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Machine Learning and its Emergence in the Modern World and its Contribution to Artificial Intelligence

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***Abstract*— Machine learning is known as the scientific study of various algorithms and statistics as well as models which can be used to create or perform certain tasks. These tasks are often based upon the dependability of the Interface as well as the patterns. As machine learning is also known as the subset of Artificial Intelligence, it enables the system to create or perform several tasks without the need for any manual changes. This mechanism relatively related to automatic performance and self- learning as it can be used to detect various faults within a inbuilt system or a software and take necessary steps to debug and run diagnostics to reduce errors as much as it can. Due to the emergence of Artificial Intelligence, various industries and private firms such as Space X and Tesla have induced Machine Learning into their workspace and especially when it comes to industrial usage, Corporations such as Tesla have developed AI based vehicles which run under electricity and automatic debugging. As the emergence of Artificial Intelligence have given ways to Machine Learning, it is inevitable that we may or may even be quite close to be perceiving futuristic technology much earlier than intended.**

Keywords*— *Artificial intelligence, machine learning, filtering, computer vision, clustering, concept learning

I. INTRODUCTION

Machine learning is known to involve various concepts such as concept learning, clustering, training examples, etc. Concept Learning is known as one of the categories of Machind Learning which can be used to predict values give within a set of instructions and categorize the objects into classes in a process similar to partitioning. In the concept learning task, we obtain various attributes and each attribute is known to consist of certain instances. It is up to the system or software's job to classify these instances into their respective attributes in ordet to reduce time complexity during the processing of large or several combination of tasks. This component of Machine Learning can be used for boolean valued functinos as well as the training examples for the input and output.

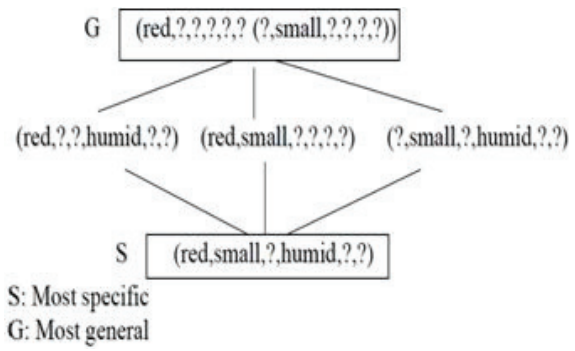

Fig. 1. Concept Learning Task

An Example for Concept learning task can be given below, where G stands for the general instances and S stands for Specific instances.

II. LITERATURE SURVEY

Candidate LIST-THEN-ELIMINATE Algorithm is known as one of the Machine Learning concepts which can be used to derive various components in order to obtain the version space. A Version space is known as one of the logical approaches to machine learning in which a set of logical values can be predefined within the hypotheses.

In the candidate LIST-THEN-ELIMIATE Algorithm, certain examples from the Hypothesis can be obtain known as examples. These examples can then be used to obtain the version space. A representation of this mechanism is given below.

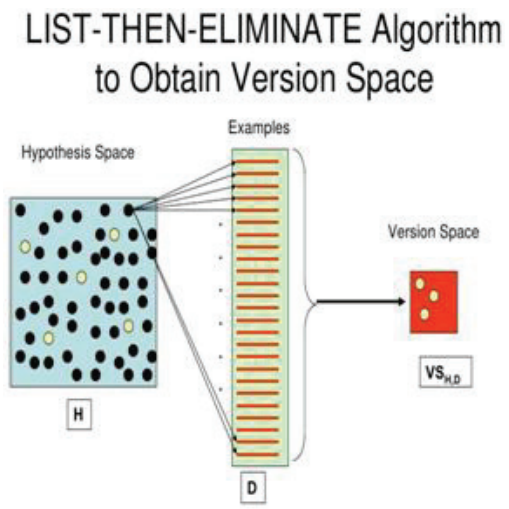

Fig. 2. Candidate LIST-THEN-ELIMINATE Algorithm

In the above representation, we can observe that the hypothesis space consists of a group of clustered data in which certain examples can be derived. Upon receiving the data, the mechanism undergoes certain algorithms which can be used to obtain a defined variable known as the version space.

III. METHODOLOGY

Over the years, machine learning has been implemented and used quite intensively such that almost every electronic equipment which can be connected to Wi-Fi is quite automatically associated with the Artificial Intelligence as the wireless network connection as well as the Bluetooth are known to be used as a medium between the software and the hardware, in which multiple hardware components can be

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operated remotely with the help or assistance of such medium [1].

Various corporations such as Tesla are known to make vehicles which contain self-driving where the automobile can detect any obstacles within the safety radius and take measures to avoid collision [3]. The future of the automobile industry is known to be closely associated with artificial intelligence and the implementation of machine learning is known to bring positive outputs as well.

When it comes to the implementation of machine learning into various components such as automobiles, software, etc. The indulgence of clustering takes place [4]. Clustering is known as the combination of various instances sourced together in order to create learning types such as :

1. Supervised Learning
2. Unsupervised Learning

Supervised Learning is known as the mechanism in which the learning task maps functions into input output pairs. In supervised learning, the components undergoe a detailed functioning of the clustering mechanism, whereas unsupervised learning on the other hand does not involve the indulgence of the input output functions. Hierarchical clustering is also known to be associated with Machine learning in which the mechanism is used to create hierarchies of clusters ranging from small to big.

In hierarchical clustering, the clusters are usually formed from the initial stage and gets carried out downwards or sideways into a more detailed form of clusters which enables the end user to obtain several options and clusters and each cluster can be used to benefit the user in their respective ways [2]. There are several advantages of clustering in which the number of possibilities can be determined and can be used to find patterns as well.

A general representation of the clustering mechanism can be given as:

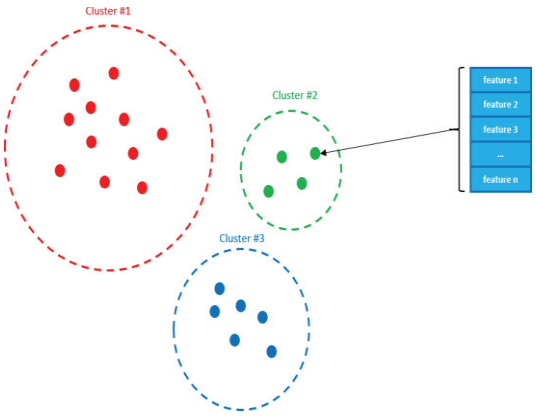

Fig. 3. Clustering into datasets

IV. PROPOSED SYSTEM

In machine learning, one of the most utilized and effective component is the software fault detection mechanism. The software fault detection mechanism is known as the process in which various concepts are utilized in order to enable a certain software to automatically detect faults and take measures to reduce and errors. This allows the debugging phase to run effectively and ensure that the software runs effectively. Various concepts such as Artificial Neural Networks (ANN), Particle Swarm Optimization (PSO) can be used for this mechanism.

Particle Swarm Optimization (PSO) is known as a simulation of a simplified social system. In PSO, the original intent was the graphical simulation of the unpredictable change in the location of a flock of birds. Each particle was subjected to keep track of its coordinates, which are associated with its result [7] . The Advantage of the PSO is that it is based relatively upon intelligence, which can be utilized for multiple purposes, such as scientific research and engineering use [6].

V. SYSTEM REQUIREMENTS ANALYSIS AND SPECIFICATION

There are various factors which depend upon software fault detection and prevention [5]. Given below is a representation of defect prevention phase and defect detection phase in which the design and implementation are associated with detection due to the possibilities of occurrence of higher number of errors which allows the user or the programmer to obtain given errors and take measures or precautions to prevent the occurrences to new errors [8].

Although this measure is not always effective as it depends on various software requirements and demands, however it allows the programmer to take a step towards the improvement of the software by enabling it to become bug free in order to boost performance and prevent the possibilities to future defects.

Implementation on the other hand works in the similar manner as design [13]. This can be backed by the fact that the implementation of software prior to the occurrence of a software test, is liable to retrieve certain defects which hold back the software in terms of performance, and versatility. So, in order to reduce or prevent this to happen, certain measures are taken within a phase known as the defect prevention phase.

Testing phase however, depends primarily upon the overall software performance, due to the fact that the software contains certain bugs which allow the defects to be detected and rectified, if not, termination [16]. This phase is followed by the defect prevention phase due to such reasons. The defect detection phase solely identifies the bug present in software or a program, and allows the user to rectify it or terminate it. This phase is known as the software detection phase.

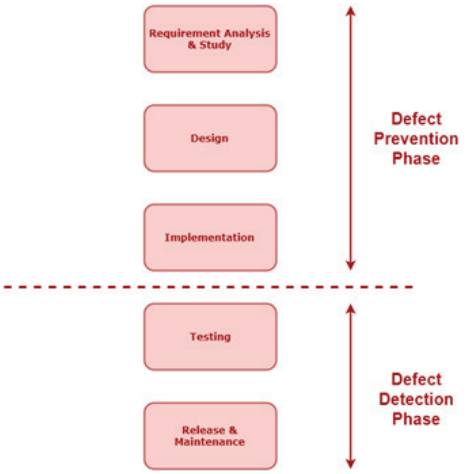

Fig. 4. Software Error Detection

The software detection phase contains testing and the release of the software, followed by its maintenance. There are various methods of software bug prevention, including various phases, with these phases being an example of what we may encounter later in the paper [16]. Machine learning can also be used for genetic programming in which the utilization and dependence of a machine can be put into use alongside genetic algorithms such as:

- Selection
- Crossover
- Mutation
- Update
- Evaluation

In the selection mechanism, the individual genomes are selected or chosen from an existing group or population which can be used for various purposes such as breeding.

The breeding process takes place during the cross over mechanism in which the strings from multiple parties are selected in order to produce an offspring which may consist capabilities of both the parties.

In the mutation mechanism, the alteration of the genes may take place allowing the gene values to completely transform and undergo several changes.

The update mechanism is used to merely keep track of the existing changes and undergo a final thorough operation prior to the evaluation.

In the final component of the genetic mutation known as evaluation, the elite chromosome can be determined keeping in track of various changes which have occurred in selection, mutation, and crossover mechanisms, thus enabling the final result to be an elite chromosome which may consist values of multiple genetic parties.

This mechanism can be represented as:

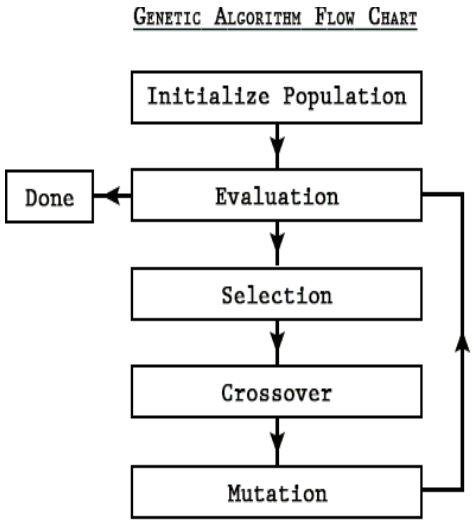

Fig. 5. Genetic Algorithm

In the above figure, we can observe that the genetic algorithm consists of a flow chart in which the initialization of a population can be observed, followed by the rest. Upon meeting the criteria, this mechanism can be executed and the final result received depends on the overall performance of these components[18].

The genetic algorithm can be accomplished by obtaining the following criteria:

- Chromosome Encoding
- Population Creation
- Fitness Evaluation
- Convergence

This can be represented as:

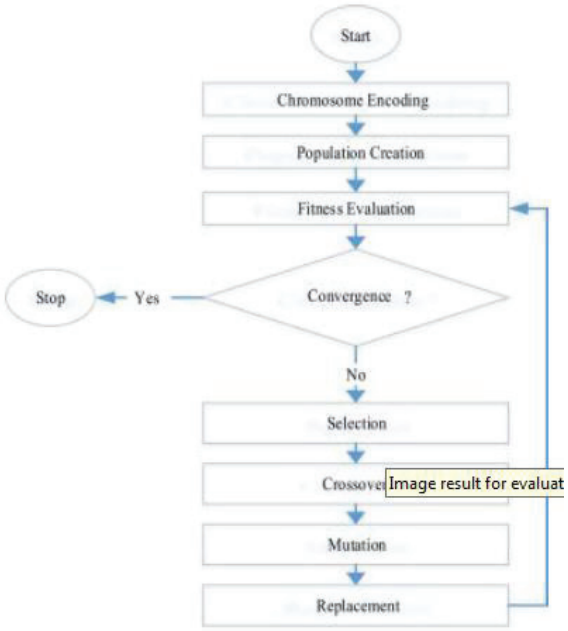

Fig. 6. Genetic Algorithm Flow Chart

In the above representation, we can observe that the process can start from chromosome encoding which involves the addition of chromosomes into a particular process in order to encode genomes.

This can be followed by the population creating in which the overall number of chromosomes can be determined so that the selection criteria can take place.

The fitness evaluation determines how fit the chromosomes are, in which the convergence criteria takes place. In the convergence criteria, the determination of genetic mutation occurs in which if present, the process halts.

If the process doesn't undergo convergence, the entire encoding process takes the next step involving

- Selection
- Crossover
- Mutation
- Replacement

This is known as the process in which the entire genetic algorithm can be observed and put into execution.

VI. CONCLUSION

There are several processes which can be obtained through machine learning in which the inclusion of clusters such as hierarchical clusters, non-hierarchical clusters, k-means algorithms, etc. take place and enable the involvement of machine learning along side artificial intelligence. Due to the emergence of technology, the artificial intelligence has seen a rise in technology involving several aspects such as genetic mutation, error detection, software development, artificial neural networks, and several such areas. Software Detection Systems are a well known process when it comes to modern software development as the rise in bugs and faults enable to system to learn and avoid the repetition of faults. Although there are various ways to do so, the implementation of ANN and PSO not only allows the software to debug and repair, but also enable it to be more refined in terms of performance.

The indulgence of machine learning alongside artificial intelligence has enables a noticeable growth spurt in worldwide in terms of economy as well as technically. The emergence of various multinational companies depend upon the upcoming technologies rather than the pre-existing ones. Thus allowing a great demand for technologies such as machine learning and artificial intelligence.

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