employees, certain studies are done every year, where each employee answers anonymously to a set of questions. Then various automated studies of the collected data are done.

From this answer we can see that the interviewee, not being from the management department, does not know exactly the ways in which the information about employees is analyzed, however internally there are tools for monitoring the activity (applications, platforms) but the respondent does not have conclusive information to it tells us whether or not they are based on deep learning.



Figure 2. Features enabling digital strategy optimization

Source: TheBrain software output

Mainly, deep learning algorithms are used to analyze the activity of users on the e-commerce portal, to make product recommendations, advertisements, discounts, etc. Customer lifetime prediction is a priority objective of using deep learning algorithms, obtaining remarkable results on customer churn prediction, customer profitability prediction, customer recommendation engine and website content personalization to tailor customer needs (Figure 3).

Another participant in the interview answered this question stating that he does not know details about deep learning systems, and another answer tells us the following „ I did not have direct contact with the maintenance system or creation of deep learning algorithms, but the internal organization of the company is based on many applications built with machine / deep learning systems ”, drawing a parallel between the types of answers given and the occupation of the respondent, I noticed that those who work in the field of Web Development associate those working as Solution Architect specify that they have not interacted directly with deep learning systems in their work.

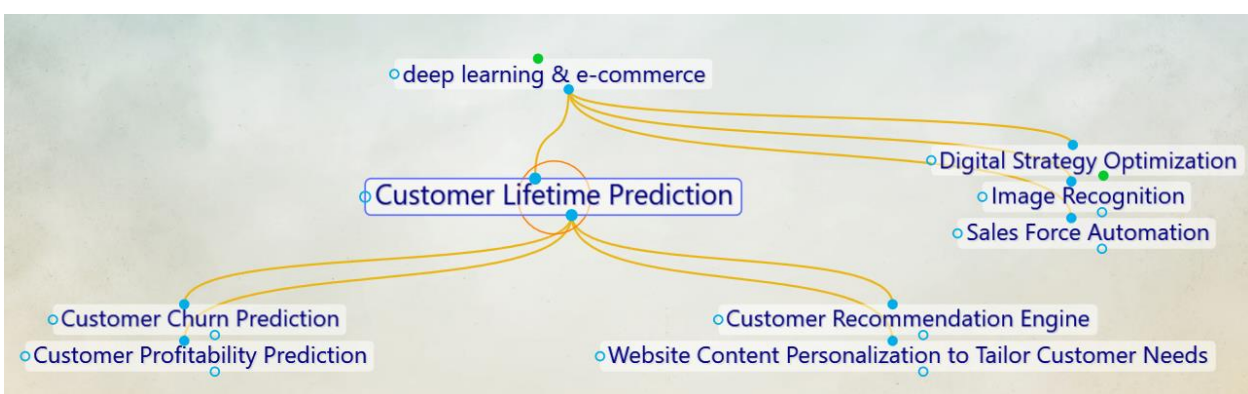


Figure 3. Features enabling customer lifetime prediction

Source: TheBrain software output

There are several internal systems that are used to manage the activities of both managers and employees. In these systems you can add tasks, estimates, you can mark the current stage of tasks (eg not started, in development, in review). Usually, each team can create their own project and their own way of planning, monitoring and executing tasks. Team and individual planning is done in the same project, so managers have visibility into current progress.

To this question most of the answers were similar to the one exemplified above, so that all employees participating in the interview use the same methods of planning and internal organization of projects. The e-

commerce company provides several HR Management applications, but each team manager proposes to his team a more accessible application, more adaptable to the type of projects they carry out in such a way that the tasks are organized and completed in a timely manner. both quantitatively and qualitatively.

The last two questions in the interview focused on employees' perceptions of the e-commerce company's digital strategy. We can understand that a digital strategy similar to that of the investigated e-commerce company requires very large financial and time investments.

We can see that from the point of view of employees, maintaining their own based systems on deep learning it is more difficult in small and medium enterprises, and the optimal recommended solution would be to use the services offered by technology giants (Google, Oracle, Facebook).

Other employees strongly argued that the digital strategy based on observing customer behavior can be applied to other companies, but that they will have to scale the financial possibilities very well.

5. Conclusions and managerial implications

A digital strategy is formulated in two stages - the first is the design and the second is the application of the strategy, observing the model of the e-commerce company, we can conclude that the strategy aimed at satisfying customer needs started as a simple strategy, and with the digitization of this strategy It has been transformed into a digital one, meaning that all processes related to customer communication, customer relations and the identification of optimal solutions for customers have been integrated with automated systems that allow the company to provide even better quality services so that the customer experience is one. loyalty.

Analyzing the results of the case study, we can see that both employees and customers of the e-commerce company are positively influenced by the company's digital strategy, externally it attracts more and more customers, increases sales, integrates more data collection systems that can be used later to create innovative systems and products adapted to the new market requirements, but internally the implementation of the digital management strategy considerably improves the quality and motivation of employees through continuous measurement of results and management, orientation of employees to areas as compatible as possible. training.

As a result of defining systems based on deep learning, we can consider that they can be applied in other companies, especially those that are oriented towards the activity in the online environment. It is possible that the implementation of software based on deep learning and their individual maintenance may be too expensive in terms of technology and qualified personnel required, but this is not an impediment, however, but in addition to the web services offered by the company There are a number of e-commerce services from Google, Cloud, and other technology giants that meet large and medium-sized businesses by providing integrated platforms with artificial intelligence systems that allow for process automation and the analysis of large databases. We can see that digitalization in this sense does not reduce the importance of human labor in industries but rather requires a transformation of staff, so that employees are trained to monitor digital applications and platforms in order to create their own digital strategies.

Depending on the field of activity, each company can focus its strategies either on products, employees or the quality offered to customers, but regardless of the direction that the management strategy takes, it must be digital, ie based as much as possible. towards automation and integration with artificial intelligence systems.

Technological developments in recent years have greatly transformed people's lifestyles, which is why adapting to the facilities offered by deep learning, customers will opt for an intuitive online environment, which is why the recommendations of this study could be addressed to entrepreneurs, marketers in the physical environment as well as for those already launched in the online environment.

In the first case, a recommendation would be to integrate online visibility, even if the business does not involve product sales. A first way to online visibility would be to create a website that is integrated with traffic monitoring systems so that be observed the activity of customers or potential customers - which links are accessed, which sections of the site are most interested so that later the content is adapted so as to convert and retain customers.

For companies that have already integrated online visibility, a solution to adapt the digital strategy is to identify the most appropriate and advanced technologies for monitoring site traffic and especially to pursue the integration of deep learning systems for product recommendations and promotions. The integration of automated systems based on deep learning in the management of online stores is an optimal and viable solution for e-commerce companies that want scalability in the near future.

Acknowledgement

This work was supported by a grant of the Ministry of Education and Research from Romania, CCCDI – UEFISCDI, project number PN-III-P1-1.2-PCCDI-2017-0800/86PCCDI/2018, project name: FUTUREWEB, within PNCDI III.

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