Survey of robust artificial intelligence classifier proper for various digital data

Khadijeh Karamzadeh, Hamid Moharrami
Electrical Dept., Eng. Faculty, Miyaneh Branch, Islamic Azad University, Miyaneh, Iran
1st author's email: kh_karamzadeh_h@yahoo.com
2nd author's email: h_moharrami_kh@yahoo.com

ABSTRACT

Artificial intelligence or machine intelligence should be considered as the vast domain of junction of many knowledge, sciences and old and new technics. Today, classification of documents is adopted extensively in information recovery for organizing documents. In the method of document supervised classification some correct information about documents that previously have been classified are available for us and based on these information we classify these documents. Thus, we will examine methods such as: expert systems, artificial neural network, Genetic algorithm and fuzzy logics and so on. In this project we examine documents thematically and then using existing algorithms we predict a theme for a new document.

Keywords

artificial intelligence; expert systems; artificial neural network; genetic algorithm; fuzzy logics.

1. INTRODUCTION

An accurate definition has not been still presented for artificial intelligence which has met the consensus of all scientists and this is not astonishing at all. Because the more underlying subject, namely the intelligence itself is not still defined comprehensively.

But most definitions presented in this regard are established on 4 premises as follows:

- Systems that think logically
- Systems that act logically.
- Systems that think like human
- Systems that act like human

Perhaps one can describe artificial intelligence as Karami[1] states:

"Artificial intelligence includes the study of the fact that how computers can be urged into tasks that man is doing it better currently ".

1.1 History of Artificial Intelligence

The artificial intelligence is a quite young field of science. In fact, many consider the advent of artificial intelligence in 1950s, when Alan Turing wrote its article regarding the manner of making an intelligent machine (that later would be known as Touring test). Turing in that article has suggested a method for recognizing the intelligence. This method was rather similar to a play.

1.2 Horizons of Artificial Intelligence

McClutch (psychologist, philosophe and poet) and Pitts (Mathematician) conflated in an article, the viewpoints of that date about calculation, logics and neural psychology. The main idea was the how to perform logical actions through neural network simple components. Very simple components of neurons in such network were in contact only through exitory and inhibitory signals. It was the same thing that later computer scientists called them OR, thus the design of the first computer has inspired deeply from it by Von Neumann in 1947.

Nowadays after passing half a century from work of McClutch and Pitts, one can say that this work has been inspiring a quite dynamic and new inclination in artificial intelligence.

Connectionism considers the intelligence as just the product of parallel and simultaneous work as well as the interaction of a lot of quite simple components with each other.

Neural networks inspired from human mind neural network model today has quite scientific and expansive technological applications and their function in variegated fields have been examined such as control system, robotics, text recognition, image processing, and so on.

In addition, Lewis[2] states that working on development of intelligent systems with inspiration from nature (intelligent creatures except human) now is among popular fields in artificial intelligence.

Genetic algorithm that is suggested by Darwinian evolution idea and natural selection is a good method for finding response to optimization problems. By this token, other methods have been proposed in this regard such as evolutionary algorithms.

In this field any corner of nature mechanism that has found an optimal response for problems can be scientifically addressed. Fields such as human body immune systems in which countless viral offensive patterns are intelligently stored or the method of finding the shortest way to food resources by ant colony all suggests some corner of biological intelligence[3].

Another trend of artificial intelligence focus rather on modeling cognitive actions (symbolic modeling) this trend does not restrict itself so to presented systems biological contemplation capabilities.

Case-based reasoning is one of active trends in this branch. For example, the reasoning procedure by a physician over diagnosis is just like a CBR, in such manner that the physician has in its mind a great number of known diseases evidences and it only need to correspond its observation with the available samples in its mind, the most similar and consistent sample might be the disease.

Thus properties, requirements and capabilities of CBR have been addressed as an overall study framework in the artificial intelligence.

However, when we speak about future trends, we should not neglect conflated trends that do not confine themselves to progression in cognitive, biological or logical frameworks and addresses a conflation of them. One may anticipate that such trends will establish psychological meta-structures based on simple biological elements.

2. DISCUSSION

2.1 Definition of Artificial Intelligence

It is developing capacity for performing tasks by computer that are generally known by human characteristics including: detection, reasoning, concept, generalizing and learning and so on.

2.1.1 Topics Discussed in Artificial Intelligence

2.1.1.1 Robotics:

Constant: such as automotive industry and so on.

Moving: humanoid and so on

2.1.1.2 Perception:

- Vision: image observation and the ability to identify the images

- Speech: voice identification, identifying uttered words and conversion to text

2.1.1.3 Solving Problems and Puzzles:

Defining algorithms and functions of machine learning for problem solving

2.1.1.4 Pattern Identification

Statistical

Structure: mathematics and physics

2.1.1.5 Neural Networks

2.1.1.6 Expert systems

2.1.1.7 Fuzzy control systems

Application of artificial intelligence in accounting and financial affairs[4]

Artificial intelligence is a combination of some sciences of computer, physiology, philosophy, mathematics and statistics and linguistics, attempting to simulate human characteristics through computer systems.

Artificial intelligence has a special position in accounting and financial affairs such as: reporting, financial analysis, auditing and assurance.

4 cases of applying artificial intelligence are as follows:

2.2 Expert System

These systems are intelligent software in which the experts' specialty role has been summoned up as a set of scientific information.

Indeed, it is the system that adopts the human knowledge by computer for solving problems that often call for human expertise. For example, purchase commitment, storing, banking, strategic planning, production and operation management, financial communications, and marketing management and so on.

Expert system is a subset of artificial intelligence that essentially works with knowledge and reasoning for solving problems that call for human knowledge.

2.2.1 Purchase Commitment:

Expert systems increased the possibility of adopting more integrated organizational standards for assessing the degree of different risks. The necessary database for purchase commitment systems, including information of special industry about safety equipment and adopted measures for reducing the risk are among technics of assessing risk level. The best time for designing computer systems is at renewal of insurance policy.

2.2.2 Storage

How much of current incomes should be put aside for coming eventual demands for compensation damage.

2.2.3 Banking:

Banks offer different loans such as mortgage to their customers. One uses expert systems for draft services and transferring funds, operations of purchase of sale of foreign exchange and other trades.

2.2.4 Strategic planning:

In determining time, skill, financial resources, consultants

2.2.5 Production Management:

With increase of complexity in production industries and calling for higher efficiency, shorter life cycle for products, higher flexibility, quality, customer satisfaction and so on. The main challenge of any organization is in adjustments with these alterations of commercial environment.

2.2.6 Marketing Management:

Like McDonald Company that has many branches around the world and for arranging and managing these branches a complicated system is needed.

Estimation of the finished priced, bankruptcy valuation, anticipating coming estimation and managing asset portfolio and stock papers, and pricing new stock papers

2.3 Artificial Neural Networks:

many problems such as vision or speech identification that take place impossible or highly difficult with algorithm computers can be solved easily by human brain while usual speed of calculation in computers is multimillion operations per second and the usual velocity of operation calculation is 10 per second and this stems from human brain neural network.

2.3.1 Some Cases of Application of Neural Network:

2.3.1.1 Stock Price Procedure Anticipation:

Anticipating the price or return of stock is not an easy task, because many market factors are determinants in this regard and all of them cannot be incorporated in a technical analysis. Only history data relating to price and size of stock trades can be studied for anticipating coming movement of the price.

2.3.1.2 Auditing: ANN (Artificial neural network):

It can help in process of examination, analysis, activity continuation decision and other cases.

- valuation:

One can estimate the value of stock paper and other assets that we want to purchase, and to simulate the valuation process.

2.3.1.3 Anticipating the Credit Amount:

ANN can be planed so that its input information would be data related to customers and its outcome will be actual decisions of credit analyzers. In fact, it can undertake imitation of human decision maker in giving or rejecting credit and determining the credit ceiling.

2.3.1.4 Approving Credits:

Artificial neural systems can be so designed that their input information relate to customers and its output is associated to credit analyzers actual decisions.

2.4 Genetic Algorithm:

Considering the Darwinian Theory, any creature changes over time according to conditions and becomes more complete and evolved. Like giraffe having a long neck, the networks evolve over time too according to conditions. This technic is a non-classic and direct exploration method that only deals with the function itself not with its derivatives.

2.4.1 Applications:

1) Detecting cheating in financial statements

2) Anticipating bankruptcy

2.5 Fuzzy logics:

Binary term or zero and one term is ambiguous in business condition of natural states and what is and what does not exist is not appropriately defined. That is, it is between zero and one. In general the fuzzy set makes it possible to state mental and qualitative information in a scientific manner. Thus the individual prejudices and biases decreases and decision making takes place more logically[5].

2.5.1 Application Cases:

2.5.1.1 Decision Making:

Using time conditions, it conveys uncertain inputs to certain responses.

2.5.1.2 Auditing:

It helps in assessing and managing auditing eventual risk, ambiguity in auditing environment and evaluating the importance.

2.5.1.3 Asset Allocation:

Allocating assets to saving, income investments and growth investments can be designed based on the age and degree of risk taking of people of the asset allocation model.

2.5.1.4 Hybrid Artificial Intelligence:

In a lot of studies most of emphasis is on the individual nonlinear methods that is used heuristically for a certain problem[6].

- Bankruptcy prediction
- auditing
- ABC

2.6 Machine Learning

Verbeist et al.[7] have presented a concept from machine learning experience. Mathematic knowledge in this arena includes differential and integral calculus, vector geometry and Lagrange coefficient.

The first part of this article has presented the problem of classification of linear separate data and explains SVM concept. Methodology of SVM for has been developed for linearization separation. The vector machine of soft margin introduces in this section Slack variables premise and exchange between maximizing the margin and minimizing the number of variables with inadequate classification. Next section describes SVM features. This section describes that how the participation of this part of mathematic allows SVM to provide nonlinear data classification. Except verbeist et al., most of documents are based on works of Bishop[8] and Young[9].

Support vectors are nearest example of separated hyperplane and the objective of support vector machine (SVM) is inclining toward this hyperplane so that it provides the nearest value both category[7].
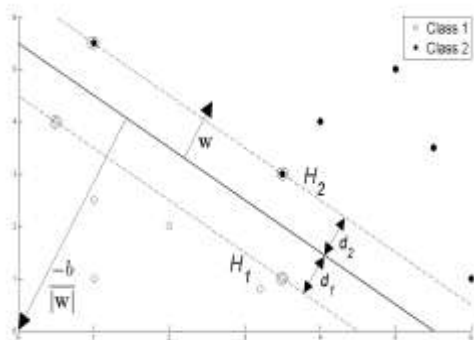
Figure 1: Hyperplane Through two linear separated category

Looking at above figure, the implementation of SVM is intended for selection of variables b and w so that educational data can be described as follows:

$$\mathbf{x}_i \cdot \mathbf{w} + b \geq +1 \quad \text{for } y_i = +1$$
$$\mathbf{x}_i \cdot \mathbf{w} + b \leq -1 \quad \text{for } y_i = -1$$

(1), (2)

These equations can be combined as:

$$y_i(\mathbf{x}_i \cdot \mathbf{w} + b) - 1 \geq 0 \ \forall_i$$

(3)

If now we take into account that the points reside at nearest separating hyperplane, for example in vicinity of support vectors, then two planes of H_1 and H_2 reside on these points as:

$$\mathbf{x}_i \cdot \mathbf{w} + b = +1 \quad \text{for } H_1$$
$$\mathbf{x}_i \cdot \mathbf{w} + b = -1 \quad \text{for } H_2$$

(4), (5)

2.7 Nearest Neighbor Method

The nearest neighbor is a statistical pattern detection method without variable that finds K similar patterns for the existing hydrological pattern called as the nearest neighbor. The nearest neighbors are used for statistically

estimating desired hydrological variable. One has composed a method for its application in analyzing temporal series and hydrological predictions.

In this method, at first one defined a dependency structure for independent and dependent variables by Ft specific vector. In other word the specific vector shows that variable being predicted, Rt (output flow) depend to which parameters. By having specific vector (Model test data), K the nearest specific vectors in history data (model education data) can be found with weighed Euclidian distances. Storage output (predicting variable) can be estimated from K the nearest neighbor using weighing regression using Kernel function.
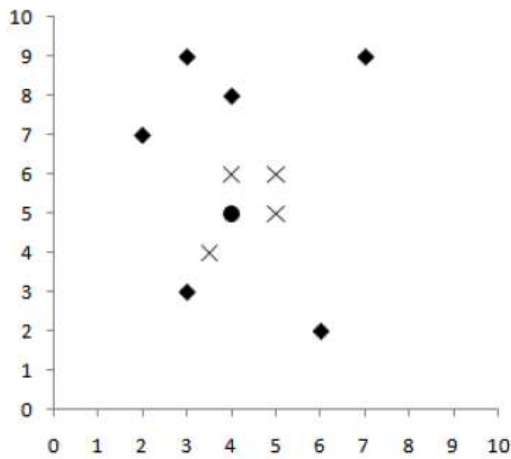

Figure 2: an example from KNN with K=10

$$d_{eucl}(x,t) = \sqrt{\sum_{i=1}^{m} d_{eucl}^i(x,t)}$$

$$d_{eucl}^i(x,t) = (a_i(x) - a_i(t))^2$$

(6), (7)

Consider KNN with K=10. The test sample is shown with the points. There are two classes where 4 neighbors belong to the first class and have shown by cross sign and 6 other neighbors belong to the second class that are shown by rhombus. With a simple poll it can be specified that this algorithm know the test sample as belonging to second class though considering the figure 1 one can understand that the test sample belongs to first class. Anyway the classification in this way has great dependence to the number of neighbors namely the value of K.

Solution: in this article we have determined the value of K by very simple mathematical formulas and there is no need to determining the number of neighbors by user and this parameters is determined depending to sample position.

But the second deficiency of this method is that for assigning labels, all nearest neighbors of test sample are considered with the identical degree of importance. For solving this problem Keller et al have used the theory of fuzzy set. After obtaining the nearest the test sample K , they attribute the test sample to a class that the following formula value exceeds it.

$$R(x,t) = \cfrac{1}{d_{eucl} \cfrac{2}{m-1}}$$

(8)

$$\frac{\sum x \in NN R(x,t) C(x)}{\sum x \in NN R(x,t)}$$

(9)

If x depends to C clash the value C(x) =1, otherwise it is zero.

2.8 Neural Network

As it has been explained, there are a lot of types of network. Meanwhile there is a network that considers the node as an artificial neuron. So, such networks are called artificial neural network or ANN.

An artificial neuron is in fact a calculative model that is inspired from human real neurons. Natural neurons receive their inputs from synapse. These synapses reside on dendrites or neuron membranes. In a real neuron, the dendrites change the domain of received pulses and the type of this change does not remain constant over

time and so, it is learned by the neuron. If the received signal is strong enough (and exceed from a threshold limit), the neuron becomes activated and emits a signal over axon. This signal in its turn can enter to another synapse and provokes other neurons.

2.9 Support Vector Machine Method

Classical problems of artificial intelligence

A framework is a structure for display, processing and storage of similar data in large scale with presenting the method of providing and high flexibility in the structure. For designing the desirable framework, at first one should gather a relatively complete set of problems and plays and identify their important factors for presenting them to design. Any problem includes different parts that usually the problem definition is posed verbally. For turning problems into frameworks one need to define a well-composed and specified structure expressing required factors for understanding and adopting specific technics on it.

The information can usually be found in a scattered manner in various references. In the beginning , near 60 problems have been posed in this field including plays, old problems, and special problems for artificial intelligence, robotics problems and etc, and these problems have been studied. Various problems have been posed in mathematics and control as well[10].

2.10 Branches of Artificial Intelligence Science

2.10.1 Symbolic artificial intelligence

This intelligence follows findings based on statistical calculus and is often classified as machine learning. The symbolic intelligence attempts to state the system and its rules in the form of some symbol and by recording information into symbols and rules attempts to solve problems.

2.10.2 Non-symbolic Intelligence

This intelligence relies on an inductive logic and draws on learning approach (system improvement through iteration). These learnings are established upon not statistical results and analysis, but on the method of learning (learning from experience). In this type of artificial intelligence, the rules are not offered in the beginning to the system, but the system itself extracts the rules through its own experience.

2.11   Future Perspective in Artificial Intelligence

There are some concerns about machine intelligence namely artificial intelligence, because some believe that artificial intelligence may cause problems for human and sometimes it can be dangerous. However this concern in some cases is unreal. Artificial intelligence and its learning dimension can be examined and studied accurately. The topic of artificial intelligence learning at the level of human learning has caused that researchers examine these two subjects together.

Researchers have studied scientific and engineering intellectual problems in this regard. Fabrizio [11] presumes that it is the time for reexamine the traditional methods. If general objectives of artificial intelligence would be actualized, the artificial intelligence reaches to its most advanced level. The most advanced level of artificial intelligence has been defined by Fletcher[12]: "any kind of intelligence that promote the human mental performance to its highest level".

If artificial intelligence can perform like human intelligence, its progression is not far from expectation. Therefore artificial intelligence should step further human ability and continue its path as faster as possible[13].

As Hawking acknowledges achievement in accomplishing objectives of developing artificial intelligence will turn into a turning point in the human history. Unfortunately some dangers may threaten human in the future too.

3.   PROJECT EVALUATION AND CONCLUSION

Working in the field of artificial intelligence may results in emergence of numerous ideas. Researchers of artificial intelligence and experts now can draw on more intelligent efforts in their methods in fields such as indexing, organizing, referencing, processing and restoring information in library science. The major reality of artificial intelligence is developing computer performances similar to human intelligence performances such as reasoning, interaction, learning and problem solving.

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