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# A STUDY TO ANALYSE THE DIFFERENCE BETWEEN DEEP LEARNING AND MACHINE LEARNING

Zhang Yajuan, Midhun chakkaravarthy

Lincoln University College, 47301 Petaling Jaya, Selangor D. E., Malaysia.

Corresponding author: Zhang Yajuan, Lincoln University College, 47301 Petaling Jaya, Selangor D. E., Malaysia, Email: 501743141@qq.com

## ABSTRACT

The revolutionary subfields of computer science known as machine learning and deep learning are finding significant application in the business world. The process of teaching computers and other machines how to make predictions based on prior data or actions using examples from their own memory is known as machine learning. Deep learning is a subsection of machine learning that makes use of artificial neural network techniques and algorithms to train and learn from data that is not structured. This allows for learning to take place from data that is not organized. In order to make sense of the mountain of data that is being created each day, there is an urgent need for techniques of data usage and management that are highly automated and technologically advanced. The software for machine learning (ML) and deep learning (DL) is subjected to a thorough investigation that we provide in this work. The study serves as an introduction to the fundamentals of ML and DL. The most widely used approaches and techniques in fields made feasible by technological advancements are investigated next. In conclusion, a business point of view is presented on the two applications of ML and DL that are most often used.

**KEYWORDS:** Deep Learning, Machine Learning, Artificial intelligence

## INTRODUCTION

The previous two decades have seen a dramatic shift in how people use technology across all walks of life. There is no limit to the ways in which people may better their daily lives thanks to the wide availability of new technological tools. Artificial intelligence has simplified many aspects of our daily lives, including the following:

communicating, social networking, transporting, manufacturing, providing healthcare, having a virtual personal assistant, banking, educating, doing business, trading, and broadcasting. These days, practically every major corporation and several nations are pouring resources into this area because of its boundless potential. The popularity and pervasiveness of AI have skyrocketed, and it is now an integral part of our life. Although the trend towards building intelligent robots had begun much earlier, the fast growth of current intelligent technology has offered mankind hope for a better future. Researchers and people all across the globe have been hoping for artificial intelligence to become a reality for decades (V.A. Yashchenko, 2014). Artificial intelligence (AI) has improved because of more powerful computers and the capacity to store massive amounts of data. The ability to learn from and use many forms of knowledge is at the heart of what it means to be intelligent. The goal of artificial intelligence (AI), sometimes known as machine intelligence, is to create machines that are capable of doing tasks normally performed by human brains. Instead of being strictly driven by linear programming, machine intelligence permits a computer system to learn from inputs. In many aspects, today's sophisticated artificial intelligence is simplifying and easing human existence. Many scientists, however, believe that general artificial intelligence will eventually usher in a period of dramatic transformation for humankind. The primary goal of this thesis is to investigate AI in great detail. This thesis provides a comprehensive analysis of AI. In addition, the notion of artificial neural networks as well as the many kinds of neural networks are outlined, as well as the distinction between machine learning and deep learning. Another product of this thesis is a browser-based tool for doing AI tasks like object identification and picture categorization. Popular deep neural networks trained on big datasets, a single-shot multibox detector, and other crucial technologies such as react, TensorFlow.js, and ML5.js were utilised to create this web application (J. Arockia Jeyanthi, 2020).

## BACKGROUND OF THE STUDY

Arthur Samuel is credited as having first using the term "machine learning" in 1952. Frank Rosenbelt developed the perceptron in 1957 at the Cornell Aeronautical Laboratory, building on the work that Donald Hebb and Arthur Samuel had done before. In the beginning, the perceptron was conceived of as a physical mechanism rather than a computer programme. The software was installed on a custom-made computer known as the Mark 1 perceptron. This perceptron was designed for the IBM 704 and was supposed to be used for image recognition. As a consequence of this, it became feasible for the software and algorithms to be exported to other computers and utilised on those machines instead. In 1967, the closest neighbour algorithm was developed, which is considered by many to be the beginning of rudimentary pattern recognition. This method was one of the first algorithms to address the issue of identifying the path that would be most ideal for travelling salesmen. It was used to map routes, and it was one of the first algorithms to tackle the problem. The salesman made use of it to locate

appropriate (but not always the best) routes to get to the city of their choice. There was some progress in the 1950s and 1960s, but it wasn't until the late 1970s that there was a significant amount of achievement. This was due to a number of factors, the most notable of which was the popularity of Von Neumann architecture. Many individuals have built programmes based on this architecture, which stores instructions and data in the same memory and is said to be simpler to comprehend than a neural network. Many people have designed programmes based on this architecture. Nevertheless, in 1982, John Hopfield put out the idea of constructing a network of bidirectional lines. This is conceptually similar to the way neurons carry out their tasks, and such networks are a typical approach for implementing deep learning in the twenty-first century. In addition, Japan made the announcement in 1982 that it would be focusing on more sophisticated neural networks, which prompted financing from the United States and therefore enhanced research in this area. Aside from Terrence Sejnowski's invention of NETtalk in 1985, which is software that uses text as input and compares phonetic transcriptions to learn how to pronounce written English text; the introduction of backpropagation in improving the neural network in 1986; and the introduction of convolutional neural network in 1989 by Yann LeCun, where backpropagation was included; there wasn't much success in the field of machine learning in the late 1980s and at the beginning of the 1990s. However, in addition, IBM's Deep Blue, a self-play chess-playing computer, was created in 1997. It was the first machine to defeat a reigning world champion in a chess game in a chess match under regular time limitations, and it was considered an example of a situation in which a machine surpassed a human brain. However, since the turn of the 21st century, some corporations have seen the potential of machine learning and have begun making significant investments in order to remain ahead of their competitors. Because machine learning is becoming more popular, there is a significant amount of research and development being carried out in this area (Keith D. Foote, 2019).

## PROBLEM STATEMENT

“Deep learning requires millions of data points whereas machine learning just needs hundreds. Typically, machine learning algorithms do well with smaller datasets. In order to comprehend and outperform conventional machine learning algorithms, Deep Learning needs massive volumes of data.”

To develop goal-oriented behaviour and an artificial personality through training and education, AI researchers study neural-like elements and multidimensional neural-like expanding networks, transient and long-term memory, and the functional organisation of the brain of artificial intelligent systems. Artificial intelligence (AI) is a wide term encompassing many different approaches to the use of computers to solve problems via the use of logic, processes, and algorithms. The notion of artificial intelligence has been utilised in programmes for natural language processing, information processing,

automated programming, robotics, scenario analysis, game playing, intelligent systems, and scientific theorem proving.

Machine learning is a subfield of AI that enables self-improvement in computers without further manual programming. Algorithms and models of neural networks are used to train computers to become better over time. The goal of machine learning is to develop automated systems capable of analysing data and adapting to new circumstances without human intervention. In order to improve in the future, given the examples we provide, learning begins with observations of data, including direct experience or teaching. In machine learning, algorithms are 'trained' to learn how to identify patterns and features in big datasets and then use that information to make judgements and predictions.

Deep Learning is a subfield of machine learning that computes an output based on an input dataset (metadata) that has been exposed to numerous layers of nonlinear alteration. This approach was developed for use with Artificial Neural Networks (ANNs) and is referred to as Deep Learning (DL). It is a reference to the process of machine learning, in which computers gain information via the process of trial and error as well as statistical analysis without any involvement from a human being. Because of the one-of-a-kind capability of this technique to do automated function extraction, only the characteristics that are absolutely necessary for finding a solution to the problem are retrieved by hand.

## LITERATURE REVIEW

Since the beginning of the 17th century, researchers have been interested in how people are able to converse across different languages. Since that time, several communication aids and theoretical frameworks, such as universal languages and mechanical dictionaries, have been developed in an effort to narrow the gap in understanding that exists between people who speak different languages. Because of the rise of highly internationalised businesses and general globalisation, the ability to translate texts from one language to another via the use of automated means without the participation of a human being is an issue that has been the subject of discussion for close to sixty years.

Direct mail and email marketing are two methods that are often used in fundraising campaigns in order to attract the attention of potential contributors. When it comes to fundraising, one objective of targeted marketing is to disseminate information to those who would either directly benefit from or be receptive to the cause that is being pushed. This is a frugal method for making the most of the resources that are available. It may be challenging to anticipate future behaviours, such as customer's purchase or a donor's gift, but machine learning may provide assistance in this endeavour. Increasing the use of machine learning in your business will improve your chances of reaching the

target audience. Classification and regression are two fundamental components of the traditional analytical approach to the fundraising process. The identification of possible contributors is the objective of the classification model. Within the context of this approach, a binary (give/do not contribute) or multi-class categorization technique is used. The amount of money that a contributor will contribute to the future may often be predicted with the use of regression. Both strategies take into account the background of the donor as well as their giving history. Donor categorization and response modelling, which identifies receivers of campaign communications, are two examples of the more common approaches to fundraising analysis. Both of these methods may help determine who will receive campaign communications.

In contrast to cross-sectional data, which is collected at a single point in time, time series data consists of a succession of observations taken at regular intervals throughout time. This is in contrast to cross-sectional data, which is collected at a single point in time. It's possible that the individual data points in a time series are connected in some way. In the field of academic research on commercial advertising, sequential deep learning models are used rather often. Many of the marketing strategies that are employed by for-profit businesses are also utilised by non-profit organisations in order to recruit supporters and staff. The fundraising data also includes information in the form of time series. On the other hand, to the best of my knowledge, there are no previously published research studies that make use of sequential data. In this section, we provide some research that uses sequential learning to the data that is comprised of e-commerce time series. Sequential learning has a variety of potential uses in marketing for fundraising, some of which are proposed by the literature on its use in marketing. Sequential learning also has a number of other conceivable applications.

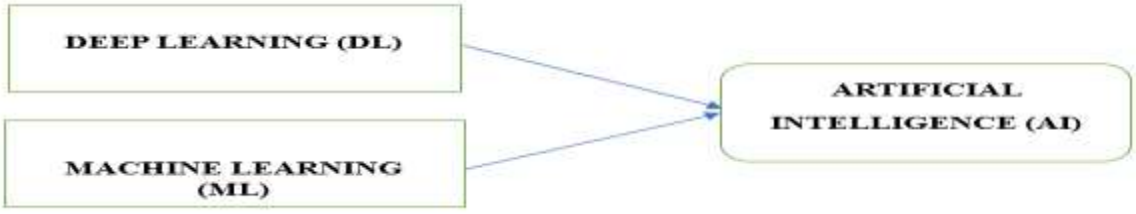
## RESEARCH OBJECTIVE

1. To find out the difference between deep learning and machine learning.

2. To determine the uses of deep learning and machine learning.

3. To identify the differentiate machine learning from deep learning and deep learning from artificial intelligence.

## CONSEPTUAL FRAMEWORK



## RESEARCH METHODOLOGY

The goal of quantitative research to find statistically significant relationships between variables by collecting numerical data on those variables and feeding it into statistical models. Quantitative studies aim to get a more in-depth understanding of society. Researchers often use quantitative methods when examining phenomena with a personal effect. Quantitative studies provide hard data in the form of tables and graphs. Quantitative study relies heavily on numerical data, which necessitates a methodical strategy to collecting and analysing the data. It may be used in a variety of ways, including averaging out data, making forecasts, looking into connections, and extrapolating results to bigger populations. Quantitative studies are the polar opposite of qualitative studies, which rely on in-depth interviews and observations. Quantitative research techniques are widely used in many academic disciplines, including biology, chemistry, psychology, economics, sociology, marketing, and many more.

**Sampling:** A pilot study was conducted with the questionnaire using a group final study was conducted with the questionnaire. A total of questionnaires was distributed among customers selected in a systematic random sampling. All the completed questionnaires were considered for the study and any incomplete questionnaire will be rejected by the researcher.

**Data and Measurement:** Primary data for the research study was collected through questionnaire survey. The questionnaire was divided into two parts – (A) Demographic information (B) Factor responses in 5-point Likert Scale for both the online and non-online channels. Secondary data was collected from multiple sources, primarily internet resources.

**Statistical Software:** MS-Excel and SPSS 25 will be used for Statistical analysis.

## RESULTS

- **Verification as well as Dialogue According to the Data**

The performance of the sequential models is compared with that of the traditional models in this part. Additionally, a summary of the data that was employed in our investigation is provided, as well as a focus on the key model difficulties. In Section 4.1, a summary of the statistical information is provided.

In Section 4.2, we will discuss the model assessment metrics, and then in Section 4.3, we will discuss the test results and the lessons learned.

- **Summary of the Data**

The information that was employed for this study was given by the Advancement Services at the University of Victoria. Within the scope of the data collection, there are a total of 171,874 live persons. There are 123,515 former students of the University of

Victoria mentioned among those individuals. Some of the information that is kept on file for each person includes their age, gender, marital status, degree of education, percentage of emails opened, and donations to charity organisations. We did not include the data of non-alumni in our study since they do not have any information on their ages or educational backgrounds. The alumni database also contains the information of former students who have graduated. The University of Victoria came out of Victoria College, which opened in 1903 and was the first postsecondary institution in the province of British Columbia. The Faculty of Education at Victoria was established in 1956 when Victoria College and the provincial normal school merged to form a single institution. It continued to operate as a distinct university until its reformation in 1963 as the University of Victoria that we are familiar with today. Alumni of Victoria College and Normal School are the ones who paved the way. 1987 is the first year for which records of gifts from alumni are kept. At this time, there are 123,515 graduates, but only 18.4% of them are donors (105,033). Since less than 15% of UVic graduates make contributions, it is probable that the majority of UVic's alumni do not make donations. This brings up the problem of class imbalance in the classification models, which is elaborated upon in further detail in section 4.2 of the discussion portion of the work.

- **Data Limitations**

Donations made by alumni to their undergraduate institutions of education are vital for a variety of reasons, not just one (Kosse, 2019) investigated whether or not there is a correlation between alumni loyalty and the amount of money given to their alma institution. In light of his findings, he draws the inference that the dataset he analysed had a robust correlation between ages and gifts. We also investigated the connections that exist between the various motivations that alumni have for giving back to the university. However, missing values provide a challenge when attempting to analyse the connections between feature variables and objective variables. Many records lack fundamental demographic information such as age, work information, an accessible location, and marital status. This makes it difficult to do the research. Data on employment and marital status are collected from graduates either via self-reporting or through interviews. At the University of Victoria (UVic), there is a student calling scheme that has been running for quite some time. Within this programme, students are instructed to make calls to alumni in an attempt to generate financial aid. Over the phone, information about alumni's employment, families, and current contact information is acquired if they are willing to supply it; but, due to privacy and confidentiality issues, the number of queries made and the kind of questions asked are restricted. In addition, the Advancement Services Oce at the University of Victoria has a scheme that aims to track down long-lost graduates of the institution. It's possible that calling or using an alumni tracking programme won't be very useful for acquiring certain sorts of data. As a direct consequence of this, a significant portion of the entries still have no values assigned to some components. In the context of categorical features, the number -1 is used to denote the absence of certain information. Every factor that may be put into a certain category is changed into a fake variable.

Reconstructing the missing numerical data, such as ages and census data (mean income, mean real estate value, etc.), was accomplished via the use of a technique called multivariate imputation by chained equations (MICE). In Chapter 3, we will explore the missing data imputation approach in further detail.

| Type | Total Count | % |
|---|---|---|
| Individual live Constituents | 171,874 | 100% |
| live Alumni | 123,515 | 72% |
| live Non-Alumni | 48359 | 28% |

**Table 2: live Alumni vs. live non-Alumni Distribution**

| Type | Total Count | % |
|---|---|---|
| Live Alumni | 123,515 | 100% |
| Live Alumni Donors | 18,482 | 15% |
| Live Alumni Non-Donor | 105,033 | 85% |

**Table 3: Live Alumni Donors vs. Live Alumni Non-Donors**

| Type | Total Count | % |
|---|---|---|
| Live Constituents | 171,874 | 100% |
| Age Missing | 22,455 | 13% |
| Age Known | 149,419 | 87% |

**Table 4: Missing Age Among live Constituents**

## CONCLUSION

This chapter introduced a training approach termed dense-sparse-dense (DSD), which includes pruning and then rebuilding the connections, in order to regularise neural networks. DSD is an acronym for "dense-sparse-dense." In the first stages of our technique's intense instruction, we focus primarily on learning which connections are the most important. After this, DSD will regularise the network by removing any superfluous connections and retraining to a sparser, more stable solution that will either preserve or enhance accuracy. After that, the network is retrained from the ground up using the mended connections that were created throughout the pruning phase. The scope of the model and the number of dimensions that its parameters may take on are both increased as a result of this. DSD training results in an increase in the accuracy of the predictions. Our experiments on ImageNet with GoogleNet, VGGNet, and ResNet;

on Flickr-8K with NeuralTalk; and on the WSJ dataset with DeepSpeech and DeepSpeech-2 reveal that DSD training can significantly increase the accuracy of CNNs, RNNs, and LSTMs. These results were obtained from our experiments. In addition to this, we used a T-test to validate the significance of the advancements achieved by DSD instruction. The results of the experiments demonstrate that DSD training is beneficial for improving accuracy.

In this master's thesis, we analysed deep learning architectures for medium- and small-sized image classification datasets. In the first chapter, we discussed the impressive accuracy of Convolutional Neural Networks and how they function. In the next chapter, we demonstrated the effectiveness of the Fine-Tuning method on this data set. We also detailed how our bootstrapped version of InceptionV3 proved victorious in the DSG online contest. We discussed the pros and cons of several Weakly Supervised Learning methods, including Multi Instance Learning (MIL) and Spatial Transformer Networks (STN), in the last chapter. Weldon, a specific kind of MIL model, was also enhanced via the use of Fine Tuning.

In a nutshell, artificial intelligence (AI) is a method that gives us the ability to often produce astounding insights from mundane data mountains. This research demonstrates that not all artificial intelligence (AI) techniques, such as deep learning and machine learning, are suitable for solving all issues. In spite of the fact that deep learning is a more modern and, presumably, more advanced technique, decision tree-based models fared better in this study than deep learning did when it came to forecasting the degradation of land. This illustrates that while deep learning is effective for many applications, more conventional machine learning methods remain the preferable choice for forecasting land degradation owing to their higher accuracy. This is the case despite the fact that deep learning has been more popular in recent years.

## LIMITATION

The main goal of quantitative study is to find the numbers in data. A big sample size is generally needed for quantitative study methods. However, this large-scale study can't be done because of a lack of funding. In the future, this can be done by using a bigger group number and taking longer to do this work. The organised questions used in quantitative research can only give limited results, and the results don't always show what really happened in a broad sense. Additionally, quantitative research is hard, costly, and takes a substantial amount of time to analyse. In future studies, the reasons given for why the places in question were not covered in this one will be explained. List the likely problems that other researchers might run into when they are planning future study on the subject. This will help you make a research plan that you can actually carry out, including the study's topic, goal, and method.

In this day and age of Big Data, when photos of any kind and capacities that can be computed are more easily available than at any other time in history, the development, needs, and expectations of Deep Learning are apparent. In this context, the Convolutional Neural Network is the statistical model that has shown to be the most successful when used to picture recognition.

They have access to a large amount of data, which allows them to predict your preferences in advance. On the other hand, it has a number of limitations, which ultimately lead to the creation of deep learning.

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