ORIGINAL RESEARCH PAPER

Computer Science

MACHINE LEARNING: AN EMERGING APPLICATION IN MODERN WORLD

KEY WORDS: Machine Learning, FNN, Robotics, DFNN

Sushil Kumar Extension Lecturer, Department of Computer Science Government College, Hansi (Hisar) Haryana, India

ABSTRACT

In this paper I, have reviewed a comparative and emerging study about machine learning and robotics technology in modern world. Machine learning models to predict the direction of a wall following emerging techniques is described with modular diagram. The models were trained using an open-source dataset that contains 24 ultrasound sensors readings and the corresponding direction for each sample and machine capacity. In addition to the full format with 24 sensors per record, the dataset has two simplified formats with 4 and 2 input sensor readings per record and their database prepared for modern world. Several control models were proposed previously for this dataset using all three dataset formats. In this paper, two primary research contributions are elaborated and the machine learning models with accuracies higher than all previously proposed models for this dataset using all three formats.

1. INTRODUCTION:

In machine learning world, the fully autonomous mobile robots are used in various industries today such as nuclear power plant, oil refineries, chemical factories, and military applications. In general, autonomous mobile robots play an important role in process control applications. Machine Learning is also a modern technique to predict different language understanding and output producing mechanism as robotics. One of the most critical tasks that these robots should accomplish is navigation by following a wall. Wall following can be used in several operations such as fault detection, search and rescue and in detections of cracks in oil pipelines. Achieving a highly accurate control for these robots is vital for their intended operations

In Machine Learning process the language play vital role which perform tuning and system performance. It solves the defects of traditional English learning users in reciting words, such as outdated corpus, low precision of personalized recommended words, and traditional reciting words, and assists users in professional language learning, rapid expansion of vocabulary, good vocabulary aggregation, and learning relevant practical vocabulary. The thesaurus selected in this paper is based on the existing public free thesaurus, and the scope of the optional thesaurus still needs to be expanded and studied. The number of selected data in this study is only several thousand, which is undoubtedly small compared with the "big data" of machine learning. The thesaurus will be expanded in the future research.

In the fields of Machine Learning and neural networks the adaptive information processing composed of a large number of processing units. In this paper, an adaptive fuzzy neural network (FNN) is used to construct an intelligent system architecture for Hindi and English language learning, and activation function is used to apply the knowledge of computer science and linguistics to English learning process. The network neural structure diagram is presented. English machine learning model framework is established based on recursive neural network. On this basis, feature vector extraction and normalization the needs of neural network model are very tremendous. After acquiring the feature vectors of users' learning styles, the clustering algorithm is used to effectively form a variety of learning styles. The validity of the English learning model was verified by designing the functional flow based on tests. Accurate mastery can activate the corresponding brain regions not only to improve the efficiency of learning, but also to better facilitate language learning. In machine learning and cognitive learning technique the G5 Mobile Robot is basically used for the sampling collection and deep learning fidelity.

A perfect solution for the 4 and 2 inputs sensors formats is presented using Decision making Classifier by achieving a mean accuracy of 100%. On the other hand, a mean accuracy of 99.85% was achieves using the 24 sensor inputs by employing the Gradient Boost Classifier. Second, presenting a comparative study on the performance of different machine learning and deep learning algorithms on this dataset.

Fig. 1. G5 Mobile Robot

2. DEEP LEARNING:

Deep learning is another subset of machine learning technique that was proven to be one of the most powerful methods nowadays especially for classification problems with large datasets. Deep learning allows for the training of deep neural networks which are composed of multiple hidden layers. While the principle of training neural networks with multiple hidden layers is relatively old, the lack of computational power and available data in the past have imposed a major challenge on the advancement of this field. The available computational power and data available nowadays allow for the implementation of deep complex neural networks.

One of the challenges in machine learning is to select the right technique and algorithm for the intended problem. According to the popular No Free Lunch Theorem, there is no golden machine learning algorithm that can outperform all the other machine learning algorithms in solving all possible problems. This paper employs the sensor fusion problem in to evaluate and compare the accuracies of the most popular machine learning algorithms for this problem and similar problems. Besides comparing the performance of different models to solve for the problem in, this paper aims to provide a research insight to solve other data fusion problems with similar data characteristics

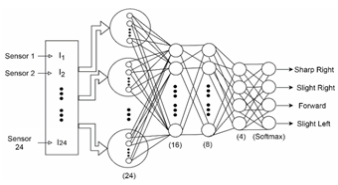

Fig. 2. Deep learning model

Deep Learning FNN (DFNN) model with a weight sharing technique. This architecture outperforms all previously proposed FNN solutions with a mean accuracy of 99.35%. As can be seen in Fig. 5, this architecture has an input layer of 24 neurons, where each neuron has a vector input of the entire 24 sensors. Each neuron in this layer assigns one shared weight and bias per vector input. This layer is different than the regular FNN layer in which every neuron process one singular value only. The output of this layer is a 2D matrix with a size of (22,22), or a 3D matrix if we take the batch size into account with a size of batch_size,22,22. Following the input layer, the 2D output is unrolled and is connected to three feed-forward hidden layers which is basically a smart layer for adaptive learning also.

3. LEARNING MODELS AND EVALUATION:

In this section presents the testing results for several machine learning algorithm using the dataset. As mentioned in the previous section, the dataset provides three different formats. The full one 24 sensor inputs, while the other two are simplified to 4 and 2 sensor inputs. Fig. 2 depicts the various machine learning and deep learning algorithms that are evaluated in this section using all three dataset formats. While deep learning is a subset of machine learning, it is common nowadays to separate deep learning from the rest of the machine learning algorithms for comparison purposes. To demonstrate the true performance of the proposed models, Monte-Carlo cross-validation was applied. As can be seen from the figure, the first step is to shuffle the data randomly, then the data is split into a separate training set and test set. In this experiment, a ratio of 15:2 was used for the splitting, this resulted in having a 4524 training sample and 546 testing sample. The machine learning process are repeated for n iteration, then the mean of accuracy for all iterations is obtained. In this paper, the value of n=50 iterations was used to evaluate all the proposed models

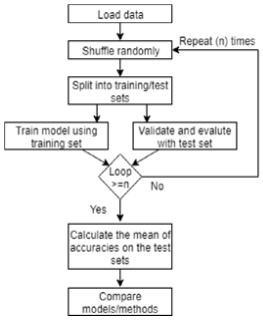

Fig. 3. Learning Iteration and Flow Model

4. VOCABULARY MECHANISM IN LEARNING:

The vocabulary mechanism in the system will automatically ask the user whether to remember the word as the core word. This technique is very important for adaptive learning and continuous data interpretation and provide output to next machine. If not marked, the system will judge whether the word belongs to proper nouns according to the characteristics of the word itself. If not, it will be marked as a common word to show users the basic usage of definition and phonetic symbols. If it is the core word, it shows the basic usage and expands the advanced usage of the example sentence. The specific process is shown in Figure 4

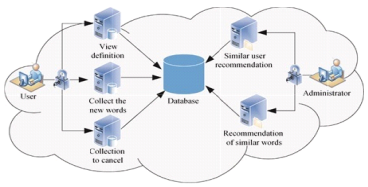

Fig. 4. Vocabulary Sub System in Machine Learning

5. CONCLUSION & FUTURE RECCOMENDATIONS

The performance of various machine learning and deep learning models for a wall following robot controller. An open-source dataset containing ultrasonic sensors readings and the corresponding robot direction was employed in this study. The models were trained using three formats of the datasets, a full format with 24 sensor inputs and two simplified ones with 4 and 2 sensor inputs. The most popular machine learning and deep learning algorithms were implemented and evaluated. The proposed models in this paper outperform all the previously proposed models for this dataset in terms of accuracy. English machine learning model framework is established based on the related theories and techniques of machine learning neural network theory, and eigenvector extraction and normalization algorithm are used to meet the needs of neural network model. After analyzing the neural network model and obtaining the feature vectors of users' learning styles, the clustering algorithm is used to divide the data points with similar characteristics into unified categories and finally generate multiple learning styles. The selection set automatically evaluates the score, makes the personalized learning plan automatically, and pushes the learning guidance system of relevant words and sentences regularly and quantitatively, so as to further expand the scope of their English learning and lay the foundation for the improvement of the effect of intelligent English learning.

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