

A survey on Machine Learning and Artificial Neural Networks

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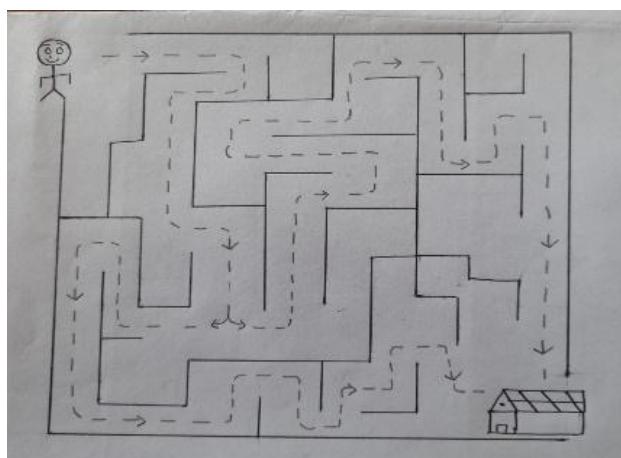
Abstract - Artificial Intelligence is the branch of computer science that works on the different principles, methods, techniques used for complex problem solving and algorithms and study how the machines think and do things better than humans. Artificial intelligence works on knowledge, problem solving, planning, reasoning, thinking, communication, etc.

A survey paper on Machine Learning and Artificial Neural Networks is the overview of various techniques developed in Machine Learning and Artificial Neural Networks and their advantages, disadvantages, applications too. In short, we are adopting Machine Learning and Artificial Neural Networks in our day-to-day life to work more accurately, properly and efficiently, so the Artificial Intelligence industry is expected to grow more significantly over coming years. So, we must have prior knowledge of Machine Learning and Neural Networks, its techniques, algorithms and its applications and take the knowledge accordingly.

Key Words: Artificial Intelligence, Machine learning, Deep Learning, Artificial Neural Networks.

1. INTRODUCTION

Artificial Intelligence is the most known, vast and demanded field in computer science which deals with the ability of computer/machine to do things/works more precisely that are usually done by humans i.e., Biological Intelligence.



A boy can find the path but finding the path which goes home quickly is the place where we require Intelligence. In such a way, the problem-solving ability of humans and computers is the point where we must work on it.

Today Artificial Intelligence is integrated in our day-to-day life in many forms such as assistants, robots, metaverse, gaming and many more. The various fields of Artificial Intelligence such as robotics, machine learning, deep learning, neural networks, etc. are helps us to improve the efficiency of works in industries, agriculture, healthcare, and education. So Artificial Intelligence is able to analyze language, handwritten text, visual effects like biometrics, face recognition, speech recognition, etc.

Machine learning is simply the study of computer algorithms, techniques which improve sufficiently, significantly and majorly through the experience and learn on its own. Machine learning helps computer in developing models from data in order to automate decision making process. Algorithm used to imitate the way that human learns. Machine Learning is based on statistics, Linear Algebra, Probability and Calculus. Machine Learning Algorithms work on the basis that strategies, algorithms and interfaces that worked in present as well as in future also.

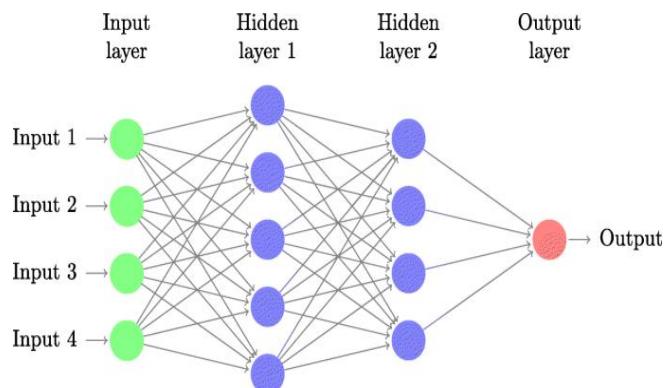
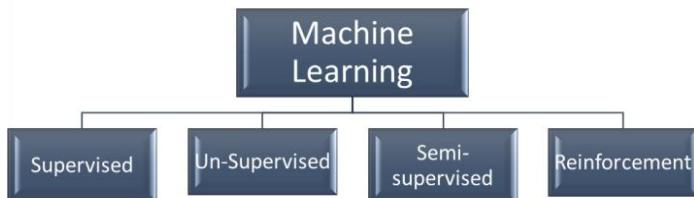
Machine Learning has two objectives,

1) To classify data based on models which have been developed.

2) To make predictions for future outcomes based on these models.

Deep learning is the part of Machine learning methods. Deep refer to use of multiple layers in network. ANNs also used in it for static and symbolic functions. This technique learns directly from data and perform works. Data can be image, text, file or sound.

Machine Learning is further classified into three types as shown in figure.



1) Supervised Learning: It has training data i.e. it consists of input and output. The learning algorithms such as Naïves Bayes Algorithm works, analyze it. It is used when data is labeled and it has some target variable.

2) Unsupervised: It has only input. The input data is analyzed and output is generated. Most of the machines work on unsupervised learning. It is used when data is unlabeled and it does not have target variables. Uses K-Means Clustering, Probabilistic clustering methods, Neural Networks, etc.

3) Semi-Supervised: It is a combination of supervised and unsupervised learning and uses labeled and unlabeled data to improve the classification performance. It is used in Web Mining, Text Mining, Video Mining, etc. Semi-Supervised able to solve the problem which does not have enough labeled data to train supervised learning algorithm.

4) Reinforcement: It is an optimal decision-making process. The agents interact with the environment and we get some rewards, outputs which are based on behavior and give critical information about the algorithm. It consists of two processes namely Episodic Learning and Continuous Learning.

Artificial neural networks are used to produce artificial nerves which work same as biological nerves of humans and other animals. The collection of connected units or nodes called Artificial Neurons are the building blocks of Artificial neural networks and it transfers message from one part of machine to other and gives output as a result from the given input. Artificial Neural Networks always learn by processing the examples. Each of these contains a known 'Input' and 'Result' and this processing is depending upon the difference between the processed output (a prediction) and a target output. It is applicable in signal analysis, processing, monitoring, etc.

A survey paper on Machine Learning and Artificial Neural Networks includes a brief introduction of Machine Learning and Neural Networks, various algorithms and concepts, advantages, disadvantages, and its applications. So, with the help of this paper, you can be able to improve your knowledge in Artificial Intelligence, Machine Learning and Artificial Neural Networks. Able to gain the knowledge of Machine Learning and Artificial Neural Networks can be used in large manner in day-to-day life. We must improve this field in large extent so that we are able to know about unknown mystery of life and universe.

2. LITERATURE REVIEW / RELATED WORKS

Miljan et.al, [1] proposed an application of Artificial Neural Networks for hydrological modelling in karst various machines learning algorithms of state-of-the-art for the task of short-term forecasting of river flow in a karst region described in this paper with comparative analysis. MLP, RBF Neural Networks and ANFIS which contain neural networks and fuzzy logic principles with different measures include relative and absolute. On several locations, inputs of precipitation and flow data analyzed. Eight input variables used in previously tested models, here five inputs subset is used. For even better results. Five inputs subset model reduced complexity and the learning task has been accelerated. Support vector machine (SVM) used for regression and classification analysis. Buna river in Bosnia and Herzegovina related flow forecast one day ahead based on the precipitation and flow over two previous days which is outperformed by the ANFIS model and enabled a better prediction model.

Wei Jin et.al, [2] proposed the basis of classification of machine learning with view that Machine Learning mainly focused supervised learning unsupervised learning and reinforcement learning but does not fully overcome Artificial Intelligence. The common algorithms in Machine Learning such as random forest, boosting, Artificial Neural Networks, decision tree, SVM, bagging, BP algorithms in proper manner. This helps us to improve the awareness about Machine Learning and increases the popularization of Machine Learning in day-to-day life.

Mohsen Attaran and Promita Deb et.al, [3] proposed a model for successful and appropriate implementation of Machine Learning in organization. Various factors adding the evolution of Machine Learning. Improvement in data collection, analytical solutions, hardware and software and computational power has been changed the field very drastically. Many jobs that require much training such as pattern recognition or image analysis which is done by pathologists and radiologists are in danger due to Machine Learning. The main point is that creating a Machine Learning strategy in a business organization require a highly qualified data scientists, organization is in favor of strategic investment because while adding new analytics functions affect existing applications, devices, services and websites of that organization.

JI-HAE-KIM et.al, [4] proposed an Efficient Facial Expression Recognition (FER) Algorithm which depends on Hierarchical Deep Neural Network structure. Facial Expression Recognition (FER) is the information visual form used to understand emotional situation of human. This research paper put forth an Efficient Facial Expression Recognition Algorithm by combining the appearance and geometric features by using Artificial Neural Networks to give more efficient and accurate facial recognition algorithm. The co-ordinate movement between Neural face and the peak emotion is extracted by the geometric features-based networks. They constructed static appearance and dynamic feature combination from appearance network and geometric feature-based networks. By experiments they showed that Top-2 error took place with average 82% correctness using the appearance feature based network. An algorithm improved this error and achieved 96.5% correctness with 1.3% advancement. When comparing to other algorithms in the CKT dataset. The proposed algorithm yields 91.3% of the correctness with 1.5% advancement while comparing with other exciting methodologies in JAFFE dataset.

Alberto Rivas et.al, [5] proposed a method for the detection of cattle using drones and Convolutional Neural Networks. In this research paper convolutional neural networks (CNN) plays important role to identify cattle captured in the image. In this article, a description of information or knowledge and its performance in the detection of cattle is given. This cattle detection system has a high favorable outcome rate in identification of livestock from image via camera. Currently, this platform has 87% accuracy which is going to increase by further algorithm modification. The satisfactory accuracy has future scope of improvement. The system has drawback of showing inaccuracy when same animal crosses the path of multicolor multi-rotor several times. By increasing multi-rotor and dividing area can solve the problem. If this model has successful impact, then there will be no need to attach GPS device to animals.

R. Vargas et.al, [6] proposed that deep learning is an appearing region of Research in Machine Learning. It consists of number of hidden layers of Artificial Neural Networks. The recent achievement in Deep Learning architectures within multiple fields have already provided notable contributions in Artificial Intelligence. Furthermore, the superior benefits of the Deep Learning methods and its hierarchy not only in layers but also in non-linear operations are presented as well as compared with the more conventional Algorithms in the common applications. The most important value of Deep Learning depends on the optimization of earlier applications in Machine Learning. Due to its creativeness on hierarchical layers processing, Deep Learning provides us effective outputs in digital image processing and speech recognition. Today and in a future, Deep Learning results in a useful security tool due to the both facial recognition and speech recognition combined.

Maryam M Najafabadi et.al,[7] proposed that Deep Learning has a benefit of giving a solution to address the data analysis and learning problems. Particularly, it assists in automatically uprooting complex data representations from unsupervised data. This makes it a valuable device for Big Data analytics, which consist of data analysis from huge collections of raw data. Data analytics tasks, mainly for analyzing huge data, information retrieval discriminative tasks such as classification and prediction. A survey of important literature research and application to different kinds of domains is explained in the paper as a means to show how Deep Learning used for different purpose in Big Data Analytics.

Ozer Celik, Serthan Salih Altunaydin et.al,[8] proposed that Machine Learning is depends upon the concept of finding the best copy for new data among the previous data over increasing data. With the advancements in the technology in recent time, Machines plays important role in our day to life. The data in our surrounding, in our life is increases day by day. These data are used very efficiently and significantly. Firms that have recognized and invested in this area uses this technology frequently and achieving success. In such environment, the importance of Information Technology and machines must be taken into consideration. Naive Bayes, Support Vector Machine (SVM), K-NN, Logistic regression, Decision Trees are some of the Algorithms and Techniques in Machine Learning.

I D	RESEARC H PAPER	ALGORITH MS	ADVANTAG ES	LIMITATIO NS	5.	Algorithm and methods for detection of cattle using Convolutional Neural Networks (CNN) and drones.	CNN	1)Accuracy of detection of cattle increases due to algorithms 2)There would be no longer need to attach GPS device to cattle's	Problems of same animal cross path of multirotor multiple times need to solve
1.	Hydrologic al modelling in Karst.	MLP, RBF NEURAL NETWORK AND ANFIS	1)The complexity decreases as used 'five inputs' variables 2)The learning and accuracy increases	Additional things such as ground water level, geological composition of river basins, morphology and vegetation can influence prediction	6.	Machine Learning consist of Artificial Neural Networks.	Convolutional Neural Networks (CNN), Supervised Semantics preserving Deep Hosting (SSPDH)	Feature Generation Automation, Better learning capabilities. Improves results and optimize processing time.	It consist multiple hidden layers of Artificial Neural Networks.
2.	Classification of Machine Learning.	DECISION TREE, SVM, BP ALGORITHM	1)Various applications modules can be design according to actual needs of users and use. 2)Helps in the development and advancements in domestic enterprises	Machine Learning is supplementing not a traditional analytic method	7.	It gives a solution to convey the data analysis and learning processes.	Semantic Indexing, Super Vector Machine (SVH), Restricted Boltzmann Machine (RBM)	Scalability of Deep Learning Models, High dimensionality. Can leverage unlabeled data.	Cannot easily learn with the linear and simpler models.
3.	Conceptua l model for Machine	DECISION TREES, SVM, NAIVE BAYS, KNN	1)Advancem ent in data collection. 2)Analytical solutions For various problems.	Implementation of Machine Learning in industries requires skilled data scientists and it is cost effective.	8.	Machine Learning depends upon the concept of finding the best copy for new data among the previous data over increasing data.	K-NN	Education, image processing, Computational Biology, Natural Language Processing	Requires large amount of data in order to perform work, expensive due to data complexity. Pruning occurs many times.
4.	Facial Expression Recognition (FER) is used to understand the emotional situation of human.	LBP FEATURE, CK+ AND JAFFE DATASET	1) With the help of algorithm accuracy of facial expression recognition can be enhanced	There is a scope to improve accuracy					

3. CONCLUSIONS

Machine Learning and Artificial Neural Networks uses Algorithms and techniques like SVM, CNN, K-NN and BP for different works. This technique proves beneficial but they also have some drawbacks like Data Complexity, requires large amount of data, etc. In this Survey we have discussed about applications of algorithms and architectures and challenges in front of us while working on Data. These techniques can be used in different fields in very efficient way like research and development. We require some techniques to find the solutions which are scalable, structured, etc. Advanced models can handle data complexity and be able to use rule-based models. In future, research will be done in different domains in Machine Learning and Artificial Neural Networks.

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