Artificial Intelligence for Sustainable Health Care Advancements

Chapter · September 2021

DOI: 10.1201/9781003153405-2

1 author:

Ayesha Banu Mohd
Vaagdevi College of Engineering
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Ayesha Banu

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DOI: 10.1201/9781003153405-2

2.1 INTRODUCTION

The possibility of machines to actually think and simulate human behavior was first introduced by Alan Turing who differentiated humans from machines by developing the Turing test. Later, John McCarthy coined the term artificial intelligence (AI). The main focus of AI is to mimic human cognitive functions. [Yoav Mintz, Ronit Brodie: 2019]. AI has no particular definition that is universally agreed. This term mostly refers to the multiple technologies of computing such as learning, reasoning, adaptation, interaction and sensory understanding that bear a resemblance to human intelligence [https://epsrc.ukri.org/research/ourportfolio/researchareas/ait/]. AI is sometimes used as the umbrella for machine learning (ML), deep learning (DL) and robotics, which gives a system the power to learn and harness the experience and performs some specific tasks faster, better and more efficiently than humans. ML is also called the superset of DL and also subset of AI as shown in Figure 2.1.

In ML, the system learns iteratively based on its past experiences whereas DL is the inspiration of human neural network where the system is given huge amounts of data until it learns by example. This is a more complex form of AI. Robotics is a machine performing any task beyond human capability with more accuracy and precision [Ross 2019]. AI is one of the most interesting and upcoming research areas of this decade, which has totally revolutionized the way humans live and work today. AI is capable of learning from its own mistakes and performing suitable improvements and becomes more useful with use. Currently, there are many applications of AI that are assisting specialists to increase their efficiency [Kumar 2020]. These applications are more general in education, banking, business, social media and day-to-day life whereas they are more specific in the area of health and medicine. Recent research in AI and the application of AI algorithms is gaining increased interest and showing a positive impact on education. The advances in AI systems like ICAI (intelligent computer-assisted instruction) open new possibilities for teaching and learning in the field of education [Chen, Chen and Lin 2020]. In today's world of e-commerce, business management is in an epoch of data, AI applications continuously help in improving efficiency in decision-making and overall business operations. AI aims at elevating the reality of extensive data, promoting business intelligence using complicated algorithms and creating insight on market trends and consumer behavior, which gives businesses a real competitive edge [Al-Zahrani and Marghalani 2018].

AI is now spreading its wings across health care to an extent where AI doctors may possibly assist human physicians for improvisation in the future. The real

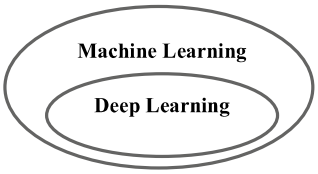

FIGURE 2.1 Artificial intelligence—machine learning—deep learning.

ISBN: 978-81-937760-4-9

SURVEY ON DATA PERTURBATION METHODS AND ITS IMPORTANCE

Thanveer Jahan
Department of Computer Science and Engineering, Vaagdevi College of Engineering, India

Abstract

The challenges of data security lead to protection of data, making a wide scope for privacy issues. A large voluminous data is published for analysis using data mining techniques. This leads to unauthorized access on sensitive or confidential data. The data consists of confidential information is distorted or perturbed using different perturbation methods. In this chapter, different data perturbation methods are used on different datasets. The data perturbation methods are based additive noise such as, Matrix decomposition method, Fuzzy logic and Hybrid methods. The above methods are compared on different datasets along with metrics. The results also show the comparison of accuracy on original and perturbed or distorted data. Different data mining techniques such as classification and clustering are used on the original and perturbed data.

Keywords:

Privacy, Fuzzy Logic, Matrix Decomposition, Data mining

1. INTRODUCTION

Today's applications rely on large volumes of personal data being collected regularly. A number of data mining techniques are used to analyze them. During this process many unauthorized users will try to access private data. This private data needs protection with the help of privacy preserving data mining techniques (PPDM).

This process many unauthorized users will try to access private data. This private data needs protection with the help of privacy preserving data mining techniques (PPDM). The PPDM techniques are used to mask or hide the private information and preserves individual's personal data [6]. In the field of research, PPDM plays an important role during data publishing.

The data publishing is dependent on the environments. In privacy preserving data mining the data is published either in centralized or distributed environment. In Distributed environment [15], data is located or distributed on various different sites. Secure multiparty computations are used in distributed environment. In this environment privacy preserving techniques protects the individual's data by integrating data from multiple sites. In centralized environment an authorized user own data and has central authority to protect private data. The PPDM algorithms can be classified as Reconstruction methods, Heuristics methods and Cryptographic methods (secure multi-party computations).Among them heuristics methods cannot be used for reconstructing the data. Therefore it fails in preserving the privacy. The cryptographic methods concentrate on the distributed environments and thereby are leading to securitize the multi-party computations. The reconstruction methods are used to reconstruct the original from the transformed one. It preserves privacy in a better way. The methods in reconstruction comprise of Data perturbation methods, Aggregation, Swapping and Randomization.

Data perturbation is one of the popular method in privacy preserving data mining. The data perturbation methods should include constraints such as privacy protection metric, the accuracy of mining results computation, applicability etc. The challenging issues in data perturbation are balance of privacy protection and data quality.

2. RELATED WORK

Various data perturbation methods are seen in the literature. They can be classified into two approaches. The first approach is based on probability distribution. This approach replaces the data with another sample distribution or by the distribution itself. The value distortion approach is the second approach for data perturbation. In this approach the data values are perturbed directly by adding either additive noise or multiplicative noise.

Among the above two approaches the large volumes of data can be easily perturbed in the value distortion approach. The value distortion approaches are matrix decomposition methods condensation and others. The matrix decomposition method [7, 9] was proposed to satisfy the distortion data using singular value decomposition (SVD). It works well in preserving privacy as well as maintaining utility of datasets [9]. The data distortion and SVD computation are considered as data preprocessing and preparation procedure for reasonable amount of computational cost in this phase may be tolerable, due to the limited number of attributes that were utilized in this method. To reduce the computational costs of sparsified SVD (SSVD) method, substantially when the datasets are large an alternative is explored. For this purpose a CLUST-SVD [3] was proposed. It distorts only confidential numerical attributes to meet privacy requirements, while preserving general features for k-means clustering analysis. This technique desires complete accuracy for clustering analysis and complete privacy to perform well. Further, to enhance performance of SSVD using filter based feature selection was used for data distortion reduced feature space [1]. This proposal was considered by modifying an experiment threshold strategy (ETS) for a matrix sparsification called METS. The result concluded that feature selection should be performed before distortion of data and compromised the accuracy.

The above matrix decomposition methods suffer from loss of information due to data distortion. To avoid loss of information in the original data and to distort only confidential information present in the dataset, fuzzy logic based perturbation [4, 2, 5, 18] were explored. The confidential numerical attributes in original dataset are identified and transformed into fuzzy data using S-based fuzzy membership function [5].The clustering algorithm (K-means) is used to test accuracy on original and fuzzy data. The resultant clusters maintain privacy and at same time relatively preserve the original values. The approach was improved by decreasing the number of passes to perform clustering.

The drawback of the above method is high processing time which can be reduced by applying different fuzzy membership functions. In a way to extend the fuzzy logic based perturbation, different fuzzy membership functions (FMF) were used to distort data such as Z-FMF, T-FMF, and Gaussian-FMF [19]. Each confidential obtained from the above three FMF and the original data are analyzed using clustering algorithm. Among all those Z-FMF resulted with a low misclassification error rate. The results show higher data utility only in clustering analysis.

The fuzzy based transformations have minimized loss of information in the original data, but did not consider loss of privacy. The loss of privacy is the level of difficulty in estimating the original data from distorted data. To achieve a well balance in privacy loss and information loss, Random Rotation based perturbation [17] [19] [20] were used for privacy preserving data classification. Random rotation based perturbations are task – specific and aims to have better balance in loss of information and loss of privacy.

A Random rotation perturbation [10, 20] framework was adopted in privacy preserving data classification. The approach has two unique characteristics. The first characteristic is to perturb the original data with geometric rotation and identify rotation invariant classifiers. The second characteristic is to build privacy model by evaluating the privacy quality of perturbation method. The privacy model generated is used to analyze the attacks such as Naive Bayes and ICA-based reconstruction attacks. The advantage of random rotation is that it perturbs multiple columns of a dataset in one transformation there by preserving length and Euclidean distance between any pair of points. It provides higher privacy guarantee with good optimized rotations. To strengthen the above perturbation method with higher privacy guarantee and to achieve better results, a hybrid method [19] was proposed. It is a combination of fuzzy based transformation and random rotation perturbation method. In this approach a confidential value from original dataset is distorted by using fuzzy membership function.

The fuzzy data is given as input to the random rotation perturbation method. Random rotation preserves the geometric properties of the fuzzy data and obtains the final distorted data. The final distorted data generated looks different from the original dataset. Hence, hybrid method provides better clustering quality. The results conclude that the hybrid method can be efficient for data utilization as well as preserves privacy.

3. PROPOSED WORK

In this chapter the following data perturbation methods are proposed made to solve the problem under investigation, as mentioned in the above. Different data perturbation methods, along with privacy metrics, mining utilities and attacks to preserve privacy.

- Data perturbation method using Matrix Decomposition Method.
- Data perturbation method using Fuzzy Logic.
- Data perturbation using Hybrid Transformation.

A Data Analysis system shown above at Fig.1 can be described as a system to analyze the data. An authorized user possesses original data. He is the central authority to transform data in the following steps: The original data is perturbed by our proposed data perturbation methods. Evaluate the efficiency of the perturbation methods using privacy metrics. Analyze the original and perturbed data with mining utilities and check the possibility of threats or attacks. Authorized user then publishes the well protected data to the Data Analyst while preserving privacy.

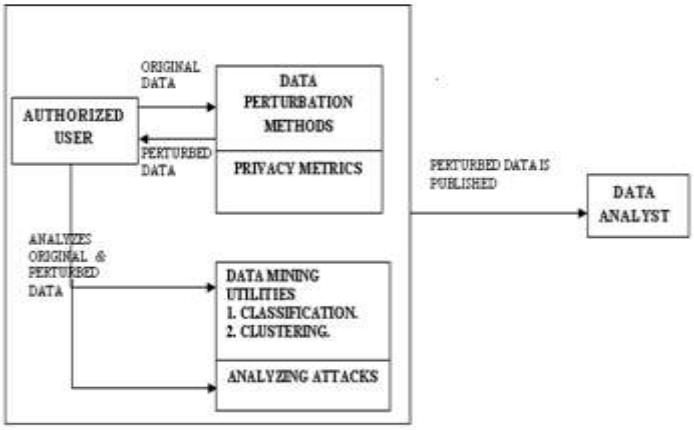

Fig.1. Data Analysis System

4. DATA PERTURBATION METHOD USING MATRIX DECOMPOSITION METHOD

The data perturbation using Matrix decomposition with Univariate datasets are considered in this sub section. For this purpose an algorithm is proposed.

Algorithm for Matrix Decomposition Method

Input: Original Dataset (*D*)

Begin

Step 1: Apply Singular Value Decomposition (SVD) on D to produce D_1.

Step 2: The D_1 is again perturbed using Singular Value Decomposition method to produce D_2.

Step 3: The data sets D, D_1, D_2 are analyzed using data mining techniques.

Step 4: The privacy metrics are also calculated on the perturbed datasets D_1, D_2.

End

The original data D, distorted data D_1 and D_2 are uploaded into Tanagra data mining tool for the purpose of analyzing the data. The original data D used in this experiment is Terrorist dataset. It comprises of 100 rows/tuples and 42 columns/attributes. The attributes of the dataset D are confidential information about the terrorists such as id, age, nationality, different sibling relationships, pilot training, location of temporary residence, wedding attendance, meeting attendance, time, date etc. one among these 42 attribute is considered as target attribute. This target attribute is used to group the tuples into either belonging to terrorist or do not belong to terrorist categories. The rest of the attributes are classified using Tanagra data mining tool with the help of facilities like Support Vector Machines (SVM), Iterative Dichotomizer 3(ID3) and successor of ID3 (C4.5) and clustering using k-means. Now few useful features are selected in datasets D, D_1 and D_2 and analyzed on the tool. This results an accurate

(correct predict rate) classification as well as clustering of datasets in separate experiments that were conducted respectively.

4.1.1 Privacy Metric:

Privacy measure [7] depend on the original matrix D and its distorted matrix D' and D".

- *Value Difference* (*VD*): The ratio of the Frobenius norm of the difference of D and |D"|.
- Position Difference: RP is used to denote average change of rank for all attributes.
- *RK* represents the percentage of elements that keep their rank of values in each column after the distortion.
- CP is used to define the change of rank of the average value of attributes.
- CK is used to measure the percentage of the attributes that keep their order of average value after distortion.

4.1.2 Results:

The experimentation described above considered an original dataset *D* as input and generated distorted datasets D_1, D_2 at output. An exhaustive experimentation is conducted using different classifiers such as ID3, C4.5 SVM and k-means with the help of Terrorist dataset. The results obtained in exhaustive experiments are noted.

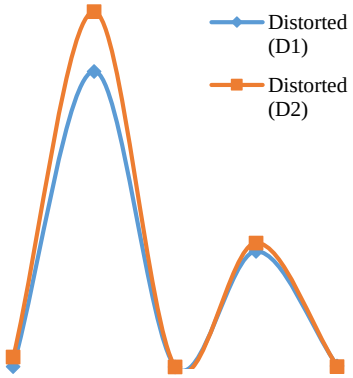

Fig.2. Privacy Metrics for Perturbed Datasets D_1, D_2

The Privacy metrics are also calculated for perturbed datasets D_1 and D_2. The metrics have proved that the matrix decomposition method is efficient. It is also observed that our results are consistent on any classifier as against results are consistent on any classifier as against results of other researchers were found on only SVM classifier. Moreover, their results were using WBC as well as SONAR datasets. There are no traces of k-means clustering employed in existing matrix decomposition methods.

4.2 DATA PERTURBATION METHOD USING FUZZY LOGIC

The matrix decomposition methods suffer from loss of information. The information lost cannot be reconstructed after perturbation. Therefore, a fuzzy logic is used to perturb the data without any information loss. For this purpose an algorithm is proposed.

Algorithm for Fuzzy Logic

Input: Original Dataset D

Begin

Step 1: Find the confidential data in the dataset *D*.

Step 2: Apply fuzzy membership function SMF on *D* to produce D_{smf}.

Step 3: Apply Fuzzy Membership Function TMF on D to produce D_{tmf}.

Step 4: The datasets *D*, D_{smf}, D_{zmf} and D_{tmf} are analyzed using data mining techniques.

End

The Experimentation was conducted using desktop computer system with windows XP Operating system, matlab (2012a) and Tangara data mining tool. A Real World Dataset, Terrorist is downloaded and used here. This dataset consists of 100 rows or tuples and 42 columns or attributes. First a dataset named Terrorist.txt is loaded into *X* data matrix with the help of load method. Next, the size ( ) method on *X* data matrix determines number of rows as 100 and number of columns as 42. From among these 42 columns a class attribute is manually excluded. The data matrix *X* is now named as data matrix $D_{p\times q}$. Further, the data matrix $D_{p\times q}$ is manually decomposed into two D_1 and D_2 data matrices. The confidential columns are using D(:,1:4) and extracted into D_1 data matrix.

The remaining non confidential columns are extracted using D(:,5:41) into D_2 data matrix. Then, the built in functions min(D_1), max (D_1) and avg(D_1) decomposes D_1 data matrix and obtains A, B and C as data matrices having one row and three columns. The *s*, *z*, *t*-based fuzzy membership functions are used on D_1, A, B and C data matrices. Initially smf(D_1,[A,B]) function transforms D_1 and obtains Ds resultant data matrix. Similarly the functions zmf(D_1,[A,B]), tmf(D_1,[A,B,C] produces D_z and D_t as resultant data matrices respectively. The resultant data matrix D_s or D_z or D_t is correspondingly concatenated with non-confidential D_2 data matrix using horzcat (D_2,D_s) and produces D_{smf}, similarly obtains D_{zmf} or D_{tmf} distorted or Fuzzy data matrix as output.

The original data matrix *D*, Distorted or Fuzzy data matrix D_{zmf} or D_{tmf} or D_{zmf} are appended with a class attribute or column that was excluded in the beginning of experimentation. Then, the data matrices are uploaded into Tanagra data mining tool for the purpose of analyzing the data. The original data D used in this experiment is Terrorist dataset, comprises of 100 rows/tuples and 42 columns/attributes. The confidential attributes of the dataset such as id, age, nationality, different sibling relationships, pilot training, location of temporary residence, wedding attendance, meeting attendance, time, date etc. etc. The target attribute is considered to group the tuples into either belong to terrorist or do not belong to terrorist categories. The rest of the attributes are classified using Tanagra data mining tool with the help of facilities like Support vector machines (SVM), Iterative Dichotomizer 3(ID3) and successor of ID3 (C4.5) and clustering using K-means. The results has correct predicate rate on classification and clustering of datasets in separate experiments that were conducted respectively.

The experimentation described above considered an original dataset D as input and generated distorted datasets D_{zmf}, D_{tmf} and, D_{zmf} at output. An exhaustive experimentation is conducted using

different classifiers such as ID3, C4.5, SVM and k-means clustering with the help of Terrorist dataset. The results obtained in exhaustive experiments are noted.

The complete sets of results in exhaustive experiments are included in the chapter. It is observed that our results are consistent on any classifier as against results of other researchers were found for k-means clustering only. Moreover, their results were using IRIS, WINE as well as CREDIT-G datasets. There are no traces of other classifiers employed in existing fuzzy methods.

4.3 DATA PERTURBATION USING HYBRID TRANSFORMATION.

The previous methods suffered either loss of information or didn't classify with efficiency on the perturbed data. Therefore, it is proposed to combine Fuzzy logic with decomposition methods to enhance the efficiency of perturbing data. For this purpose an algorithm is proposed using hybrid method. The pseudo code is listed as below:

Algorithm for Hybrid Transformation

Input: Original dataset *D*

Step 1: On Dataset *D* apply the fuzzy membership function *smf* to produce D_{smf}.

Step 2: The perturbed dataset D_{smf} is decomposed using Non-Negative Matrix Factorization to produce D3.

Step 3: The original dataset *D* and Perturbed dataset D_3 is analyzed using data mining techniques.

Step 4: Privacy Metrics are also calculated.

End

The Experimentation was conducted using desktop computer system with windows XP Operating system, MatLab (2012a) and Tangara data mining tool. A univariate Terrorist dataset is downloaded. This dataset consists of 100 rows or tuples and 42 columns or attributes. First a dataset is read into *T* data matrix with the help of load method. This method loads a text file named Terrorist.txt into *T* data matrix. The size( ) method on *T* data matrix returns the number of rows r and columns as *c*. From the data matrix *T*, one among 42 columns a class attribute or column is excluded. The resultant matrix is called data matrix $O_{r\times c\text{-}1}$. The data matrix $O_{r\times c}$ is decomposed as O_1 and O_2 data matrices. The data matrix O_1 extracts manually identified confidential first three columns from data matrix $O_{r\times c\text{-}1}$ using $O(:,1{:}4)$.

Similarly non confidential columns are extracted from data matrix $O_{r\times c\text{-}1}$ into O_2 using $O(:,5{:}41)$. The data matrix O_1 is further decomposed using min ( ) and max( ) functions as *X* and *Y* data matrices . The z-based fuzzy membership function is created on O_1, *X* and *Y* data matrices.

The function zmf(D_1, [A, B]) on O1 data matrix produces *Fs* data matrix. The data matrix is concatenated with non-confidential O_2 data matrix using the function horzcat (O_2, *Fs*) and obtains the Fuzzy data matrix *D*'. Compute the value *k*, using the function $k = \min(r,c)$. Then, the function $n_{nmf}(D', k)$ decomposes the data matrix *D*' along with *k* and obtains *W* and *H* data matrices. The resultant distorted data matrix *D*" is obtained by multiplying *W* and *H*.

The original data set *O*, Fuzzy data set *D*' and distorted data set *D*" is appended with class attribute or column that was excluded in the beginning of experimentation. Then, it is uploaded into Tanagra data mining tool for the purpose of analyzing the data.

The original data O used in this experiment is Terrorist dataset comprises of 100 rows/tuples and 42 columns/attributes. The attributes of the dataset are confidential about details of terrorists such as id, age, nationality, different sibling relationships, pilot training, location of temporary residence, wedding attendance, meeting attendance, time, date etc. etc. The target attribute is considered to group the tuples into either belong to Terrorist or do not belong to Terrorist categories.

The rest of the attributes classify using Tanagra data mining tool with the help of facilities classifiers like K-Nearest Neighborhood (KNN) and Successor of ID3 (C4.5) and clustering using K-means. The results has correct predicate rate on classification and clustering of datasets in separate experiments that were conducted respectively.

The degree of privacy is assured on the original data D and distorted data (D'). It is calculated using a Bias of Standard Deviation

The experimentation described above considered an original data set D as input and generated distorted dataset D" at output. An exhaustive experimentation is conducted using different classifiers such as KNN, C4.5 and k-means clustering with the help of Terrorist dataset.

The results obtained in exhaustive experiments are noted and sample results are furnished at Table III given below. The Table III presents the results obtained on our proposed hybrid data perturbation algorithm and results found in literature on existing hybrid methods. Column 1 presents the datasets accuracy of our proposed algorithm is presented at column 2. The results of existing algorithm are presented at column 3.

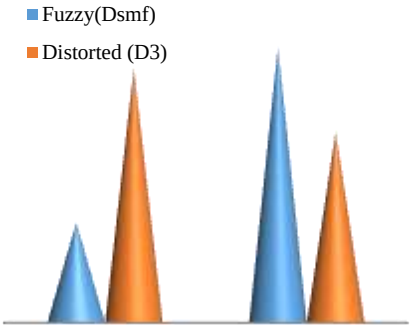

Fig.3. Degree of Privacy

The Fig.3 shows the degree of privacy. The hybrid method is calculated on the measurement of degree of privacy, it shows that the proposed hybrid represents the highest degree than the existing hybrid methods.

5. COMPARISONS

The complete sets of results in exhaustive experiments are included in the chapter. It is observed that our results are consistent on any classifier as against results of other researchers were found for k-means clustering only. Moreover, their results

were using IRIS as well as WINE datasets. There are no traces of other classifiers employed in existing hybrid methods.

6. CONCLUSION

The investigation considered to propose a data perturbation algorithm with a modification in existing matrix decomposition using a univariate dataset. Further, to avoid information loss in the original data a Fuzzy logic based data perturbation algorithm was proposed. In order to enhance the performance a Hybrid data perturbation algorithm were also proposed using the same univariate datasets. Finally to consolidate the accuracy of data perturbation algorithms when a multivariate datasets are being employed, a new multiplicative data perturbation algorithm was proposed.

All the above proposed algorithms were implemented successfully. Each of the above implementation was exhaustively experimented using different classifiers such as ID3, SVM, C4.5, KNN, and k-means etc. The results were compared with the existing methods. An analysis on the results obtained in exhaustive experiments and the existing ones reveal that the obtained one is most accurate while preserving privacy of the data. The chapter focusses only on additive data perturbation methods whereas multiplicative data perturbation [21], which perturbs only multiple columns of dataset.

REFERENCES

[1] Lin, P., Zhang, J., Omer, I. S., Wang, H., & Wang, J. (2011). A comparative study on data perturbation with feature selection. In Lecture Notes in Engineering and Computer Science: Proceedings of the International MultiConference of Engineers and Computer Scientist (pp. 454-459).

[2] Ahmed, S. M. T., Haque, S., & Tauhid, S. F. (2014). A fuzzy based approach for privacy preserving clustering. *Int. J. Sci. Eng. Res*, 5(2), 1067-1071.

[3] Maheswari, N., & Duraiswamy, K. (2008). CLUST-SVD: Privacy preserving clustering in singular value decomposition. *World Journal of Modelling and Simulation*, 4(4), 250-256.

[4] Goguen, J. A. (1967). L-fuzzy sets. *Journal of mathematical analysis and applications*, 18(1), 145-174.

[5] Kumari, V. V., Rao, S. S., Raju, K. V. S. V. N., Ramana, K. V., & Avadhani, B. V. S. (2008). Fuzzy based approach for privacy preserving publication of data. *International Journal of Computer Science and Network Security*, 8(1), 115-121.

[6] Agrawal, R., Evfimievski, A., & Srikant, R. (2003, June). Information sharing across private databases. *In Proceedings of the 2003 ACM SIGMOD international conference on Management of data* (pp. 86-97).

[7] Xu, S., Zhang, J., Han, D., & Wang, J. (2005, May). Data distortion for privacy protection in a terrorist analysis system. *In International conference on intelligence and security informatics* (pp. 459-464). Springer, Berlin, Heidelberg.

[8] Agrawal, R., & Srikant, R. (2000, May). Privacy-preserving data mining. *In Proceedings of the 2000 ACM SIGMOD international conference on Management of data* (pp. 439-450).

[9] Wang, J., Zhong, W., Zhang, J., & Xu, S. (2006, June). Selective Data Distortion via Structural Partition and SSVD for Privacy Preservation. *In IKE* (pp. 114-120).

[10] Chen, K., & Liu, L. (2005). A random rotation perturbation approach to privacy preserving data classification.", *In Proceedings of IEEE International Conference on Data Mining (ICDM)*, pp.589-592.

[11] Gilburd, B., Schuster, A., & Wolff, R. (2004, August). k-TTP: a new privacy model for large-scale distributed environments. *In Proceedings of the tenth ACM SIGKDD international conference on Knowledge discovery and data mining* (pp. 563-568).

[12] Gao, J., & Zhang, J. (2003, May). Sparsification strategies in latent semantic indexing. *In Proceedings of the 2003 Text Mining Workshop* (pp. 93-103).

[13] Pinkas, B. (2002). Cryptographic techniques for privacy-preserving data mining. *ACM Sigkdd Explorations Newsletter*, 4(2), 12-19.

[14] Agrawal, R., & Srikant, R. (2000, May). Privacy-preserving data mining. *In Proceedings of the 2000 ACM SIGMOD international conference on Management of data* (pp. 439-450).

[15] Evfimievski, A., Gehrke, J., & Srikant, R. (2003, June). Limiting privacy breaches in privacy preserving data mining. *In Proceedings of the twenty-second ACM SIGMOD-SIGACT-SIGART symposium on Principles of database systems* (pp. 211-222).

[16] Oliveira, S. R., & Zaiane, O. R. (2010). Privacy preserving clustering by data transformation. *Journal of Information and Data Management*, 1(1), 37-37.

[17] Sadun, L. A. (2007). *Applied linear algebra: The decoupling principle*. American Mathematical Soc.

[18] Lakshmi, M. N., & Rani, K. S. (2013). A Privacy Preserving Clustering Method Based On Fuzzy Approach And Random Rotation Perturbation.

[19] Naga Lakshmi, M., & Sandhya Rani, K. (2013). Privacy preserving clustering based on fuzzy data transformation methods. *Int. J. Adv. Res. Comput. Sci. Softw. Eng*, 3(8), 1027-1033.

[20] Chen, K., & Liu, L. (2011). Geometric data perturbation for privacy preserving outsourced data mining. *Knowledge and information systems*, 29(3), 657-695.

[21] Jahan, T., Narasimha, G., & Rao, V. G. (2016). A Multiplicative Data Perturbation Method to Prevent Attacks in Privacy Preserving Data Mining. *International Journal of Computer Science and Innovation*, 1(1), 45-51.

Withdrawal Notice

WITHDRAWN: Public key authentication schemes in asymmetric cryptography

P. Kumaraswamy [a], V. Janaki [b], K. Srinivas [c], D. Naveen kumar [c]

[a] *S R University, Warangal, India*
[b] *Vaagdevi College of Engineering, Warangal, india*
[c] *KITS, Warangal, India*

This article has been withdrawn as part of the withdrawal of the Proceedings of the International Conference on Emerging Trends in Materials Science, Technology and Engineering (ICMSTE2K21). Subsequent to acceptance of these Proceedings papers by the responsible Guest Editors, Dr S. Sakthivel, Dr S. Karthikeyan and Dr I. A. Palani, several serious concerns arose regarding the integrity and veracity of the conference organisation and peer-review process. After a thorough investigation, the peer-review process was confirmed to fall beneath the high standards expected by Materials Today: Proceedings.

The veracity of the conference also remains subject to serious doubt and therefore the entire Proceedings has been withdrawn in order to correct the scholarly record.

An Impact of COVID 19- A Well-Being Perspective for a New World

Dr. Thanveer Jahan
Associate Professor, Vaagdevi College of Engineering,
Warangal, Telangana, India

Abstract:

One of the data science issue is COVID-19, which had created a major hit massively is on public health. It resulted on a major health issues and thereby resulted to deaths. The structure of the society and community is affected to concentrate on important issues such as affordability of a healthcare, availability of medicines, rights for worker's and freedom to move. Some parts of the population in the world were exposed to the complications of anxious, depression and symptoms of post-traumatic as these are related to stress The situation had become crucial for a data scientist, as there were many questions started to rise and trust the data, curves that was plotted by social media websites. The situation made them to scare or think worst that could even happen in society. It made society more panic and empowered to handle this situation. This paper concentrates on a sur vey on the issues and problems on society, children, students, teenagers such as Physical fitness, psychological and social evaluation effects of pandemic. It also focuses on a new perspective on the usage of digital devices that effected mental health.

Keywords: Data science, Psychological, Covid 19, mental health.

Introduction

Traditional health surveillance systems are well known for major time lags. The current situation clearly indicates that the, systems are critically needed locally and are robust [1]. In this situation the collection of data is very difficult for such an infectious disease. In real time data analysis of such a high resolution data has become a diffi-

cult task for a data scientist. They work in domains such as public health and also learn from various domains. Corona virus is a disease which is contagious, where mild infection are treated in home quarantine or thereby rely on hospitals or a practitioner to estimate the spread that can mislead the early stages of disease progression. The people in the society are lesser, who have actually made their presence at health facilities to test or care. The report of it can lead to focus on morbidity and mortality. The fact is that many countries don't show actual count of people having virus. The increase in the number of test will increase the count. Countries like Iceland have done systematic sampling including the people having asymptomatic symptoms [2]. The prevalence of the infection is indicated along with the containment areas. Keeping apart the conspiracy theory of the government is that, the test for caronavirus is expensive. The count collected from a country is dependent on the widespread of the virus and the financial status of a local health care facility for testing. The problem for data sampling has become concern for a data scientist in many cases. The concern of pandemic had also affected the society wherein they are separated from their loved ones, less freedom as well as uncertainty of the spread of the disease. The concern in the general public is increased working in health care centre's as to understand spread of number of cases. The families in the society were panic in storing long shelf of food items. It became more fear for them to shop in super markets or public places. Lockdown was stressful period which made society living style have completely changed. The affect of covid 19 also affected children in the society with obesity problems [3]. The lockdown in many countries have also imposed children by stopping the physical activity. Children who stay in urban or in small houses or apartments were having limited space for any physical activities. These were a one of the wave of covid 19 that affected children very badly [4].
Data collection had become essential part in this situation, which it rely on accuracy and limitations.

Data Modeling and Prediction

The WHO gave on information from the country china where the symptoms of the virus may vary from first day to 14 days after the

exposure [5]. It is been issued from the centre of disease control and prevention that the highest alerts from Italy.
The countries that restricted for travel in the countries such as Iran, China and South Korea. The virus outbreaks are shown in the Figure 1 below. The impact of virus had made data scientist to model the data and predict its impact on the society. The Corona virus disease made conditions worst with an outbreak of sense of fear, stress, anxiety and mental disorders. The overwhelming of the disease has caused to develop more emotions among adults and children. Overcoming with stress led the society, people made stronger [6].

To protect the mental health of the people in the society, WHO updated these measures.

1. The sense of fear is created by the digital media, reading and watching news.
2. To protect their dear ones by seeking relevant information.
3. The trigger of fear and anxiety id from the sources such as social media.

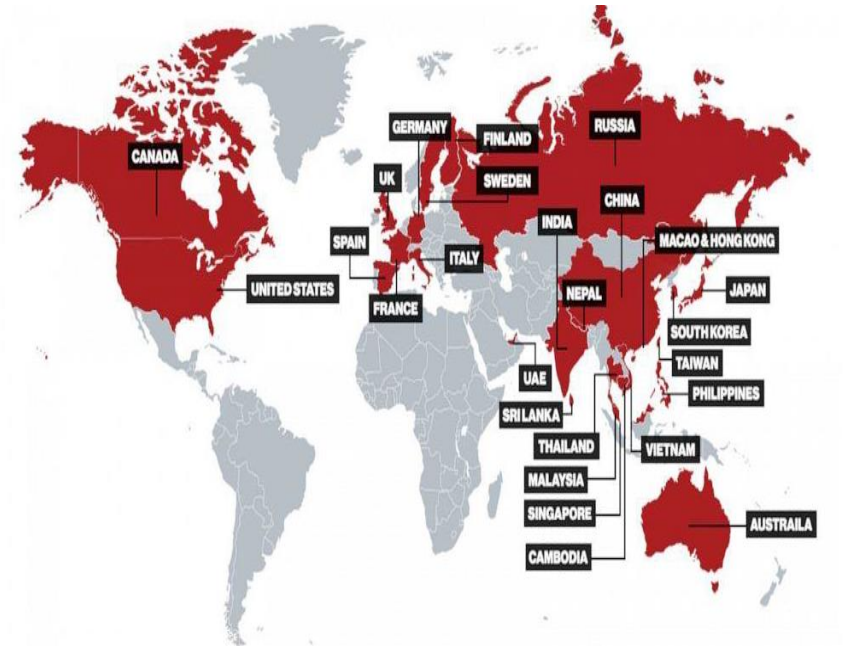

FIGURE 1: Covid 19 affected countries and Number of Cases in INDIA

Covid -19 Impact on Mental Health.

The most attractive online platforms for a young generation was used even before pandemic [8]. It has before a cup of coffee after pandemic. The schools were closed during pandemic. The communication among young children increased with this platform by playing online games and access social media platforms also. The virtual learning is been made compulsion on many school children. The physical activity was decreased as there prolonged sedentary periods, as they were using screens for long time. The screen time is been increased day by day while using these platforms[9,10]. The increased weights in the children have been increased day by day. This in turn had led to sedentary habits which have further increased in the risk for complications such as fear, anxiety, depression etc. It was then predicted by many data scientists that the prolonged closure of schools will proportional rise the obesity rate in children. The data scientists have also predicted and recorded that in Decem-

ber 2020, there will be an rapid increase on new obesity cases. The statistics are inferred by data scientists as shown below in the Figure 2.

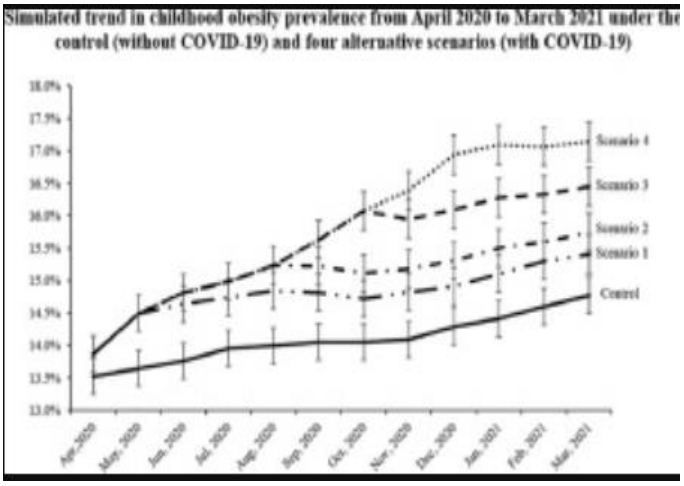

FIGURE 2: The Four Alternative Scenario Of Children Obesity During Covid 19.

Impact Of Covid19 On Unchangeable Environmental

The life style during covid 19 pandemic should have a family environment, which can change the behavior in child [11]. The foetal environment plays an important role in life course of children. As many women have a problem of obesity that is linked childhood, which can even lead to diabetes and cardiovascular diseases [23]. Pregnant women were also made to lower hospital visits as they are more vulnerable for the spread of covid 19[13,14]. The containment zones were avoided more by taking measures. The government made a mandate to stay at home. The routine checkups are cancelled temporarily. This had in turn led a pregnant woman to extra pressure and stress related issues. There was a remote antenatal care available in many remote areas [17, 18]. The stop of maternity checkups and unavailability of resources during pregnancy due to prioritize the disease have made data scientists to predict increase in the risk of death, maternal morbidity and mortality [15, 16].

An Impending Recommendation for Post covid 19

The Number of new challenges in the upcoming year 2021 are been faced many countries in the world. The year 2020 has ended up with a new scholastic year approach. The social economic conditions, emotional conditions such as stress had fallen down abruptly. The Child education is been hanged with a termination of physical learning. Children are re-introduced to schools and can facilitate the physical activity also [23]. This will not provide benefit to child behavioral health but also solves the problems related to childhood obesity. The threshold and safety measures indicators are crucial to avoid the spread of corona transmission within the school, colleges and educational institutions [7].

The wide spread of the curbing disease corona and to protect the health have become a highest priority till a good effective vaccine for covid 19 is made available. Various adhesive problems also exists in the society such as stress, mental and obesity issues[21,22]. The above problems are uncontrolled if there is a long-term extreme health and economic results [12]. There must be more support and manage system that can be dealt in the problems in obesity in children. The issues related to availability and choose of food on low budget can be handled wisely by educating parents. A necessary need of physical activity and maintaining physical distance is a need of every teenager, child and parents in the society. A very special attention should be given in the form of counseling to the pregnant ladies, who need lot of care [19,20]. They should be educated with the problems of obesity and the preventive measures taken to avoid obesity before the child is unborn. The issues should be considered as priority based by an every individual in the society, community during the pandemic.

The pandemic can be ended if there is a large share in the world that needs to get immune to the disease covid 19. Vaccines are the only one technology that is dependent in the past to lesser the death rate. The challenging task is to make these vaccine available o all people in the countries. In this connection data scientists are making their efforts in constructing the datasets for an international vaccination.

REFERENCES

[1] Bansal et al., Journal of Infectious Diseases *214*, S375–S379

[2]https://www.government.is/news/article/2020/03/15/Large-scale-testing-of-general-population-in-Iceland-underway/

[3] World Obesity Federation. Global Atlas on Childhood Obesity [Internet]. London; 2019. Available from: https://www. worldoty.org/nlsegmentation/global-atlas-on-childhoodobesity. Accessed 3 Sept 2020.

[4] González-Muniesa P, Mártinez-González M-A, Hu FB, Després JP, Matsuzawa Y, Loos RJF, et al. Obesity. Nat Rev Dis Prim [Internet]. Nature Publishing Group; 2017 [cited 2020 May 27];3: 17034. Available from: http://www.nature.com/articles/ nrdp201734. Accessed 3 Sept 2020.

[5] World Health Organization (WHO). WHO Director-General's opening remarks at the media briefing on COVID-19 - 11 March 2020 [Internet]. 2020 [cited 2020 Apr 15]. Available from: https://www.who.int/dg/speeches/detail/who-director-general-sopening-remarks-at-the-media-briefing-on-covid-19%2D%2D-11- march-2020. Accessed 3 Sept 2020.

[6] Cuschieri S. COVID-19 panic, solidarity and equity—the Malta exemplary experience. J Public Health (Bangkok) [Internet]. Springer; 2020 [cited 2020 Jun 3];1–6. Available from: http://link. springer.com/10.1007/s10389-020-01308-w. Accessed 3 Sept 2020.

[7] Centers for Disease Control and Prevention. COVID-19 - School Reopening: Indicators to Inform Decision Making | CDC [Internet]. Centers Dis. Control Prev. 2020 [cited 2020 Sep 19]. Available from: https://www.cdc.gov/coronavirus/2019-ncov/community/ schools-childcare/indicators.html. Accessed 3 Sept 2020.

[8] Rundle, AG., Park, Y., Herbstman, JB., Kinsey, EW., Wang Y. COVID-19-Related School Closings and Risk of Weight Gain Among Children. Obesity (Silver Spring) [Internet]. Obesity (Silver Spring); 2020 [cited 2020 May 28];28. Available from: https://pubmed.ncbi.nlm.nih.gov/32227671/. Accessed 3 Sept 2020.

[9] Pietrobelli A, Pecoraro L, Ferruzzi A, Heo M, Faith M, Zoller T, et al. Effects of COVID-19 Lockdown on Lifestyle Behaviors in Children with Obesity Living in Verona, Italy: A Longitudinal Study. Obesity [Internet]. John Wiley & Sons, Ltd; 2020 [cited 2020 May 28];oby.22861. Available from: https://onlinelibrary. wiley.com/doi/abs/10.1002/oby.22861. Accessed 3 Sept 2020.

[10]Ribeiro KD da S, Garcia LRS, Dametto JF dos S, Assunção DGF, Maciel BLL. COVID-19 and Nutrition: The Need for Initiatives to Promote Healthy Eating and Prevent Obesity in Childhood. Child Obes [Internet]. Mary Ann Liebert, Inc., publishers 140 Huguenot Street, 3rd Floor New Rochelle, NY 10801 USA; 2020 [cited 2020 Sep 19];16:235–7. Available from:

https://www.liebertpub.com/ doi/10.1089/chi.2020.0121. Accessed 3 Sept 2020.

[11] Asigbee FM, Davis JN, Markowitz AK, Landry MJ, Vandyousefi S, Ghaddar R, et al. The Association Between Child Cooking J Diabetes Metab Disord Involvement in Food Preparation and Fruit and Vegetable Intake in a Hispanic Youth Population. Curr Dev Nutr [Internet]. Curr Dev Nutr; 2020 [cited 2020 Sep 19];4:nzaa028. Available from: http://www.ncbi.nlm.nih.gov/pubmed/32258989. Accessed 3 Sept 2020.

[12] Nicola M, Alsafi Z, Sohrabi C, Kerwan A, Al-Jabir A, Iosifidis C, et al. The socio-economic implications of the coronavirus pandemic (COVID-19): A review. Int J Surg [Internet]. Elsevier; 2020 [cited 2020 may 28];78:185–93. Available from: http://www.ncbi.nlm. nih.gov/pubmed/32305533. Accessed 3 Sept 2020.

[13] Guan H, Okely AD, Aguilar-Farias N, Del Pozo Cruz B, Draper CE, El Hamdouchi A, et al. Promoting healthy movement behaviours among children during the COVID-19 pandemic. Lancet Child Adolesc Heal [Internet]. Elsevier; 2020 [cited 2020 May 28];4:416–8. Available from: http://www.ncbi.nlm.nih.gov/ pubmed/32458805. Accessed 3 Sept 2020.

[14] Sport New Zealand IHI Aotearoa. Guidance for physical activity at COVID-19 alert level 3 | Sport New Zealand - IHI Aotearoa [Internet]. Sport New Zeal. IHI Aotearoa. 2020 [cited 2020 Sep 22]. Available from: https://sportnz.org.nz/about/news-and-media/ media-centre/guidance-for-physical-activity-at-covid-19-alertlevel-3/. Accessed 3 Sept 2020.

[15] Inchley, J, Currie, D, Budisavljevic, S, Torsheim, T, Jåstad A, Cosma A et al. Spotlight on adolescent health and well-being. Findings from the 2017/2018 Health Behaviour in School-aged Children (HBSC) survey in Europe and Canada. International report. Volume 1. Key findings. Copenhagen; 2020.

[16] Nagata JM, Abdel Magid HS, Pettee Gabriel K. Screen Time for Children and Adolescents During the Coronavirus Disease 2019 Pandemic. Obesity [Internet]. John Wiley & Sons, Ltd; 2020 [cited 2020 Sep 19];28:1582–3. Available from: https://onlinelibrary. wiley.com/doi/abs/10.1002/oby.22917. Accessed 3 Sept 2020.

[17] Tripathi M, Mishra SK. Screen time and adiposity among children and adolescents: a systematic review. J Public Health (Bangkok) [Internet]. Springer; 2020 [cited 2020 May 28];28:227–44. Available from: http://link.springer.com/10.1007/s10389-019- 01043-x. Accessed 3 Sept 2020.

[18] Marsh S, Ni Mhurchu C, Maddison R. The non-advertising effects of screen-based sedentary activities on acute eating behaviours in children, adolescents, and young adults. A systematic review. Appetite [Internet]. Appetite; 2013 [cited 2020 May 28];71:259– 73. Available from: http://www.ncbi.nlm.nih.gov/pubmed/ 24001394. Accessed 3 Sept 2020.

[17] Franckle R, Adler R, Davison K. Accelerated weight gain among children during summer versus school year and related racial/ethnic disparities: A systematic review. Prev Chronic Dis [Internet]. Prev Chronic Dis; 2014 [cited 2020 May 28];11. Available from: https:// pubmed.ncbi.nlm.nih.gov/24921899/. Accessed 3 Sept 2020.

[18] von Hippel PT, Workman J. From Kindergarten Through Second Grade, U.S. Children's Obesity Prevalence Grows Only During Summer Vacations. Obesity (Silver Spring) [Internet]. Obesity (Silver Spring); 2016 [cited 2020 may 28];24:2296–300. Available from: http://www.ncbi.nlm.nih.gov/pubmed/27804271. Accessed 3 Sept 2020.

[19] An R. Projecting the impact of COVID-19 pandemic on childhood obesity in the U.S.: A microsimulation model. J Sport Heal Sci [Internet]. Elsevier; 2020 [cited 2020 May 28]; Available from: https://www.sciencedirect.com/science/article/pii/ S209525462030065X. Accessed 3 Sept 2020.

[20] Jogdand SS, Naik J. Study of family factors in association with behavior problems amongst children of 6–18 years age group. Int J Appl basic Med Res [Internet]. Wolters Kluwer – Medknow Publications; 2014 [cited 2020 Sep 22];4:86–9. Available from: http://www.ncbi.nlm.nih.gov/pubmed/25143882. Accessed 3 Sept 2020.

[21] Leddy MA, Power ML, Schulkin J. The impact of maternal obesity on maternal and fetal health. Rev Obstet Gynecol [Internet]. MedReviews, LLC; 2008 [cited 2020 May 28];1:170–8. Available from: http://www.ncbi.nlm.nih.gov/pubmed/19173021. Accessed 3 Sept 2020.

[22] Centers for Disease Control and Prevention. Others At Risk for COVID-19 | CDC [Internet]. Centers Dis. Control Prev. 2020 [cited 2020 Sep 22]. Available from: https://www.cdc.gov/coronavirus/ 2019-ncov/need-extra-precautions/other-at-risk-populations.html. Accessed 3 Sept 2020.

[23] Esegbona-Adeigbe S. Impact of COVID-19 on antenatal care provision. Eur J Midwifery [Internet]. E.U. European Publishing; 2020 [cited 2020 Sep 22]; Available from: http://www.journalssystem. com/ejm/Impact-of-COVID-19-on-antenatal-careprovision,121096,0,2.html. Accessed 3 Sept 2020. 24. Unicef. Framework for reopening schools [Internet]. 2020. Available from: https://www.unicef.org/sites/default/files/2020-06/Framework-for-reopening-schools-2020.pdf. Accessed 3 Sept 2020.

International Conference on AI, Robotics and Automation
ISBN: 978-81-937760-4-9

AI BASED ADVANCED HEALTH CARE SYSTEMS

Ayesha Banu[1] and Rehana Fatima[2]
[1]*Department of Computer Science and Engineering, Vaagdevi College of Engineering, India*
[2]*Department of Information Technology, King Abdul Aziz University, Saudi Arabia*

Abstract

The miracle of machines thinking like humans is possible only with Artificial Intelligence (AI). Simulation of Human Intelligence in machines gives them the traits of Learning, Decision Making and problem solving. AI works in hand with large amounts of data with fast, iterative processing and complex algorithms, allowing the software to learn automatically from patterns or features in the data. Cognitive computing is a subfield of AI that strives for a natural, human-like interaction with machines. Artificial Intelligence in healthcare is the use of complex algorithms and software to emulate human cognition in the analysis, clarification, and understanding of complicated medical and healthcare data. Specifically, AI is the ability of computer algorithms to estimate conclusions without direct human input. The basic job of AI software is to simplify the work of patients, doctors and hospital administrators by performing tasks that are typically done by humans, but in less time and at a segment of the cost. Right from finding out new links between genetic codes to drive surgery, assisting robots, artificial intelligence is reinventing and reviving modern healthcare through machines that can predict, comprehend, learn and act.

Keywords:

Artificial Intelligence, Intelligent Algorithms, Cognitive Computing, Healthcare Systems

1. INTRODUCTION

Artificial Intelligence is an active and continually changing and growing technology. The main focus of AI is the use of intelligent agents, which include devices that perceive the environment and accordingly take actions in order to maximize the expected goal. In the context of modern digitalized world, AI simulates machines, computer programs and systems to perform the intellectual and creative functions of a person, self-reliantly find ways to solve problems, be able to draw conclusions and make decisions. Most artificial intelligence systems have the ability to learn, which allows people to improve their performance over time. The recent research on AI tools, including machine learning, deep learning and predictive analysis intended toward increasing the planning, learning, reasoning, thinking and action taking ability [1]. Artificial Intelligence can be used to solve real-world problems by implementing the following processes.

Techniques of AI: Machine Learning, Deep Learning, Natural Language Processing, Robotics, Expert Systems, Fuzzy Logic. This paper gives details of all these tools/techniques.

The primary focus of this paper is the role of AI in Advanced Health Care Systems. The healthcare industry is ready for some key changes. The areas of AI would range from chronic diseases like cancer to radiology and risk assessment. There are nearly infinite opportunities to influence technology to organize more precise, efficient, and impactful interventions at exactly the right moment in a patient's care. As payment structures evolve, patients demand more from their benefactors, and the volume of available data continues to increase at a staggering rate. Artificial Intelligence is poised to be the engine that drives improvements across the care continuum. AI offers numeral advantages over traditional analytics and clinical decision-making techniques. Learning algorithms can become more precise and accurate as they interact with training data, allowing humans to gain unprecedented insights into diagnostics, care processes, treatment variability, and patient outcomes. This paper explains the various algorithms used in AI in, along with the various AI Health Domain Software's.

2. MAJOR ALGORITHMS USED IN ARTIFICIAL INTELLIGENCE

Artificial Intelligence algorithms can be broadly divided as [2]

2.1 CLASSIFICATION ALGORITHMS

Classification algorithms are a slice of supervised learning. These algorithms are used to divide the subjected variable into different classes and then predict the class for a given input. For example, classification algorithms can be used to classify emails as spam or not. Here are few commonly used classification algorithms.

2.1.1 Naive Bayes:

Naive Bayes algorithm works on Bayes theorem and takes a probabilistic approach, unlike other classification algorithms. The algorithm has a set of prior probabilities for each class. Once data is fed, the algorithm updates these probabilities to form something known as posterior probability. This comes useful when you need to predict whether the input belongs to a given list of classes or not.

2.1.2 Decision Tree:

The decision tree algorithm is more of a flowchart like an algorithm where nodes represent the test on an input attribute and branches represent the outcome of the test.

2.1.3 Random Forest:

Random forest works like a group of trees. The input data set is subdivided and fed into different decision trees. The average of outputs from all decision trees is considered. Random forests offer a more accurate classifier as compared to Decision tree algorithm.

2.1.4 Support Vector Machines:

SVM is an algorithm that classifies data using a hyper plane, making sure that the distance between the hyper plane and support vectors is maximum.

2.1.5 K Nearest Neighbors:

KNN algorithm uses a bunch of data points segregated into classes to predict the class of a new sample data point. It is called

An Improved Impulse Noise Removal VLSI Architecture Using DTBDM Method

Sresta Valasa, D. R. Ramji, Jitesh Shinde, and Mahesh Mudavath

Abstract Images are vulnerable to anomalies called as distortion or corruption during the transmission of signals. When the impulse noise encounters the image quality gets disturbed, to reconstruct the pixel information with reduced complexity, we hypothesize an efficacious VLSI architecture to drastically reduce impulse noise in pictures leveraging edge preserving filter. The method is compared with two mask sizes in terms of performance evaluation. To take advantage of detailed identification including certain PSNR generalizations and picture flexibility, the proposed framework will prove to be more effective than the conventional poor complexity paradigms. Throughout the low noise concentrations, the edge conserving median filter spotlights stellar performance and indeed in high noise concentrations through high window sizes. These effects are demonstrated through the simulation results. The comparisons are framed between area and power consumptions of 3*3 and 5*5 window sizes concluding which window size gives better performance in terms of those constraints.

Keywords Noise removal · Window size · Edge conserving median filter · DTBDM · PSNR · Power consumption

S. Valasa (✉) · D. R. Ramji · J. Shinde · M. Mudavath
Department of Electronics and Communication Engineering, Vaagdevi College of Engineering, Warangal, Telangana, India
e-mail: shreshtavalasa@gmail.com

D. R. Ramji
e-mail: ramjidr@gmail.com

J. Shinde
e-mail: shindejitesh.vaagdevi.coe.ece@gmail.com

M. Mudavath
e-mail: mahichauhan@gmail.com

K. A. Reddy et al. (eds.), *Data Engineering and Communication Technology*,
Lecture Notes on Data Engineering and Communications Technologies 63,
https://doi.org/10.1007/978-981-16-0081-4_32

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S. Valasa (✉) · D. R. Ramji · J. Shinde · M. Mudavath
Department of Electronics and Communication Engineering, Vaagdevi College of Engineering, Warangal, Telangana, India
e-mail: shreshtavalasa@gmail.com

D. R. Ramji
e-mail: ramjidr@gmail.com

J. Shinde
e-mail: shindejitesh.vaagdevi.coe.ece@gmail.com

M. Mudavath
e-mail: mahichauhan@gmail.com

K. A. Reddy et al. (eds.), *Data Engineering and Communication Technology*,
Lecture Notes on Data Engineering and Communications Technologies 63,
https://doi.org/10.1007/978-981-16-0081-4_32

Novel Wavelet Domain Based Adaptive Thresholding Using Bat Algorithm for Image Compression

V. Manohar, G. Laxminarayana and T. Satya Savithri

Abstract Image compression is the significant study in the arena of image processing owing to its enormous usages and its ability to reduce the storage prerequisite and communication bandwidth. Thresholding is a kind of image compression in which computational time increases for multilevel thresholding and hence optimization techniques are applied. The quality of reconstructed image is superior when discrete wavelet transform based thresholding is used as compared to when it is not applied. Both particle swarm optimization and fire fly algorithm becomes unstable when the velocity of the particle becomes maximum and when there is no bright firefly in the search space respectively. To overcome the above-mentioned drawbacks bat algorithm based thresholding in frequency domain is proposed. Echolocation is the sort of sonar used by micro-bats. The way they throng their prey, overcoming the hurdles they come across, pinpointing nestling gaps have become the main motivation research in artificial intelligence. With the feature of frequency tuning and having the benefit of automatic zooming, bat algorithm produces superior PSNR values and quality in reconstructed image and also results in fast convergence rate as compared to state of art of optimization techniques.

Keywords Image compression · Thresholding · DWT · Bat algorithm · PSO · Firefly algorithm

V. Manohar (✉) · T. Satya Savithri
Department of Electronics & Communication Engineering, JNTUH, Hyderabad, Telangana, India
e-mail: manoharvu@gmail.com

T. Satya Savithri
e-mail: tirumalasatya@jntuh.ac.in

G. Laxminarayana
Department of Electronics & Communication Engineering, Anurag College of Engineering, Hyderabad, Telangana, India
e-mail: gln9855@gmail.com

H. S. Behera et al. (eds.), *Computational Intelligence in Data Mining*, Advances in Intelligent Systems and Computing 990,
https://doi.org/10.1007/978-981-13-8676-3_24

2021 7th International Conference on Advanced Computing & Communication Systems (ICACCS)

Energy Efficiency and Throughput Analysis Using IED with Selection Combining in Proposed CSS Network Over Weibull Fading Channel

Santosh K Boddupelli
Department of ECE
Vaagdevi College of Engineering
Warangal, Telangana, India
santoshb4@gmail.com

B.Naveen Kumar
Department of ECE
Balaji Institute of Technology Science
Warangal, Telangana, India
naveenget426@gmail.com

M.Ranjeeth
Department of ECE
Vaagdevi College of Engineering
Warangal, Telangana, India
ranjithmamidi2001@gmail.com

Srinivas Nallagonda
Department of ECE
Marri Laxman Reddy Institute of Technology and Management
Hyderabad, Telangana, India
srinivas.nallagonda@gmail.com

2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS) | 978-1-6654-0521-8/20/$31.00 ©2021 IEEE | DOI: 10.1109/ICACCS51430.2021.9441848

***Abstract*—The proposed cooperative spectrum sensing network gives potential attributes to improve the detection performance. This research paper mainly focuses on the identification of unknown signals in Weibull fading environment using an improved energy detector (IED). The proposed network consists of multiple cognitive radio (CR) nodes, at each CR node number of antennas are used and selection combining (SC) is used to select the maximum value of detection probability. Further, the activity of primary user (PU) is identified using fusion rules at fusion center (FC). Initially, closed-form of missed detection and false alarm probabilities are proficiently derived. Later on, energy efficiency and an average channel throughput analysis are evaluated using k=1+n and k=N-n rules at FC.**

***Index Terms*—Multiple antennas, weibull fading, average channel throughput, energy efficiency.**

I. Introduction

The radio spectrum (RS) is an important natural resource that is available throughout the world and it is necessary for all the radio communication applications. The RS need to be continuously monitored to provide the essential tasks and to avoid harmful interference [1]. Now a days, fixed range of frequencies (bands) of RS are allocated for various applications. The spectrum regulatory bodies have stated that most of the frequency bands are underutilized [2]. These underutilized frequency bands should be identified to make proper utilization of RS and this can be done by a promising technology i.e. cognitive radio (CR). The CR network consists of cognitive users (CUs) and they utilizes the vacant bands in the absence of primary users (PUs). The regular montioring is required on RS to identify the vacant frequency bands this process is known as spectrum sensing [3]. The detection probability (identification of vacant bands) is very low with spectrum sensing technique due to only one SU lies in it's network and this technique is also not feasible under fading effects. Hence, to overcome these limitations and to improve the detection probability value, multiple CRs should be used in the network, this network is known as cooperative spectrum sensing (CSS) network. This network gives feasible values of detection probabilities under fading environments [4]. From the literature, it is observed that conventional energy detection (CED) technique is widely utilized [5]. In [6], authors have discussed that the detection of vacant bands is limited when CED scheme is used in CSS network. Further, detection probability value enhanced using an improved energy detection (IED) technique and every CR node equipped with number of antennas in the network [7]. An experimental analysis of an IED method is addressed in [8]. It has been observed that the average channel throughput value decreases due to fading effect present in the wireless transmissions. The drop in throughput further reduces the detection probability and also it causes an interference between PU and SUs. Therefore, an average channel throughput value should be maximized. An IED scheme based CSS in Weibull channel is used to model the waves which are propagating in multi-path and also it is useful for heterogeneous communications [9]. With the help of Weibull distribution, one can easily model indoor and outdoor communication environments for such networks. For the proposed system, closed-form of false alarm and missed detection probabilities expressions are provided. Further, average channel throughput, energy efficiency and complementary receiver operating characteristics (CROC) performances are evaluated in weibull fading. Section-II describes about system model and calculation of missed and false alarm probabilities expressions. We have explained the simulation procedure using flow chart and average channel throughput expressions and energy efficiency analysis in section-III, Further, we have provided extensive simulations results based on various sim-

2021 7th International Conference on Advanced Computing & Communication Systems (ICACCS)

Energy Efficiency and Throughput Analysis Using IED with Selection Combining in Proposed CSS Network Over Weibull Fading Channel

Santosh K Boddupelli
Department of ECE
Vaagdevi College of Engineering
Warangal, Telangana, India
santoshb4@gmail.com

B.Naveen Kumar
Department of ECE
Balaji Institute of Technology Science
Warangal, Telangana, India
naveenget426@gmail.com

M.Ranjeeth
Department of ECE
Vaagdevi College of Engineering
Warangal, Telangana, India
ranjithmamidi2001@gmail.com

Srinivas Nallagonda
Department of ECE
Marri Laxman Reddy Institute of Technology and Management
Hyderabad, Telangana, India
srinivas.nallagonda@gmail.com

2021 7th International Conference on Advanced Computing and Communication Systems (ICACCS) | 978-1-6654-0521-8/20/$31.00 ©2021 IEEE | DOI: 10.1109/ICACCS51430.2021.9441848

***Abstract*—The proposed cooperative spectrum sensing network gives potential attributes to improve the detection performance. This research paper mainly focuses on the identification of unknown signals in Weibull fading environment using an improved energy detector (IED). The proposed network consists of multiple cognitive radio (CR) nodes, at each CR node number of antennas are used and selection combining (SC) is used to select the maximum value of detection probability. Further, the activity of primary user (PU) is identified using fusion rules at fusion center (FC). Initially, closed-form of missed detection and false alarm probabilities are proficiently derived. Later on, energy efficiency and an average channel throughput analysis are evaluated using k=1+n and k=N-n rules at FC.**

***Index Terms*—Multiple antennas, weibull fading, average channel throughput, energy efficiency.**

I. Introduction

The radio spectrum (RS) is an important natural resource that is available throughout the world and it is necessary for all the radio communication applications. The RS need to be continuously monitored to provide the essential tasks and to avoid harmful interference [1]. Now a days, fixed range of frequencies (bands) of RS are allocated for various applications. The spectrum regulatory bodies have stated that most of the frequency bands are underutilized [2]. These underutilized frequency bands should be identified to make proper utilization of RS and this can be done by a promising technology i.e. cognitive radio (CR). The CR network consists of cognitive users (CUs) and they utilizes the vacant bands in the absence of primary users (PUs). The regular montioring is required on RS to identify the vacant frequency bands this process is known as spectrum sensing [3]. The detection probability (identification of vacant bands) is very low with spectrum sensing technique due to only one SU lies in it's network and this technique is also not feasible under fading effects. Hence, to overcome these limitations and to improve the detection probability value, multiple CRs should be used in the network, this network is known as cooperative spectrum sensing (CSS) network. This network gives feasible values of detection probabilities under fading environments [4]. From the literature, it is observed that conventional energy detection (CED) technique is widely utilized [5]. In [6], authors have discussed that the detection of vacant bands is limited when CED scheme is used in CSS network. Further, detection probability value enhanced using an improved energy detection (IED) technique and every CR node equipped with number of antennas in the network [7]. An experimental analysis of an IED method is addressed in [8]. It has been observed that the average channel throughput value decreases due to fading effect present in the wireless transmissions. The drop in throughput further reduces the detection probability and also it causes an interference between PU and SUs. Therefore, an average channel throughput value should be maximized. An IED scheme based CSS in Weibull channel is used to model the waves which are propagating in multi-path and also it is useful for heterogeneous communications [9]. With the help of Weibull distribution, one can easily model indoor and outdoor communication environments for such networks. For the proposed system, closed-form of false alarm and missed detection probabilities expressions are provided. Further, average channel throughput, energy efficiency and complementary receiver operating characteristics (CROC) performances are evaluated in weibull fading. Section-II describes about system model and calculation of missed and false alarm probabilities expressions. We have explained the simulation procedure using flow chart and average channel throughput expressions and energy efficiency analysis in section-III, Further, we have provided extensive simulations results based on various sim-

2020 IEEE International Symposium on Sustainable Energy, Signal Processing and Cyber Security (iSSSC) | 978-1-7281-8880-5/20/$31.00 ©2020 IEEE | DOI: 10.1109/iSSSC50941.2020.9358880

Energy-Efficiency Analysis of Cognitive Radio Network with Improved Energy Detectors and SC Diversity over Nakagami-q Fading Environment

Srinivas Nallagonda
Department of ECE
Marri Laxman Reddy Institute of Technology and Management
Hyderabad, Telangana 500043, India
srinivas.nallagonda@gmail.com

Kiran Kumar Godugu
Department of ECE
Marri Laxman Reddy Institute of Technology and Management
Hyderabad, Telangana 500043, India
gkk145@gmail.com

M. Ranjeeth
Department of ECE
Vaagdevi College of Engineering
Warangal, Telangana 506005, India
ranjithmamidi2001@gmail.com

Abstract—In this work, energy efficiency of a cognitive radio network (CRN) with improved energy detection (IED) based CR nodes in Nakagami-q fading is proposed. All the CR nodes contain the number of antennas and use selection diversity (SC) technique. Each CR node senses a PU using erroneous sensing links and reports its sensing information (one-bit decision) to fusion center (FC) with the help of erroneous reporting links. The decision about PU status (final) is taken by performing k-out-of-N fusion rule. The mathematical framework for energy efficiency analysis for the proposed network is developed. The simulation results is also discussed to validate the performance characteristics obtained analytically. For several network parameters values, the comparison through various various metrics between IED and traditional energy detection method under different fusion rules is studied. The impact of diversity technique and effect of fading severity parameters on the energy efficiency is also investigated. The effect of channel error on energy efficiency performance for both proposed and conventional networks is presented. Finally, optimal network parameters values for achieving maximum energy efficiency are also highlighted.

Index Terms—cognitive radio, spectrum sensing, improved energy detector, Hoyt fading, energy efficiency

I. Introduction

Cognitive radio (CR) is an intelligent wireless technology that is able to monitor, sense, and identify the unlicensed users (also called as secondary users, SUs or CR nodes/users) and also act according to the realtime changes in the environment. The unlicensed users are permitted to share the frequency band of licensed users (called as primary user (PU)) in a sophisticated and effective way as long as the licensed user is not in its operations [1]. Several sensing techniques are developed, when priori information related to PU is not known, energy detection (ED) technique is the simplest one that can be used to detect and receive the information on the status of a PUs [2]. But, in a realistic wireless environment, a single CR node's decision may not be reliable, cooperative spectrum sensing (CSS) plays a vital role to take reliable decision about the PU status. Every decision from each CR node is reported to a common control center called as fusion center (FC) for combining process to get final decision.

A. Related Work

In [3], throughput performance and in [4] energy efficiency performance of CED based CSS system are investigated in $\kappa\,\mu$ and $\eta\,\mu$ fading channels. In [5], the IED based sensing network performance over Hoyt fading channel is discussed. The performance analysis of an average channel throughput for IED based CSS over non-fading environment is investigated in [6]. In [7], throughput performance of cooptative spectrum sensing network in presence of Hoyt fding channel is investigated. However, the performance of energy efficiency is not investigated in [5]- [7]. The analytic performance of conventional energy detector (CED) based CR nodes in terms of energy efficiency is studied in [8]. In [9]- [10], the energy consumption is minimized by using green cloud computing with different approaches. This related works has motivated towards the development of a suitable theoretical and simulations for CRN with IEDs over Nakagami-q fading channels for the analysis of energy efficiency of proposed CRN. The Hoyt fading, also called as Nakagami-q, to model more severe than Rayleigh fading.

It can be believed from the related works that energy efficiency analysis of a CRN with IEDs and SC diversity over Nakagami-q fading environments can be a significant work. Our novel and major contributions in this paper are.

1) The development of detection probability expression for both AWGN, Nakagami-q, and Rayleigh fading environments and the mathematical frameworks for energy efficiency analysis of the proposed network.
2) For several network parameters values, the investigation on comparison between IED and traditional energy detection method under different decision fusion rules is investigated. Further, performance characteristics of energy efficiency are illustrated analytically over noise plus Hoyt fading channels.
3) The impact of SC diversity technique, effect of fading severity parameters, and optimal values on the energy efficiency are also investigated.

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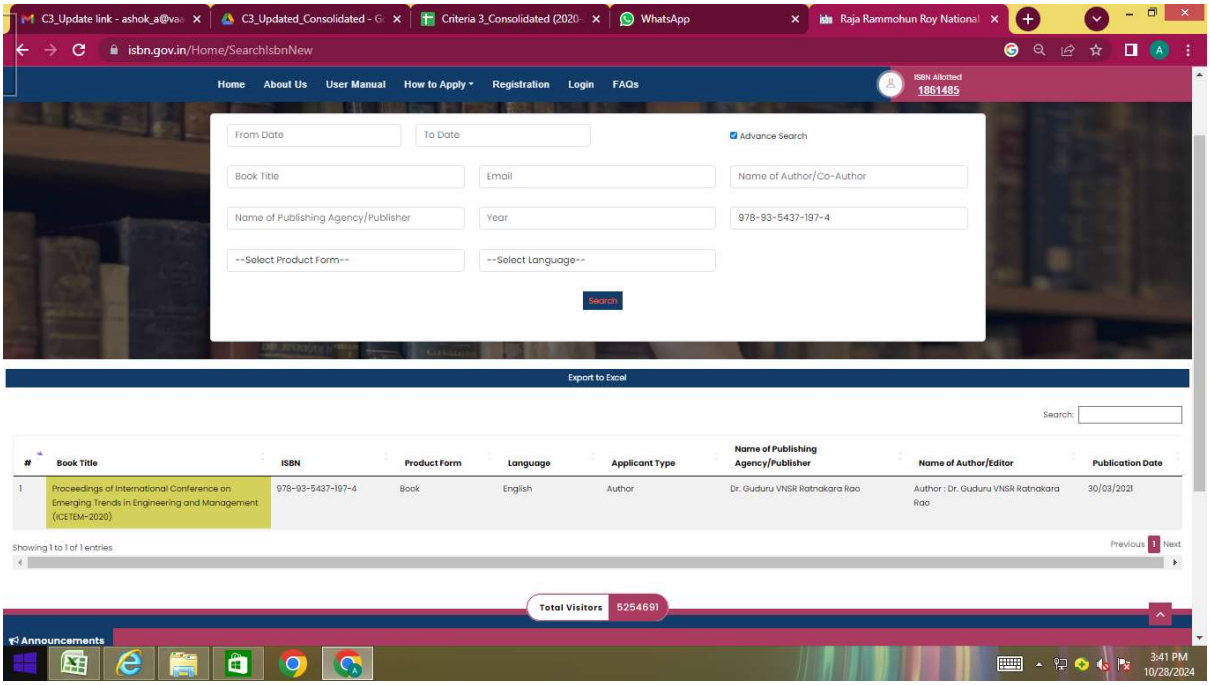
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