Secure Data Hiding Technique using Spiking Neural Network

Sajal Tamrakar[1], Vilas Alagdeve[2]

[1] P.G. Student, Department of Electronics Engineering, YCCE, Nagpur, India
[2] Asst. Professor, Department of Electronics Engineering, YCCE, Nagpur, India

ABSTRACT

This review paper focuses on implementation and development of hiding mechanism which is based totally at the property of encrypted domain facts hiding with SVM (support vector machine) for class on the receiver aspect. This property makes susceptible to assaults due to the reality that SVM can classify best among distinctive classes. Accordingly, the attacker can get a danger of identifying the statistics. This drawback may be eliminated with the assist of at ease n-class classifier with top category performance. On this paper, we are using spiking neural network (SNN) classifier for forming this venture with a view to ensure that the hidden information is stored securely and has a high level of receiver facet class performance.

Keyword:- *Spiking Neural Network (SNN), PSNR, MMSE, MATLAB 2013 a*

1. INTRODUCTION

Spiking neural network is any other special class of synthetic neural network wherein the neural version can talk spikes through spikes. SNN is able to manner a big amount of facts the use of the small quantity of spikes. SNN is functionally similar to biological neuron, which uses a quick and unexpected growth in voltage to ship data named an action potential or spikes and biological neuron speak by using producing and propagating electric pulses. Whereas spiking neural network offers powerful tools for studying various procedures in mind or neural facts processing plasticity and learning. it additionally affords technique to the large variety of problems inclusive of speech recognition, sequence recognition, spatial navigation, fast signal processing and in a numerous security systems.

Spiking neuron models are computationally extra powerful then perceptions and sigmoidal gain. Due to all this cause, SNN is the concern of constantly growing interest of researchers. The primary assumption has been made that implementation of maximum of this spiking model is in the timing of spikes as opposed to the particular shape of spikes which convey neural records. aid vector gadget is two class classifier.

2. LITERATURE REVIEW

In paper [1], proposes a completely unique reversible image information hiding theme over associate degree encrypted domain. information embedding is achieved through a public key modulation mechanism, in which access to the key secret writing secret's not required. At the decoder facet, a strong two-class SVM classifier is intended to distinguish encrypted and non-encrypted image patches, allowing us to conjointly decrypt the embedded message and also the original image signal. Compared with the progressive ways, the proposed approach provides higher embedding capability and is able to utterly reconstruct the first image still because of the embedded message. in-depth experimental results area unit provided to validate the superior performance of our theme.

In paper [2], proposes a biologically plausible network architecture with spiking neurons for sequence recognition. This architecture may be a unified and consistent system with functional elements of sensory secret writing, learning, and coding. This is the primary systematic model making an attempt to reveal the neural mechanisms considering each the upstream and therefore the downstream neurons along. the full system may be a consistent temporal framework, wherever the precise temporal arrangement of spikes is used for information processing and psychological feature computing. Experimental results show that the system is competent to perform the sequence

recognition, being sturdy to uproarious sensory inputs and invariant to changes within the intervals between input stimuli within a particular vary. The classification ability of the temporal learning rule utilized in the system is investigated through 2 benchmark tasks that outstrip the opposite 2 wide used learning rules for classification. The results conjointly demonstrate the procedure power of spiking neurons over perceptrons for process spatiotemporal patterns. In summary, the system provides a general method with spiking neurons to cypher external stimuli into spatiotemporal spikes, to be told the encoded spike patterns with temporal learning rules, and to decrypt the sequence order with downstream neurons. The system structure would be beneficial for developments in each hardware and software package.

In paper [3], reports the results of experiments to develop a bottom neural network for pattern classification. The network uses biologically plausible neural and learning mechanisms and is applied to a set of the MNIST dataset of written digits. The analysis goal is to assess the classification power of an awfully easy biologically intended mechanism. The spec is primarily a feedforward spiking neural network (SNN) composed of Izhikevich regular spiking (RS) neurons and conductance-based synapses. The weights are trained with the spike timing-dependent malleability (STDP) learning rule. The projected SNN design contains 3 somatic cell layers that ar connected by each static and adjective synapses. Visual input signals ar processed by the primary layer to come up with input spike trains. The second and third layers contribute to spike train segmentation and STDP learning, severally. The network is evaluated by classification accuracy on the written digit pictures from the MNIST dataset. The simulation results show that though the projected SNN is trained quickly while not error-feedbacks during a few range of iterations, it ends up in fascinating performance (97.6%) within the binary classification (0 and 1). additionally, the projected SNN offers acceptable recognition accuracy in 10-digit (0-9) classification as compared with applied mathematics strategies like support vector machine (SVM) and multi-perceptron neural network.

In paper [4], develops a bio-inspired SNN that uses unsupervised learning to extract discriminative options from speech signals, which may later on be employed in a classifier. The design consists of a spiking convolutional/pooling layer followed by a completely connected spiking layer for feature discovery. The convolutional layer of leaky, integrate-and-fire (LIF) neurons represents primary acoustic options. The totally connected layer is equipped with a probabilistic spike-timing-dependent physical property learning rule. This layer represents the discriminative options through probabilistic, LIF neurons. To assess the discriminative power of the learned options, they're employed in a hidden Markov model (HMM) for spoken digit recognition. The experimental results show performance on top of that compares favourably with common applied mathematics feature extraction ways. There results offer a completely unique demonstration of unsupervised feature acquisition in associate SNN.

In paper [5], supported two-dimensional difference histogram modification, a unique reversible information concealment (RDH) scheme is projected by exploitation difference-pair-mapping (DPM). First, by considering every pixel-pair and its context, a sequence consisting of pairs of distinction values is computed. Then, a two-dimensional difference-histogram is generated by investigating the frequency of the ensuing difference-pairs. Finally, reversible data embedding is enforced in keeping with a specifically designed DPM. Here, the DPM is Associate in Nursing injective mapping outlined on difference-pairs. it's a natural extension of growth embedding and shifting techniques employed in current histogram-based RDH methods. By the projected approach, compared with the traditional one-dimensional difference-histogram and one-dimensional prediction-error-histogram-based RDH ways, the image redundancy can be higher exploited Associate in Nursing an improved embedding performance is achieved. Moreover, a pixel-pair-selection strategy is also adopted to priory use the pixel-pairs settled in swish image regions to plant information. this will additional enhance the embedding performance. Experimental results demonstrate that the proposed theme outperforms some progressive RDH works.

3.PROPOSED DIAGRAM

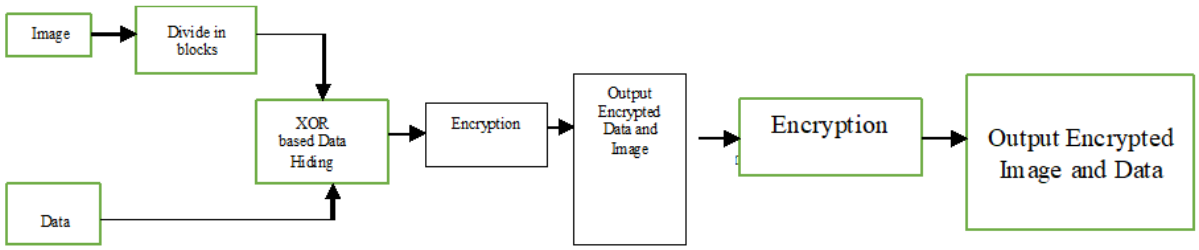

Chart -1: Proposed block diagram of transmitter

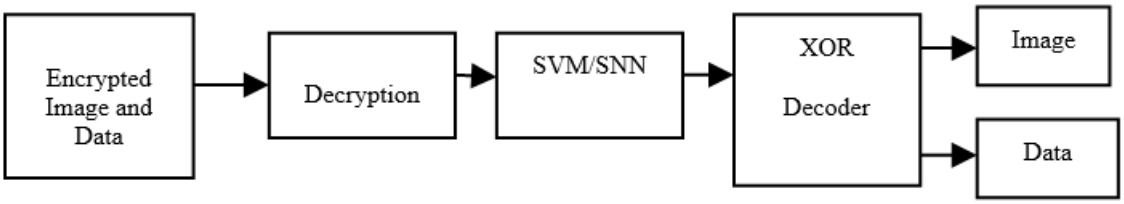

Chart -2: Proposed block diagram of receiver

4. PROPOSED OUTPUT USING MATLAB

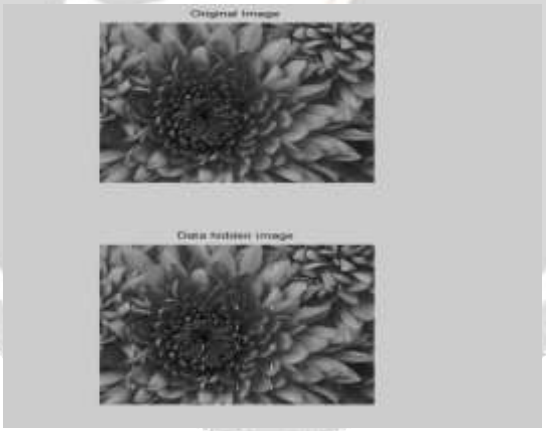

Chart 3: Data hidden image

The above figure shows data hidden image, where we have taken both inputs as an image.

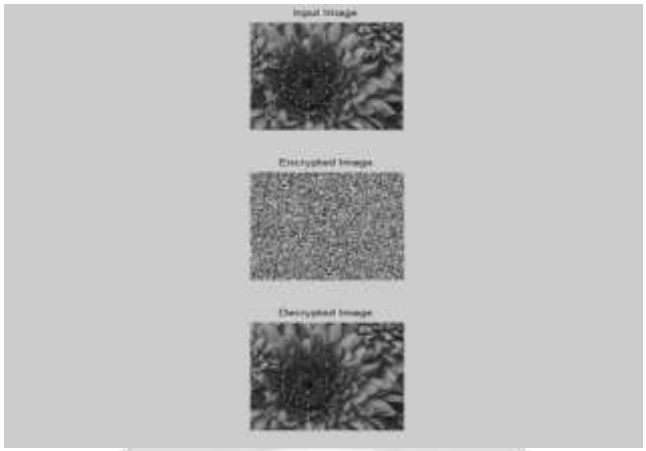

Chart 4: encrypted image and decrypted image using SVM classifier

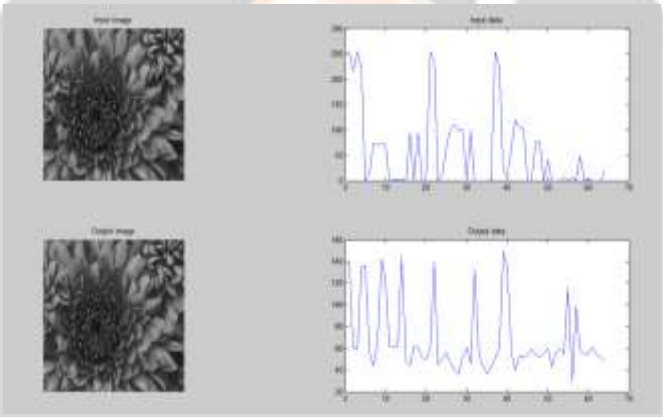

Chart 5: Output image and data of SVM classifier

The above three figures shows the output using SVM classifier where the Second image is kept hidden below the main image

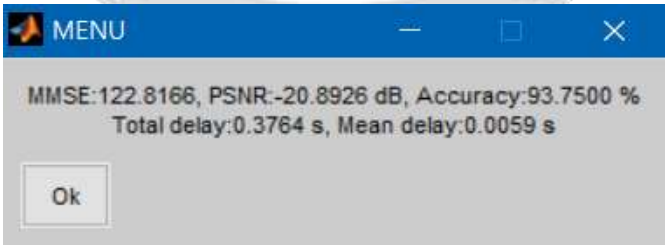

Chart 6 : Parameter estimation using SVM classsifier

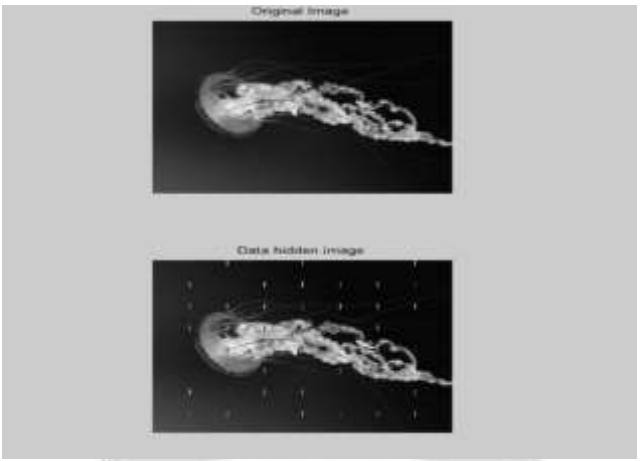

Chart 7: Data hidden image using SNN classifier

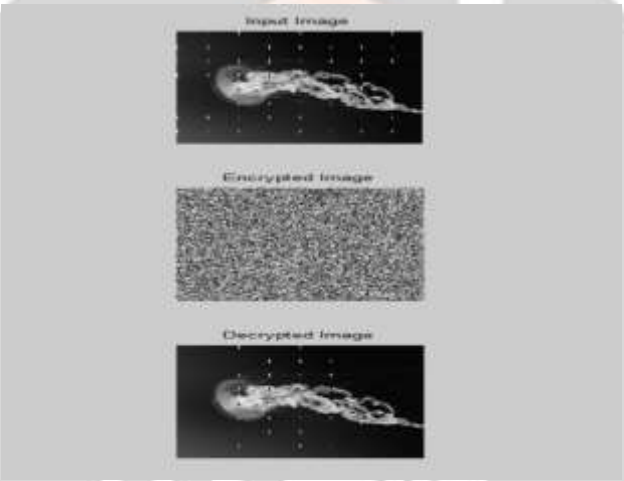

Chart 8: Encypted and decrypted image

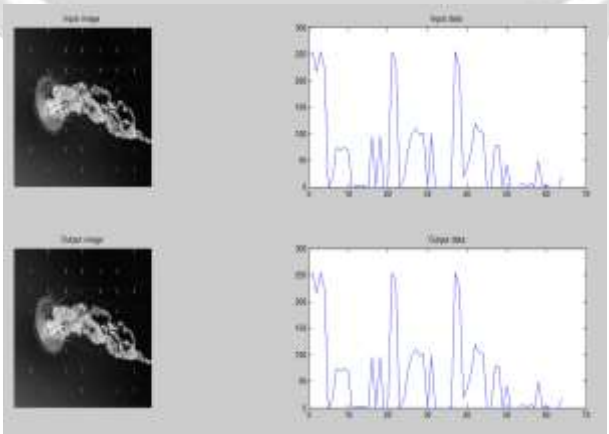

Chart 9: Output image and data using SNN

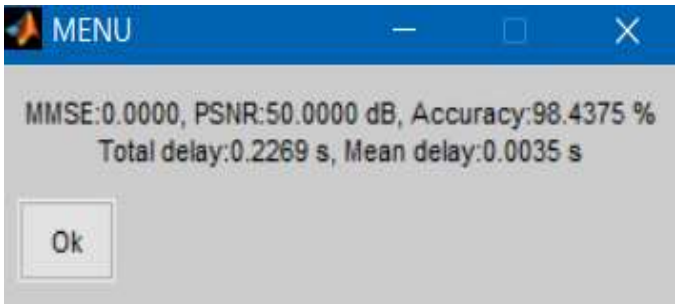

Chart 10: Parameter estimation using SNN classifier

5. CONCLUSIONS

SNN, being a multiclass classifier being capable of decode a nosy block extra effectively and predict the perfect fee of the noisy block. SVM being a two class classifier is most effective in a position to differentiate between top range and lower range of the block. Thereby generating a whole lot better blunders price as evaluate to SNN. it's miles discovered that SNN performs better as examine to SVM in phrases of PSNR and accuracy. However due to the fact SNN works at the complete range of the information so it has better put off than SVM. In future we will work on reduction of delay of SNN classifier in order that it may be used for quicker real time programs.

6. REFERENCES

[1] Jiantao Zhou, Member, IEEE, Weiwei Sun, Student Member, IEEE, Li Dong, Student Member, IEEE, Xianming Liu, Member, IEEE, Oscar C. Au, Fellow, IEEE, and Yuan Yan Tang, Fellow, IEEE, "Secure Reversible Image Data Hiding Over Encrypted Domain via Key Modulation", IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 26, NO. 3, MARCH 2016.

[2] Sajal Tamrakar, Vilas Alagdeve, "A secure data hiding technique using spiking neural network over encrypted domain", IJET(UAE), March-2018, ISBN 978-81-923607-3-7, unpublished.

[3] Qiang Yu, Student Member, IEEE, Rui Yan, Member, IEEE, Huajin Tang, Member, IEEE, Kay Chen Tan, Fellow, IEEE, and Haizhou Li, Fellow, IEEE, "A Spiking Neural Network System for Robust Sequence Recognition", IEEE TRANSACTIONS ON NEURAL NETWORKS AND LEARNING SYSTEMS, VOL. 27, NO. 3, MARCH 2016.

[4] Amirhossein Tavanaei, Anthony S. Maida, "A Minimal Spiking Neural Network to Rapidly Train and Classify Handwritten Digits in Binary and 10-Digit Tasks", (IJARAI) International Journal of Advanced Research in Artificial Intelligence, Vol. 4, No.7, 2015.

[5] Amirhossein Tavanaei, Anthony S. Maida, "A Minimal Spiking Neural Network to Rapidly Train and Classify Handwritten Digits in Binary and 10-Digit Tasks", (IJARAI) International Journal of Advanced Research in Artificial Intelligence, Vol. 4, No.7, 2015.

[6] Amirhossein Tavanaei and Anthony Maida, "Bio-Inspired Multi-Layer Spiking Neural Network Extracts Discriminative Features from Speech Signals", arXiv:1706.03170v1 [cs.NE] 10 Jun 2017.

[7] Xiaolong Li, Weiming Zhang, Xinlu Gui, and Bin Yang, "A Novel Reversible Data Hiding Scheme Based on Two-Dimensional Difference-Histogram Modification", IEEE TRANSACTIONS ON INFORMATION FORENSICS AND SECURITY, VOL. 8, NO. 7, JULY 2013.

[8] Wei-Liang Tai, Chia-Ming Yeh, and Chin-Chen Chang, "Reversible Data Hiding Based on Histogram Modification of Pixel Differences IEEE TRANSACTIONS ON CIRCUITS AND SYSTEMS FOR VIDEO TECHNOLOGY, VOL. 19, NO. 6, JUNE 2009.