Performance Comparison of Various Wireless Sensor Network Dataset using Deep Learning Classifications

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***Abstract*—Deep Learning is the subset of artificial intelligence and various techniques are available to predict the performance of real time applications. Wireless devices are available to access the devices from multiple places based environment and coverage area. Wireless sensor network (WSN) tools are positioned in multiple places which has sense the information from the substances. The performance is the major factor to facilitate the bandwidth and power. In this paper to analyse the wireless sensor network performance using deep learning techniques. Here to measure the performance indicators such as accuracy, precision and score function of sensor dataset using TensorFlow. The deep learning models such as convolutional neural networks, recurrent neural network and k-means neural network performance factors are classified by using sensory dataset. The accuracy factor is obtained as 96% and compares this with existing models.**

Keywords—deep learning, wireless sensor networks, classification, performance, tensorflow

I. INTRODUCTION

WSN is the major real time working environment to collect the data from multiple interfaces based on objects [1], location [2], coverage area [3] and sensing environments [4]. Each collected information are recorded and processed. Major issues in WSNs are coverage constraints and energy consumptions. The amount of data is considered and attracted based on aspects, networking lifetime, capacity index and routing strategies. The main contributions of WSNs are multi-hop routing features, network topologies; resource limited access, sensory networks and data centric approach. It has large volume of dataset and dynamically moving nodes. In this case the need a self-organized routing model for handling collaboration, detection and monitoring [5]. The network coverage another issues to select the nodes such as sensor, user, sink and connectivity module which is shown in Fig 1.

It is collection network and which collects the sensed information from multiple environments such as events, locations, faulty detection and deployed networks [6]. The applications such as automation, tracking, agent modelling, critical environment, surveillances are wireless sensor based environments and decision making applications such as healthcare systems, sales, shopping, IoT services, etc are used. The user node can detect the information from the environment and select the features. For example, the WSN range is also classified by using security, cluster and coverage areas. The demand of network services and their requirements the necessary connected features and their components are classified [7][8]. The major issues are considered for selecting the accuracy of the data network and delays the network lifetime based on route capacity factor. In this paper to select various deep learning methods to classify the WSN dataset which is collected from sensory network and compare the performance [9][10].

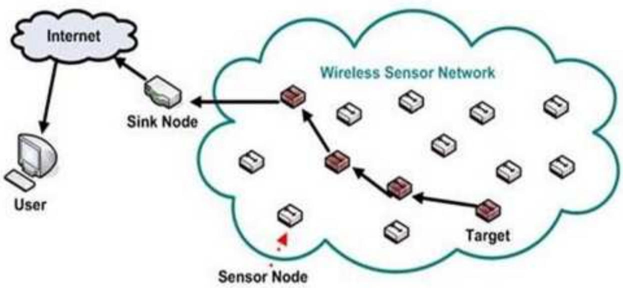

Fig. 1. WSN Working model – Data Processing and Modules

II. RELATED WORKS - DEEP LEARNING METHODS

Machine learning is the process to handle the sensed data and deep learning is the subset of machine learning for further learning the features to provide efficient decision making. The decision making is the main process which has intelligent based assisting services. It has supervised and unsupervised learning methods [11]. It is applied to each dataset for measuring classification, clustering, regression and prediction. The following are the details about deep learning, 1. This has multiple layer linear processing units for feature extraction and data transmission [12], 2. Each successive layer operational network assistance such as classification and pattern recognitions [12], 3. To process historical data for measuring accuracy [13].

From the below Fig. 2 shows that deep learning process is applied in each level. In first stage machine testing is done for extracting features and monitoring each stage. In stage two each processed data are taken form evaluation [14] and apply machine learning features [15] for deeper result processing. Here the labelled information is recorded for measuring accuracy. Finally, action to be taken for effective decisions. The Tab. 1 shows that process flow of WSN processing.

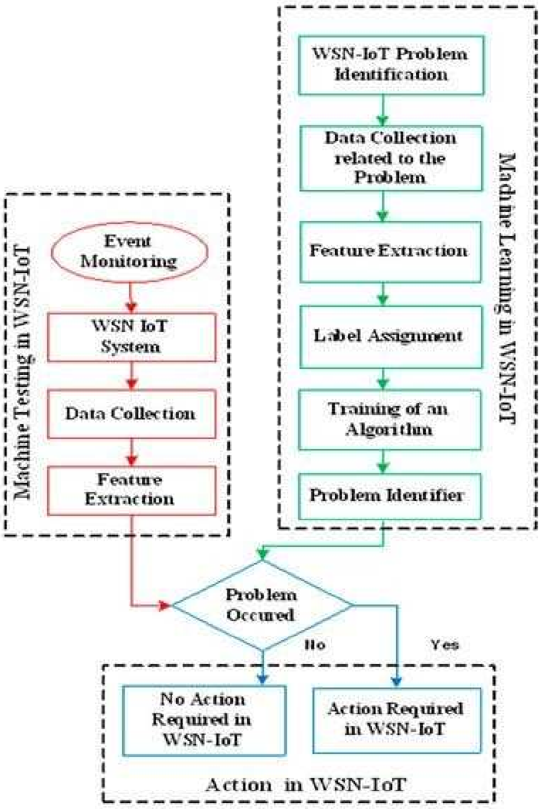

Fig. 2. Deep learning processing in WSN network

TABLE I. VARIOUS REPRESENTATION OF DEEP LEARNING REQUIREMENTS ALONG WITH WSN

Step No.	Description
Step 1:	The sensor network is majorly used for monitoring dynamic locations and moving object based on time – Time Series Analysis
Step 2:	Use location based measuring system for monitoring agricultural lands such us humidity, water level, erosion, etc– Pattern Classification
Step 3:	Select the unreachable areas such as exploitation, volcano, eruption, sewage treatment – Convolutional Neural network
Step 4:	Deploy complicated network route configuration and complicated designed environments – Feature extraction
Step 5:	Multiobject detection system such as surveillance monitoring, security enabler, alarm systems, designers domain, drone assisted system – DeepQ Residue analysis

III. PROPOSED METHODS – DECISION MAKING NETWORKS

Decision tree is an approach for measuring accuracy and prediction. It is systematic approach to select the contents from WSN environments. In this work to select or sensed the dataset from surveillance system, agricultural dataset, biometric inputs and IoT automation dataset. Here each nodes contains route set classifier values and each branches designed based on attributes representations. It is classification process which is obtained from using below Fig. 3.

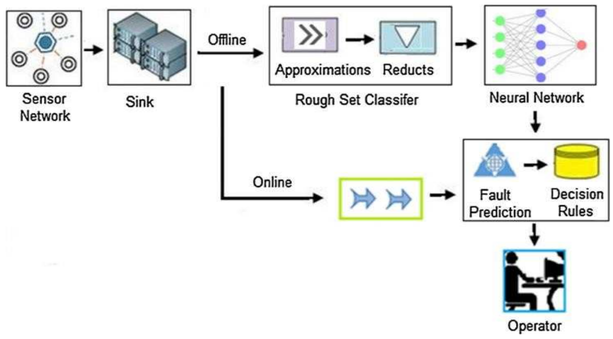

Fig. 3. Classification of dataset using decision tree

The computation procedure as follows, the classification is done as N is target and M is the task where $(M, N) < -\{M.n1, n2 \dots nk\}$ where k is the iteration index which is taken from wireless sensor network lifetime. Also it is avoided or removed redundant information such as reliability index, losing rate, corruption index, restoration factor and failures.

A. LSTM Approach – Long and Short term Memory Optimization

LSTM is the approach as the combination of CNN and RNN model. K-Means classifier is applied to calculate decision rule Eq.1 accuracy shown in Fig 4. Here two factors are recorded vanish is point to set back propagation result Eq.2 or gradient index Eq.3 and explode is the finite value of each precision index Eq.4 . Both factors are recorded and measure the accuracy by using Eq.5 and Eq.6.

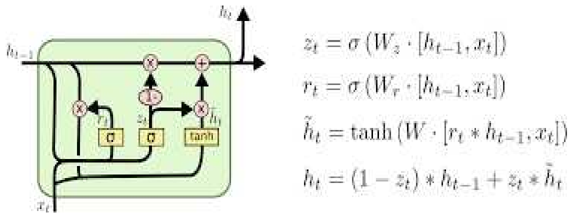

Fig. 4. LSTM Process based on features

From the above LSTM process is selected the feature based on $\{M, N\}$ features,

Activation Index

$$Select_{(it)} = \sigma(M_{xixt} + N_{hiht} - 1 + Ai) \quad (1)$$

Support Count

$$Select_{(ft)} = \sigma\left(M_{xfxt} + N_{hfht} - 1 + Bf\right) \quad (2)$$

Confidence Factor

$$Select(ot) = \sigma\left(M_{xoxt} + N_{hoht} - 1 + AB_{if}\right) Confidence\ factor \quad (3)$$

Tranform Index – Accuracy Prediction

$$Accuracy_{(int)} = tanh(M_{xcxt} + N_{hcht} - 1 + AB_{in}) \quad (4)$$

Feature Selection

$$Feature_{(ct)} = X_{(ft \cdot ct-1)} + M(it).Accuracy_{(int)}\ Precision\ Index \quad (5)$$

Output of Score function with respect to LSTM

$$Score_{(ht)} = F(ot) \cdot \tanh(ct) \quad (6)$$

B. *Algorithm – Deep Belief Network Preparation*

It can be used as deep belief network optimization for predicting the values using data aggregation, clustering, reinforcement learning, routing, framework selection and assessments represented in Fig 5. Tab. 2 below shows preparation of deep belief network and protocol optimization.

TABLE II. DEEP BELIEF NETWORK PREPARATION AND PROTOCOL OPTIMIZATION

Data Aggregation	**Reinforcement in Localization**
1. Cluster the network and aggregate the neural dataset 2. Apply the learning index measure to find the quantized vector results 3. Prepare self-structured map to find the compression index 4. Apply K-Means classifier to process the dataset and cluster the values	1. Generate decision tree for each location maps 2. Select the placement of each sensor and aggregate the neural process 3. Regress the index factor based on classified results
Routing	**Framework selection**
1. Select the query optimized values to predict each path using route table 2. Identify each query based on request and apply principal component analysis factor to measure the accuracy 3. Each event discovery value is recorded for managing components	1. Selecting MAC layers, adaptive routing and statistical results 2. Apply MAC process for measuring KNN classifier 3. Apply neural operation to find each stages of MAC duty cycle 4. Select the deviation index to measure the evaluation index

IV. EXPERIMENTAL SETUP – RESULTS AND MEASUREMENTS

The proposed deep learning techniques to measure the wireless sensor network sensed dataset and it is used TensorFlow simulator for preparing and measuring the performance factors. The below Tab. 3 is shows that input vector for simulating the environment.

TABLE III. ROUTING INFORMATION AND LAYER OPTIMIZATION INPUTS

Connected Layer	512 X 512 X 3 layer
Hidden Nodes	Coverage Limitations
Network Topology	Deep Belief Network Optimizer
Dataset	Surveillance system, Agricultural dataset, Biometric inputs and IoT Automation dataset
Simulator	TensorFlow
Nodes	100,200,500,1000
Hop count	5,10,15,20
Protocol	LSTM, CNN, RNN and KNN Classifier
Data rate	32 Gpbs to 128 Gbps
Wireless Module	Wi-Fi
Duration	10-50ms
Cluster	10, 50 groups

From the above table inputs are applied to TensorFlow for processing the dataset. So the deep belief network is generated and measured the performance index of various dataset. It is applied LSTM, CNN, RNN and KNN classifier to measure the accuracy based on routing table algorithm. The Tab. 4 shows that various measure results of this research work.

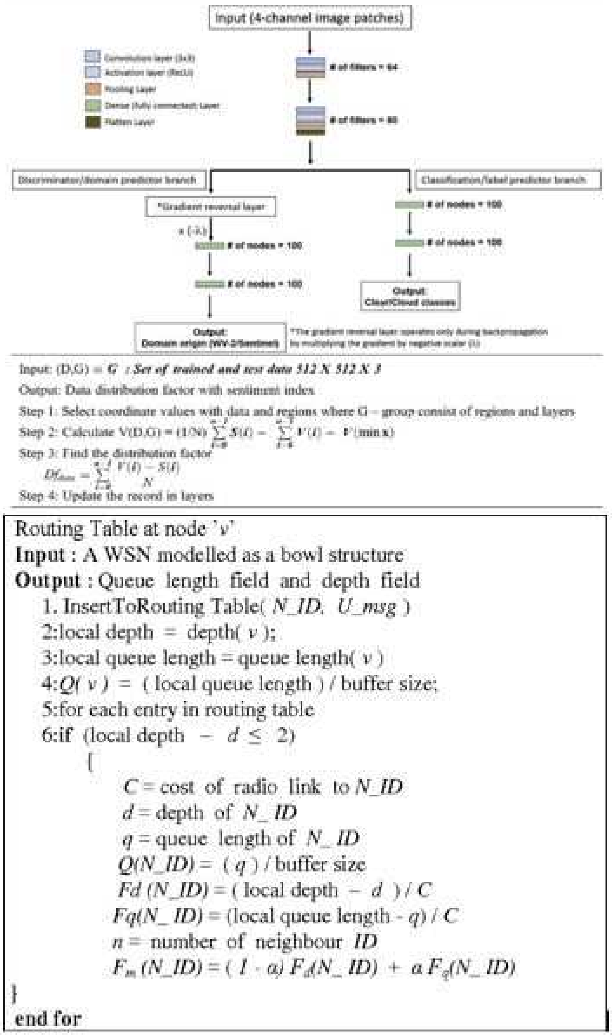

Fig. 5. Algorithm of data selection and classification with respect Tab. 2 inputs

TABLE IV. RESULTS OF VARIOUS DATASET OPTIMIZATION AND PERFORMANCE MEASUREMENT

Dataset	**Node**	**Classifier**	**Accuracy**	**Precision**	**Score**
Surveillance system	100	LSTM,	97,97,98,95	93,94,93,95	14,17,18,19
	200	CNN,	96,95,96,94	93,94,95,94	18,17,18,16
	500	RNN,	95,95,94,96	94,95,96,94	12,15,18,19
	1000	KNN	95,95,94,95	94,95,94,94	14,16,18,19
Agricultural dataset	100	LSTM,	95,95,94,95	94,95,94,94	14,16,18,19
	200	CNN,	93,94,95,94	97,97,98,95	18,17,18,16
	500	RNN,	94,95,96,94	96,95,96,94	12,15,18,19
	1000	KNN	94,95,94,94	95,95,94,96	12,15,18,19
Biometric inputs	100	LSTM,	95,95,94,95	94,95,94,94	14,16,18,19
	200	CNN,	93,94,93,95	94,95,94,94	12,15,18,19
	500	RNN,	95,95,94,96	94,95,96,94	12,15,18,19
	1000	KNN	93,94,93,95	93,94,93,95	18,17,18,16
IoT Automation dataset	100	LSTM,	95,95,94,95	93,94,95,94	12,15,18,19
	200	CNN,	95,95,94,95	94,95,94,94	14,16,18,19
	500	RNN,	95,95,94,95	95,95,94,95	12,15,18,19
	1000	KNN	95,95,94,96	94,95,96,94	12,15,18,19

Based on above table is measured the accuracy index and performance index of various WSN dataset using deep learning classifier. In this paper we achieved average accuracy index is 96%. From this stage the accuracy result is compared with exiting method such as support vector machine (SVM), computer vision (CV), deepq learn (DQL). The below Tab. 5 shows that the comparison results.

TABLE V. COMPARISON OF PROPOSED METHOD WITH EXISTING METHODS

Methods	Surveillance system	Agricultural dataset	Biometric inputs	IoT Automation dataset
	Accuracy in %			
SVM	78	75	78	75
CV	78	78	76	78
DQL	81	82	83	84
Proposed	95	94	94	95

The above table is comparison result of proposed with existing methods. Here we tested the accuracy with the node 200. Compare with the proposed system provided better accuracy results.

V. CONCLUSION

This paper provides comparative study of various deep learning classifiers with measure the accuracy of WSN dataset using TensorFlow. The selected the dataset on sensed information repository such as automation, surveillance, biometric and agriculture. Here applied machine learning techniques for classification and clustering dataset. Then the selected the dataset for optimization process by using proposed deep belief network. The simulated the environment and achieved accuracy index as 96%. In future it can be selected a particular dataset for optimization.

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