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Artificial Intelligence's Machine Learning Approach

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Abstract:

In classification problem learning and decision making is at the core level of argument as well as artificial aspects. So scientists introduce machine learning, which is widely used in artificial intelligence. Artificial intelligence planning systems have become an important tool for automating a wide variety of tasks. Machine Learning techniques enable a planning system to automatically acquire search control knowledge for different applications. In the field of robotics, machine learning plays an important role; it helps in taking decisions and increasing the efficiency of the machine. Machine learning is used in many applications, which is the principal concept for an intelligent system, assisting in the ingenious introduction and advanced concepts of artificial intelligence.

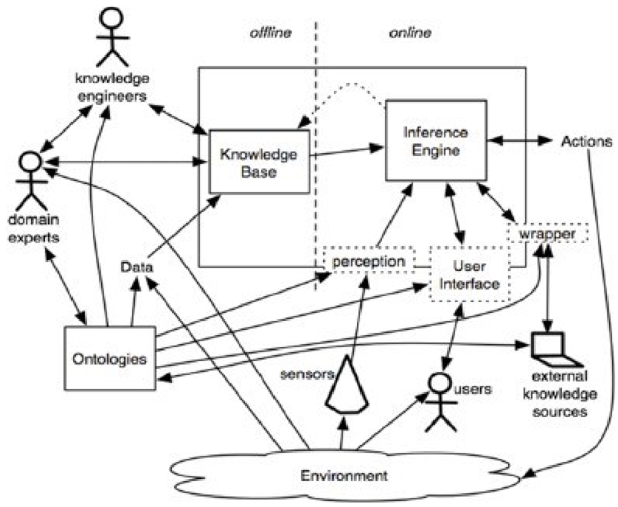

Fig1:The Machine Learning Mechanism

1. INTRODUCTION

A type of artificial intelligence, which allows software applications to predict output without explicitly being programmed, is machine learning. Data mining and predictive modeling carry the same process as machine learning. In this study of biological and artificial vision, learning is used as a key.

To comprehend the virtual environment relating to the machine, different algorithms are introduced for avoiding the building of heavy machines with explicit programming. For taking independent decisions, different algorithms are implemented in different machines. A huge number of data sets are given to classify, and based on these datasets, it processes the data and tries to predict the result. Pattern recognition is the innate process of matching information from the environment with information stored in memory. Pattern recognition is closely related to top-down perception. In both cases, knowledge and expectation are used to interpret information.

Pattern recognition involves detection of repeat characteristics, occurrences, or some other attribute. This is the basic way to make sense of the world. In other words, the constant attempt for identifying environmental information that matches the internal information.

In other words, a branch of machine learning that is used by many algorithms for getting optimized decisions is patternrecognition.

RELATED WORKS:

Sally Goldman et al. [1] gave the practical learning scenarios in which a small amount of labeled data with a huge unlabeled data presented a co-training strategy for using unlabeled data for improving the standard supervised learning algorithm. According to her assumption, there are two types of hypotheses which define the partitioning of instance space. E.g., the instance space with one equivalent class defined per tree in the decision tree partition. The conclusion she gave was that two supervised learning algorithms can be used successfully to label data for each other.

Zoubin Ghahramani et al. [2] provided an overview of unsupervised learning from statistical modeling. He concludes that unsupervised learning can be motivated from information theoretic and Bayesian principles. He further concludes that statistics provide a coherent framework for learning from data and reasoning, and he discusses types of models like graphical models which play a vital role in learning for handling different kinds of data.

Rich Caruana et al. [3] compared ten supervised learning methods in the supervised learning methods introduced in the last decade. These methods include SVMs, neural nets, logistic regression, naïve Bayes, memory-based learning, random forests, decision trees, bagged trees, boosted trees, and boosted stumps. To evaluate the learning methods, they studied and examined the effect of calibrating the models through Platt scaling and isotonic regression.

Niklas Lavesson et al. [4] stated that performance is often only measured in terms of accuracy. However, through cross-validation tests, some researchers have provided a different approach for the evaluation of supervised learning. The limitation of current measure functions is that they can only handle two-dimensional instance spaces. They present the design and implementation of a generalized multidimensional measure function and demonstrate its use through a set of experiments. The results indicate that there are cases where measure functions may be able to capture aspects of performance that cannot be captured by cross-validation tests. The final result investigates the impact of learning algorithm parameter tuning.

Yogowati Praharsi et al. [5] approached the three supervised learning methods: k-nearest neighbor (k-NN), support vector data description (SVDD), and support vector machine (SVM) because they do not suffer from the complexity of introducing a new class. They are further used for data description and classification. The output shows that feature selection based on mean information gain and a standard deviation threshold can be considered as a substitute for forward selection.

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PROBLEMS FACED IN LEARNING:

As many decisions are made, learning is considered a complex process depending on the machine as well as the algorithm. From understanding a problem to responding, many issues create a complex situation for a machine to respond to, which affects the learning process.

Perception defines how the machine perceives, so the machine should also face different types of challenges and environments. Though different inputs result in different outputs, the machine should consider only the optimized and appropriate output.

Problems faced during the learning process are as follows:

Bias: Any error that occurs in the learning algorithm is termed as bias. The problem faced is during simultaneously minimizing two sources of error, which prevents the algorithm of supervised learning.

Noise: The unwanted data and imperfection of data are now common in real-world situations. The noise that exists in the data degrades the learning process, but one of the properties of learning algorithms is to handle noisy data in all forms.

Pattern Recognition: The next problem termed as pattern recognition aims at providing a reasonable answer to all inputs and performing the matching operation for all inputs according to their statistical variation. As the machine is well known for mathematical models (square, rectangle, circle, etc.), it is also true that it becomes difficult for the machine to process inputs having different values.

Both the inputs and outputs are perceived in supervised learning. For responding to all the inputs, the algorithm has to generate all the training data from supervised learning.

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When any agent is given immediate feedback, supervised learning of action occurs. For solving any given problem using supervised learning, the following steps should be carried out:

Determination of training example and its type Collecting the training set Knowledge of input features of the learned function Determination of structure of learning function Completion of decision to run the learning algorithm based on the gathered set of data Optimizing the accuracy of the learned function and performance of the learning function, and performance should again be measured on the set which is different from the training set.

In supervised learning, inputs are received but fail to obtain supervised target outputs and rewards from its environment. Though it failed, it is possible for developing a formal framework for unsupervised learning, like clustering and dimensionality reduction.

Algorithm	Predictive Accuracy	Fitting Speed	Prediction Speed	Memory Usage	Easy to Interpret	Handles categorical Predictors
Trees	Low	Fast	Fast	Low	yes	yes
SVM	High	Medium	•	•	•	No
Naïve Bayes	Low	••	••	••	Yes	Yes
Nearest neighbour	•••	Fast•••	Medium	High	No	Yes•••
Descriminant Analysis	•••	Fast	Fast	Low	Yes	No

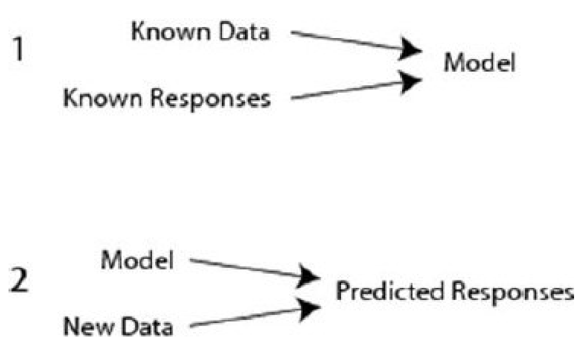

Fig 2: Supervised Learning AlgorithmThetwo categoryofsupervisedlearning are:

1. Grouping of responses having only truth values (true or false).

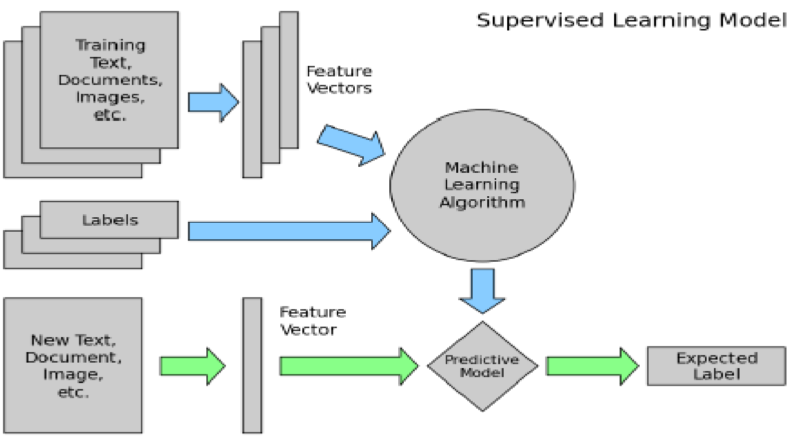

Fig 3: Working Mechanism of Supervised Algorithm for unsupervised learning:

1. HIERARCHICAL CLUSTERING:

Hierarchical clustering is a method of cluster analysis in which we aim to build a hierarchy of clusters. The goal of this algorithm is to create a multilevel hierarchy of clusters by forming a cluster tree.

Inputs:

- Objects represented as vectors

Output:

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- A hierarchy of associations represented as a "Dendrogram"

Algorithm:

1. hclust(D, : set of instances) → tree
2. var: C /* set of clusters */
3. M /* matrix containing distance between 2 clusters */
4. For each d ∈ D do:
   - Make a as a leaf node in C
   - Done
5. For each pair a, b ∈ C do:
   - Ma,b ← d(a, b)
   - Done
6. While (not all instances in one cluster) do:
   - Find the most similar pair of clusters in M
   - Merge these two clusters into one cluster
   - Update M to reflect the merge operation
   - Done
7. Return C

2. K-MEANS CLUSTERING:

In data mining, a method of vector quantization for cluster analysis is used, i.e., known as k-means clustering. The aim of this algorithm is to partition a set of data points into a predefined number of clusters.

ALGORITHM:

1. K-means((X = {d1, …, dn} ⊆ Rm, k) → 2R)
2. C: 2R /* µ, a set of clusters */
3. d: RxRm → R /* distance function */
4. µ: 2R → R /* µ computes the mean of a cluster */
5. Select C with k initial centers f1, …, fk
6. While stopping criterion not true do:
   - For all clusters cj ∈ C do:
     - cj ← {di | f1(d(di, fj)) ≤ d(di, f1)}
     - Done
   - For all means fj do:
     - fj ← µ(cj)
     - Done

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CONCLUSION

The investigation of performance measurement of learning algorithms has been studied. This is a complicated query with many aspects. Some issues, like analyzing evaluation methods and the metrics that measure performance, and a framework that describes the methods in a structural way, have been considered.

The conclusion that we made from the analysis is that the measurement of classifier performance is calculated by accuracy, like in cross-validation tests. Some general methods are used to evaluate any classifier or any algorithm by the structure of representation, while other methods are restricted to a certain algorithm of representation.

The visualization of classifier performance is required because the method doesn't work like a function returning a performance result. Measure-based evaluation for measuring classifier performance has also been investigated, and we provide factual experimental results that strengthen earlier publications of theoretical arguments for measure-based evaluation.

This experiment was capable of differentiating between classifiers that we were acquainted with via accuracy but differed in complexity.

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