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A Mechanism in Detecting Faults over Electric Devices using Machine Learning

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ABSTRACT: The technology of machine learning (ML) and Artificial Intelligence (AI) is increasing tremendously. Because of adopting ML and AI technologies many of the benefits which the different companies such as automobiles, electrical, electronic etc., in all the domains the ML was adopted due to various reasons such as reduce man power, increase production, etc., electric fitting is necessary in almost all the industries. There are many procedures in detecting the quality and working of the electric mechanism but our work shoes the faults in the electric machines in advance by the help of (Support Vector Machine) SVM classifier. Here we have tested and generated results by the form of vibrations and signals. Compared to normal operating in the machines installed our mechanism tells the mechanical and electrical faults in the device. Here for showing the problem in our device first we have to train up the SVM classifier. For complete development of the work we have used (Fuzzy Logic) FL technique, (Support Vector Machine) SVM classifier and ANN (Artificial Neural Networks) technique. The results obtained show the good generalization mechanism in using FL and ANN techniques.

KEYWORDS: Artificial Neural Networks, Fuzzy Logic, Support Vector Machine, Machine Learning, Artificial Intelligence and SVM classifier.

I. INTRODUCTION

Present the use of vehicles and motor cycles are increasing in number due to increase of population. The companies are making productions in large number but there is somewhat problem in maintaining the quality of the vehicle constant. [1] To overcome the method the companies are adopting ML and AI technologies brought into existence to overcome the pitfalls of the present work. The companies are using the VSI mechanism in motors. Present there are many issues such as device fault, motor fault, DC fault etc., to overcome those problems first they introduced switching devices such as namely IGBT, MOSFET etc., [2] these devices helps to overcome small circuit issues and small circuit falls. There are few other problems such as demagnetization and synchronous generator.

By considering the overall device normally the restart operation takes place for safe side, or for the immediate purpose. Here the switch doesn't need any type of the problem but by the help of noise we can detect the problem in the device. There may be the problem in the switch whenever we are installing so we have to take care while handling them. So for the generators which we spend huge amounts need to improve its reliability and also have to adopt the fault tolerance in the device. Generally there are 3 mechanisms for model based namely

- Statistical approach [3]
- Model based approach [4]
- Data driven approach [5]

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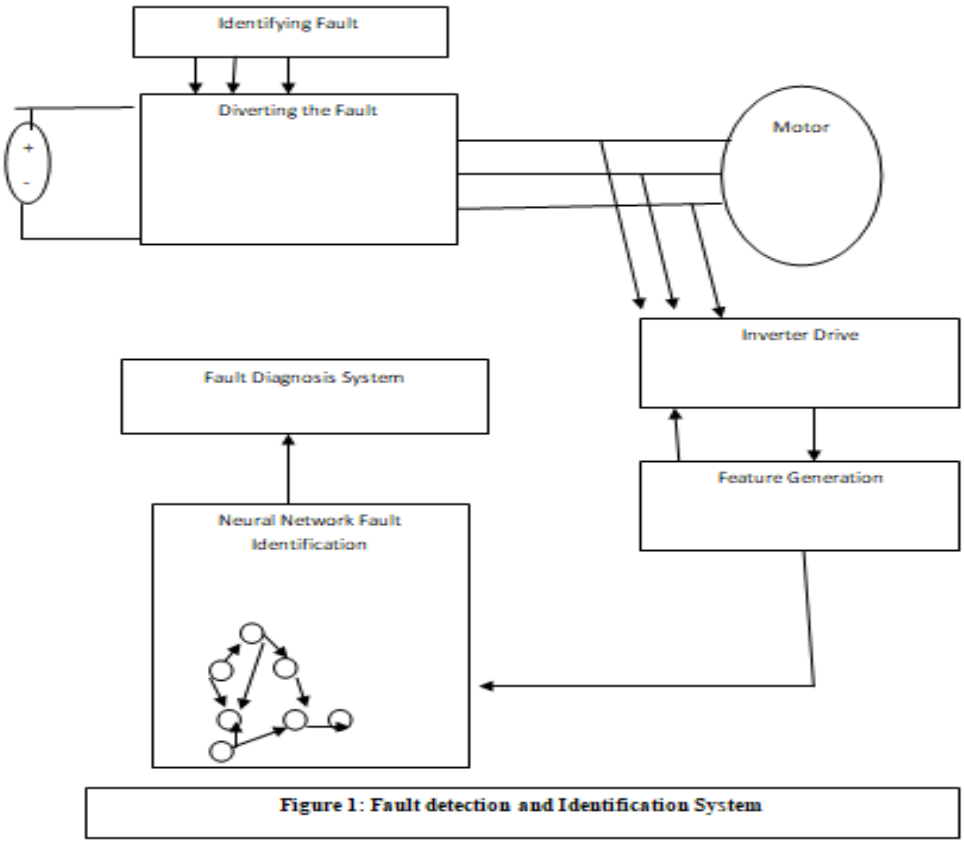

Figure 1: Fault detection and Identification System

As per the assembling and de-assembling the things some of the faults were mentioned in the device based on the present analyzing of the present things and methods. [6] The authors detected and proposed the Fuzzy logic algorithm for detecting and identifying the faults over the system. The other author by the help of fuzzy logic defined fault tolerance in advance to identify the faults in the product.

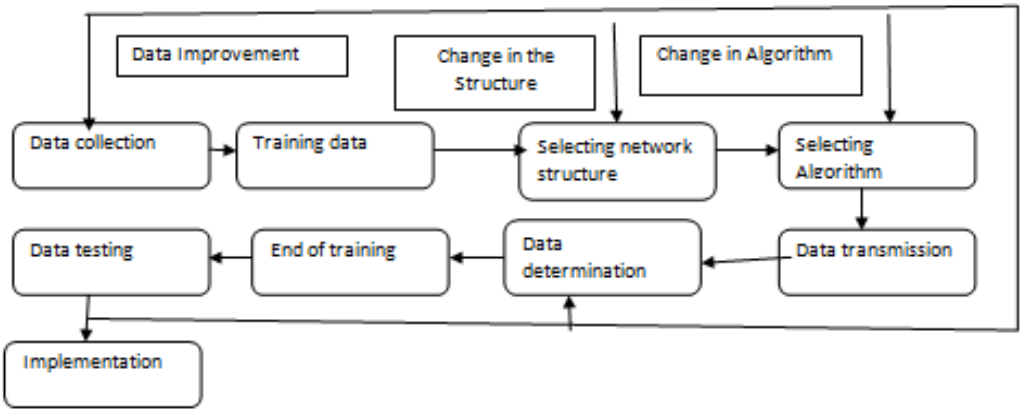

Figure 2: Present System Architecture

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Many of the authors, scholars and researchers in different organizations and R&D's were working in this research concept i.e. to improve the quality as well as to improve the efficiency of the devices. [7]

First author defined the mechanism was detected by using the procedure of Concordia procedure but this procedure suits well for single phase devices only.

Second author proposed Fuzzy logic as well as Fault tolerance mechanism among the single phase devices as well as multi phase devices and developed based on the current flow. [8]

II. EXISTING WORK AND PROPOSED WORK

Based upon all the proposed mechanisms in this paper we are proposing the three phase mechanism for designing motors and for identifying the problems in the device. We also included additionally few more sensors for the computational purposes with training data. Our proposed mechanism i.e., three phase mechanism can be used in the single phase devices as well as two phase devices. By the help of Neural Network method [9] can identify the power flow from the input to output. Our proposed results shows that it is robust, secure, accurate dynamic in nature and can detect among many faults. [10]

Here we have proposed the pattern recognition mechanism for the device. Generally the pattern recognition is used for detecting the problem when the device fault is very difficult to find. [11] All of the defined mechanisms are defined here with the results along its functionality. Here spectrum plays a major role in procesisng signal and transforming information.

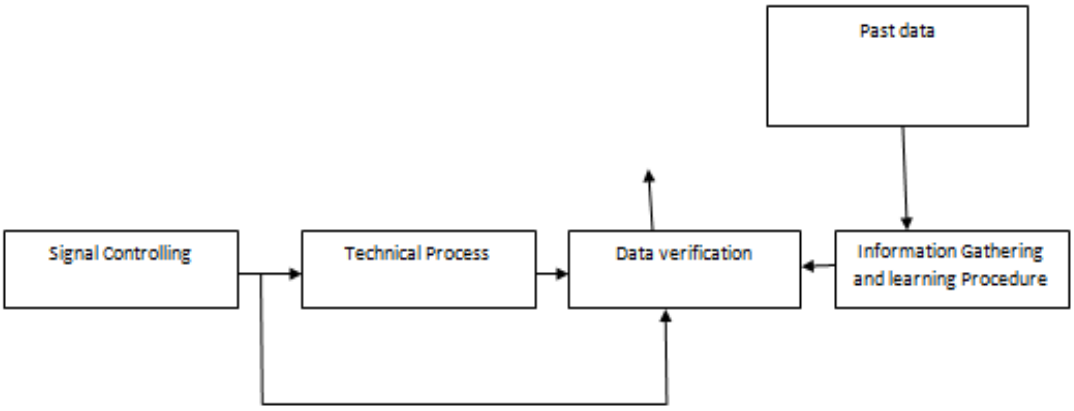

Figure 3: Proposed Work Architecture

The below is the procedure how the information is extracted

Step 1: Identify the Fourier mechanism for input
Step 2: Identify the maximum point at the local
Step 3: Sort the elements in step 2 in decreasing manner
Step 4: Declare the edges of the position
Step 5: Construct the Framework
Step 6: Generate the filters

The procedure of the proposed work was tested with single, double as well as triple filters by using ML [12] we can observe the difference the condition of the gadget or product. Here the generated signals were collected and transferred to the different conditions by the help of current signals. Here by the help of CNN the graph is generated with 1670 * N image and that can be observed the results as complexity manner.

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After the convention method there is data training to the deep values with the three set. The data is trained with the raw data. The training is done for CNN [13] with the 3 steps namely

- Convolution layer
- Activation layer and
- Pooling layer

The each layer generates graph [14] with a colored and with the different sizes namely convolution generates with size of 4*4, activation layer generates with size of 3*3 and pooling later generates with 3*3 and 2*2 size of graph. [15] The sizes of graph for each and every later are the default size. The size of the graph can be reduced personalized manner.

III. RESULTS

The proposed work was practically done on more than 180 devices to see the way how it performs. For working correct status the cross checking is done in the device for the identification of faults in the devices by performing the model driven test operation. Here we trained CNN classifier mechanism for this we have used 650 samples of training sets of data and made separately a dataset with 6 values to reduce the data lines in our database. So by concision the complete dataset it becomes 138 dataset values. The reduction of data is done because of minimizing the data values and converting as a set. The CNN is tested and verified on different data sizes like 8bit, 16 bit and 32 bit of data. The CNN data is encrypted and made it in a robust manner. The training for CNN nodes were given 100 percent while working on the data we can observe 93 % of correctness of the data.

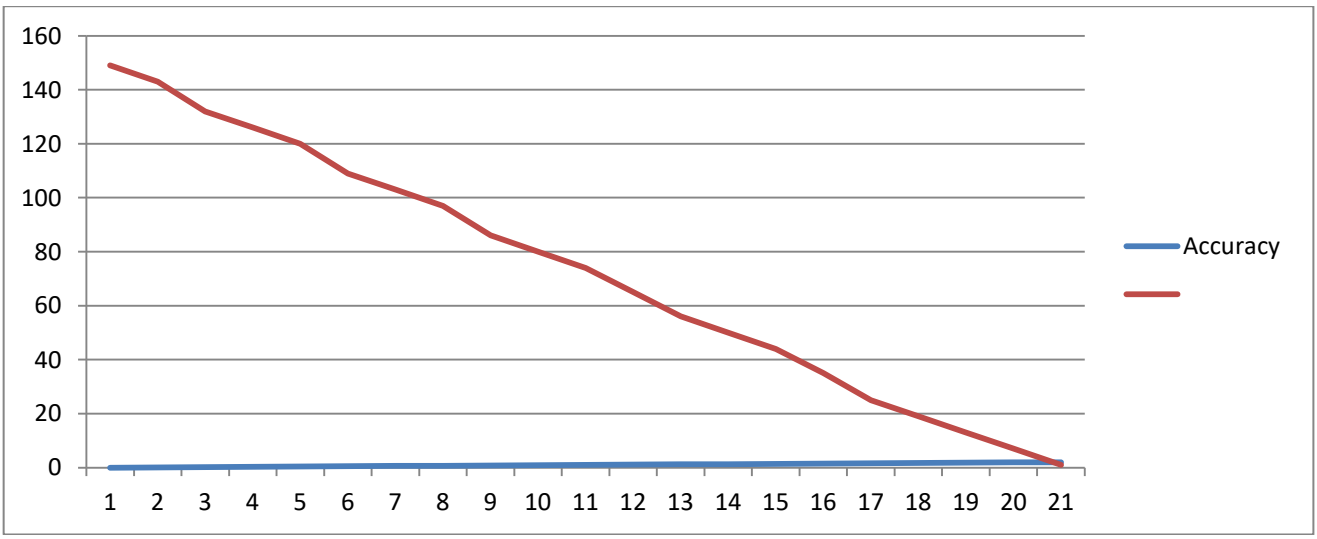

Figure 5: correctness of the data represented by graph before data training

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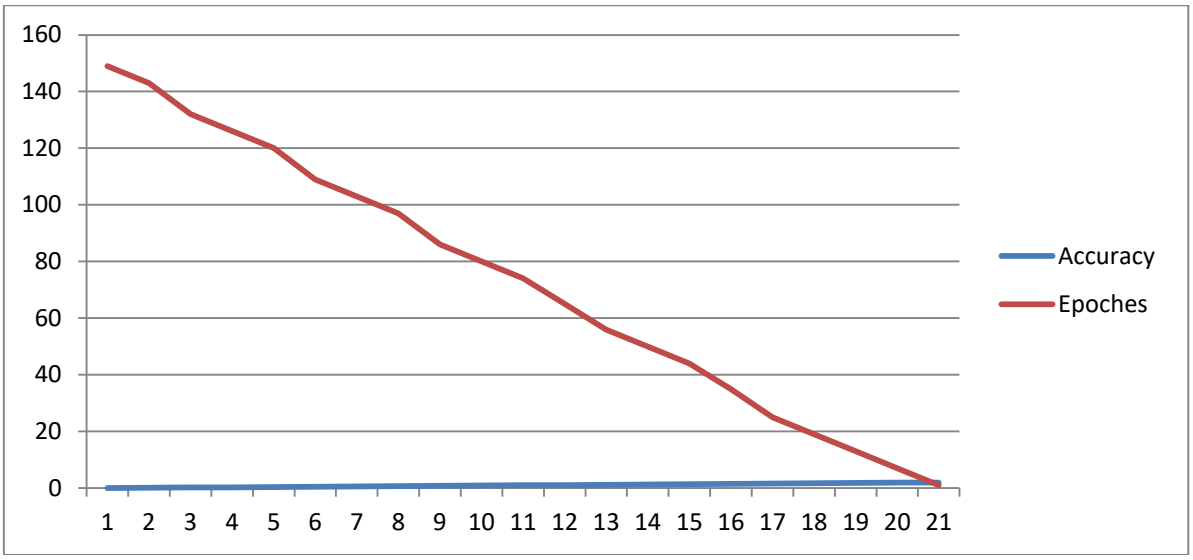

Figure 5: correctness of the data represented by graph after data training

Here we can observe in the graph regarding the improvement by embedding ML into electronic devices or gadgets. Here we can observe the 97% of accuracy of the data. We have tested these values by taking the values from the test data items over the set. Here the test data set have completely trained data values these are tested and trained values. The proposed work is capable for all the noise resistant from others. For complete development of the project we have used CNN with ML and AI mechanisms. Finally the comparison among the existing and proposed work says the by using CNN we can observe the 97 % of accuracy compared to previous existing works

Overall by the graph we can say that there are 2 major approaches for designing and training the data. By giving the training to the data items the behavior of the data elements and the way of responding to the user varies. If the user gives training to the data elements the way of responding was accurate.

IV. CONCLUSION AND FUTURE WORK

The proposed work shows the 3 phase electric power with fault detection mechanism where as the single phase and double phase is also well suits for using our proposed work. The proposed mechanism was partitioned into different types namely aluminum end ride biking, axis deviation, friction, poor insulation. Finally achieved 97 % of accuracy which is comparatively best then other DP and AI methods. We have shown the output for single variable, double variable and 3 variable features.

Even though we have proposed the 3 phase mechanism for fault tolerance mechanism the few limitations were left out such as at firs the data is less and comparative, at second the data value is increased in the number and the large data items were collected. Here the load verification and data checking process have done additionally. In the third the data set is also large here we have identified faults in first and second sets and collected huge datasets and avoided misclassification among the sets. In future we have to workout more in reducing the price for making the CNN training cost.

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