



**IJIRCCCE**

e-ISSN: 2320-9801 | p-ISSN: 2320-9798



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

**Volume 10, Issue 5, May 2022**

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 8.165**



9940 572 462



6381 907 438



ijircce@gmail.com



www.ijircce.com

# Women Safety Analysis System through Deep Belief Neural Networks

Zahir Khan Shabbirkhan Mokashi, Ganesh Nitin Patil, Tousib Raju Bagwan, Arif Imtiaz Bargir,

Prof. Ashwini Kamble

Dept. of Computer, KJCOEMR, Pune, India

Dept. of Computer, KJCOEMR, Pune, India

Dept. of Computer, KJCOEMR, Pune, India

Dept. of Computer, KJCOEMR, Pune, India

Dept. of Computer, KJCOEMR, Pune, India

**ABSTRACT:** The frequency of crimes against women, such as harassment and other forms of abuse, has increased. These are problematic because they have caused society to deteriorate and forced women in developing countries to look over their shoulders. This has caused a lot of stress and anguish for women, which has caused a great deal of problems in their lives. Therefore, there is a need for a system that allows for the realization of the analysis of women safety of a particular location based on the evaluation of tweets from the specific location. This is achieved through the system prescribed in this research article. The approach utilizes Linear Clustering algorithm and Bag of Words approach, along with Deep Belief Neural Network and Decision Making. The evaluation of the approach has been performed extensively for the purpose of achieving the analysis which has resulted in extremely promising levels of Mean Reciprocal Rank.

**KEYWORDS:** Linear Clustering, Bag of Words, Deep Belief Neural Networks, Decision Making.

## I. INTRODUCTION

In the recent years, the number of crimes perpetrated against women has increased. Because women are less capable of self-defense, these atrocities have been continuing and increasing steadily. Females must defend themselves against the physically stronger gender, which is impossible owing to the enormous gap in physical power between females and males. Many criminals take advantage of this circumstance and abuse women in order to carry forth their nefarious doings. Females are a softer target for all of these acts, which is a critical issue that should be addressed.

Female safety has long been one of the most pressing problems across the world, notably in underdeveloped nations. In contrast, the female gender is physically weaker than the male gender. Because men make up a large portion of the population, this is a very threatening and frightening prospect for women. Females are usually scared by unfamiliar men they face in everyday life. This has a substantial influence on the female psyche and development. Females need overcome male dominance, which can result in aggressive outbursts or physical confrontations that are detrimental to the female.

There are a multitude of techniques and procedures, as well as the need for the employment of stricter laws and legislation, to accomplish an efficient and effective enhancement in women's security. Law enforcement authorities have been working tirelessly to improve women's safety by incorporating different surveillance strategies. Patrolling and surveillance feeds are used by law enforcement organizations to keep an eye on the different locations. This is to help ensure that women are not harassed and that the law and order is preserved. While these strategies have been efficient in alleviating crime, they have not been able to entirely eliminate criminality. Women's safety is indeed jeopardized, and many women in developing countries are afraid to venture out alone.

The increased frequency of these attacks, as well as the magnitude of attacks that women are currently enduring, generates a rather terrifying scenario for women. A framework that can effectively provide safety and sovereignty and upheld the rights of women in need is considered essential. In this survey article, a considerable amount of research has

been assessed for this intent. The analysis has been lucrative in terms of the successful implementation of our well-planned methodology. The safety of women is a pressing concern, since the surge in harassment incidents has resulted in a slew of injustices. The decline in women's safety creates a lot of misery since they have to be on high alert all of the time, which has caused a great deal of trauma and stress for these women.

For enhancing the precision of the women's safety system, the paradigm of machine learning algorithms can meet the needs. The presented approach for the women safety has been realized through the use of Linear Clustering, Deep Belief Neural Networks and Decision Making. In the next chapters of this research work, the developed methodology will be elaborated further, and an effective assessment of the proposed technique will be accomplished to facilitate in the manifestation of the approach's effectiveness.

In this research article related works are mentioned in the section 2. The proposed technique is deeply narrated in the section 3. The experimental evaluation is performed in section 4 and whereas section 5 concludes this research article with the scope for future enhancement.

## II. LITERATURE SURVEY

A. Z. M. TahmidulKabir in developing countries and also in the developed country there is the main issue such sexual harassment. [1] In today's time, women participate in every activity alongside men. To the success of society, women are contributing which deserves praise. Thus the proposed paper introduces a smart band by using the CWS app. It is implemented to provide women's safety independently to women. The device contains Arduino nano, GPS, GSM, and Bluetooth.

N. Viswanath proposes to develop a smart device to help women when there are in danger. This device is connected to the footwear of the women it can be triggered easily by tapping the foot four times. In recent years there has been rapid growth in the field of the Internet of things. [2] Due to this quality of living can be improved with assistance. Bluetooth Low Energy module embedded with it to design and implement using Arduino microcontroller with a combination of the tri-axial accelerometer.

S. Mahmud expresses from being born to death women face many diversified situations. Violence against women (VAW) is one of the terms which is used to violent acts committed against women.[3] There have been many situations observed in the recent times thus the author of the proposed paper introduces the application that can help to find domestic violence prevention mechanisms. The proposed application also provided instruction to pregnant women by giving emergency treatment, diet charts, and tips for a healthy life.

Priyanka. S states many women are scared to go outside due to fear of violence and physical/sexual abuse is a major issue and rising day by day. [4] In this recent time technology is upgrading but still, the women are facing the problem like their fear to go in a crowded area or feeling insecure to travel many incidents are happening. Thus proposed paper implements an application for women safety device by sending a message to the near one if there are in danger. It is known as an effective approach for women's safety.

Muskan in recent times rising crimes against women are growing thus it is very important to take action on Women safety. [5] In the past there are many application builds for women safety but it is not secure or it not effective because it needs human interaction to operate. The proposed paper introduces a system that is used to read the human temperature and to read the heartbeat of the user if the user is in danger the application will generate an alarm. Firstly data is generated in a device and trained then depending threshold the system generates the alarm.

D. Chand expresses in other countries and also in India women's safety is one of the important issues. [6] According to the World Health Organization report around the world, 35 percent of women have been victims of sexual violence. Thus the researcher of the proposed paper introduces an application called as WoSApp in which contains three steps as the first step is the input of emergency contacts second is to triggering of the alarm and the last is the call to the local police. The proposed framework is known as effective research.

N.R Sogi narrates women go through different phases in their life such as young girls, mothers, and women. Women are equally keeping pace with the men in every stage of life but the women are subjected and have to face harassment, harassment, and violence in public.[7] The main aim of the paper is to provide the system with a low cost

of development, fast process, and accurate tracking. Thus the proposed paper implements by using a camera, buzzer, and Raspberry Pi Zero to activate the services.

M. Mahajan implements a safety system for women in the form of wearable devices. The device is used to track a location and also sends the live event images live on the web page using the intranet. [8] The acts of violence against women are growing for few years this is causing the growth of the country. The only measure that women can take and be secure at that time is Defense. The main focus of the author is to develop the safety system by using IoT and machine learning techniques.

A. Alrashdan proposes physical changes that women face experience amid pregnancy by using anthropometric measurements. [9] The extension of the baby bump is identified on the body. Thus the author invents the new seat belt where pregnant women will not face the pressure on the stomach and not experience the problem such as physical and psychological discomfort. Thus the author intended to give guidelines for car designers for emotional security and comfort for pregnant women.

R. R. Khandoker describes women are the victims of violence and harassment in the number of heinous incidents involving women and children.[10] For security and protective purposes, the proposed paper implements applications efficiently for security. As there is growth in the use of smartphones has increased rapidly so the application can be installed on every smartphone. Thus the LifeCraft application can minimize the crime against women. This application is continuous location tracking and showing the victim safe zone is the most useful feature application.

V. Hyndavi narrates there is always news on rape cases, molestation, and eve-teasing in public places. [11] These days women's safety is the most important concern about women's security. Due to society's hypocritical point of view, many women are scared to complain about the crime. Thus the researchers introduce a smart wearable device for the safety of women. This device generates the alert automatically if the woman is found in danger and informs the related persons.

D. Kumar expresses a lot of violence and harassment are faced by women and girls in various cities. There are many types of research made in various cities across India [12]. The main aim of the proposed paper promoting the safety of women in various cities of India concerning the Twitter platform Facebook and Instagram. Social media contains images and text that focus on the safety of women with content messages.

S. Ahir elaborates women's harassment cases in India are increasing every day. The paper implements a smart device that is worn by women on the wrist as a band. This band has to keep active the woman has to tap on the band twice if she feels she is in danger or someone is abusing her. Once she taps one of her bands the coordinates latitudinal and longitudinal of the location will be sent to the nearest police.

### III. PROPOSED METHODOLOGY

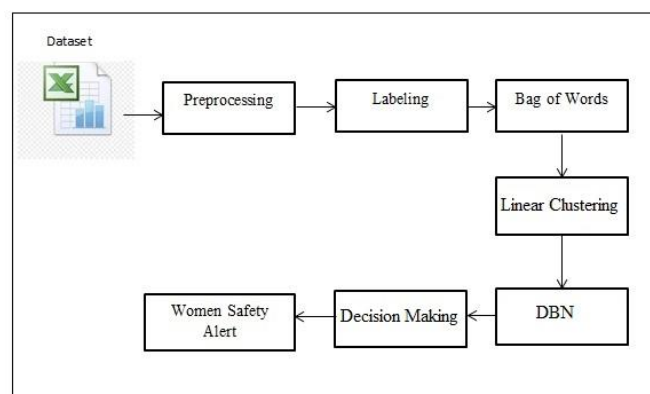


Figure 1: Overview of Woman Safety Analysis System

The proposed system for analysis mechanism for a woman's safety has been depicted in the figure 1 above. The steps achieved for the purpose of realizing this system have been listed below.

*Step 1: Data Collection, Preprocessing & Labeling* – The presented approach for the purpose of enabling effective woman safety analysis utilizes an interactive user interface to get the dataset input. The User interface has been designed using the Swings framework on the java programming language. This interface is used to provide the input dataset to the system which has been downloaded from the URL –

<https://www.kaggle.com/kazanova/sentiment140?select=training.1600000.processed.noemoticon.csv>.

The information provided in the dataset consists of tweet data gathered from the twitter social media website. These tweets are posts that have been aggregated along with the various other attributes for utilization as the data for evaluation of the woman safety of a particular area. The input dataset consists of various attributes such as, source (where the tweet has been posted from), user id, username (the username of the user posting the tweet), user description (the information about the user entered by them in their profile), user follower count, user friends count, user location, user verified (public personalities are provided a verification), user url, tweet (the actual content of the tweets), and length of the tweets.

This dataset is provided as an input to the system which takes the input in the form of a workbook format. The workbook cannot be effectively processed as an input natively; therefore, for this purpose the JXL library is being used. The JXL library converts the workbook into a relevant double dimension list for the purpose of providing it as an input to the java code for further processing and evaluation of the system.

Out of the several attributes in the presented approach, only the relevant ones are selected for the evaluation of the woman safety. This effectively reduces the space complexity for the approach and saves the processing time which will be wasted. The selected attributes are the user name, user location and tweet. These attributes are then labeled by converting these into their effective integer format. This is useful as it allows for efficient processing of the data that can lead to highly accurate results.

The input attributes are also preprocessed, along with the tweet contents. The preprocessing approach employs the use of stopword removal, which removes the stopwords which are redundant in nature. The preprocessing approach also performs stemming which transforms the words in the tweet to their root forms. This preprocessed and labeled dataset is provided to the next steps for the purpose of further analysis and utilization.

*Step 2: Bag of Words* – The Bag of Words is one of the most effective and useful approaches to determine the semantics of the tweet. This is done through the use of a personalized dictionary that is referred to as the bag of words approach. This bag of words contains words or keywords that indicate any inclination towards violence or any other unacceptable behavior that reduces the safety of the women. This bag of words is populated with commonly used phrases which are used for detecting their presence in the tweets.

The user interface provided by the proposed system also facilitates a dedicated section or a frame to view the words contained in the bag of words approach. The system also provides the ability to add more words or remove certain words from the Bag of Words approach through the interactive user interface. This allows for a much more personalized analysis of the women safety which can be achieved very easily by changing these parameters. The bag of words count is attained which will be utilized in the subsequent steps of the presented approach.

*Step 3: Linear Clustering* – The labeled and preprocessed dataset attained in the previous step is provided as an input in this step for the cluster generation. The rows of the double dimension list are read consequently and subjected to evaluation. The values of the selected attributes are effectively evaluated and the labeled value of the user location is being used to sort the list into an ascending order.

The maximum and minimum values of location are extracted from the sorted list for attaining the crisp values for the cluster formation. The achieved values are extracted and their difference is computed. The obtained difference value is then subjected to division by 5.

This division achieves 5 different segregations based on the value of the labeled location obtained previously. These divisions are referred to as the crisp values. These 5 crisp values are named as VERY LOW, LOW, MEDIUM, HIGH and VERY HIGH. The labeled location values in the dataset are then subjected to classification using the obtained crisp values.

*Step 4: Deep Belief Neural Network*–The cluster list obtained in the previous step is used to obtain the Deep Belief Neural Networks. The 3 attributes have been utilized to generate the 2 hidden layers for the input clusters. The clusters are supplied as an input to this step through the execution of the previous step. The hidden layers utilize the ReLU activation function to identify the hidden layer value through the use of 8 random weights, along with 1 bias weight each for each layer and the use of two target values as 0.01 and 0.99.

$$T = (\sum_{k=0}^n A_T * W) + B \quad (2)$$

$$H_{LV} = 2 \left( \frac{1}{1 + \exp(-T)} \right) - 1 \quad (3)$$

Where,

n- Number of attributes

A<sub>T</sub>- Attribute Values

W- Random Weight

B- Bias Weight

H<sub>LV</sub> – Hidden Layer Value

These values are then used in the equation 3 below to estimate the hidden layer value through the use of the values achieved from the equation 2 and 3 given above. The output layer values are used along with the target values in the equation 4 given below to achieve the error rate. This error rate is calculated and returned as the probability value.

$$\text{Error Probability} = \sum \frac{1}{2} (T_0 - O_L)^2 \quad (4)$$

Where,

T = Target Values

O<sub>L</sub> = Output Layer Values

These probability values are then stored as an DBN probability list which is sorted in the ascending order of the probability values. All the achieved value is then added to the end of the respective row of the DBN Prediction score list. The list is then provided to the next step for classification.

The process of Hidden layer estimation is depicted in algorithm 1.

---

ALGORITHM 1: Hidden Layer Estimation

---

//Input: Cluster List C<sub>L</sub>, Weight set W<sub>S</sub> = { }

//Output: Hidden Layer value list H<sub>LV</sub>

hiddenLayerEstimation (C<sub>L</sub>, W<sub>S</sub>), index=0

1: Start

2: H<sub>LV</sub> = ∅ { Hidden Layer value}

3: *for* i=0 to size of C<sub>L</sub>

4:     ROW = C<sub>L</sub>[i]

5:     *for* j=0 to size of ROW

6:         X=0

7:         *for* k=0 to N [ Number of Neurons]

8:             ATR=ROW[j]

9:             X = X + (ATR\* W<sub>S</sub>[index])

10:             index++

11:         *end for*

```
12:     HLV=reLUmax(0, X)
13:   end for
14: end for
15: return HLV
16: Stop
```

---

*Step 5: Decision Making* –The probability values attained in the preceding step are being used as an input in this step for classification of the methodology. The decision making is an effective classifier that completely classifies the input variables. This is achieved through the use of the if-then rules that segregate the probability scores accurately. The maximum and minimum values of the probability are extracted and an average value is measured by subtracting these values and dividing this value by 2. The probability values are subjected to comparison with this average value, if the values are more than or equal to the average, the values are added to the decision making list. This is achieved for all the rows of the dataset and the resultant list is subjected to unique value extraction which displays the results of the locations where it has been analyzed to be unsafe for the women through the tweets.

#### IV. RESULT AND DISCUSSIONS

The proposed methodology for the purpose of achieving the analysis of woman safety through the use of Deep Belief Neural Networks and Decision Making has been realized in the Java Programming language. For coding the proposed approach, the NetBeans IDE has been used. The machine for the deployment of the technique has been powered by a laptop consisting of an Intel Core i5 processor and 8GB of RAM along with 1TB of hard drive storage. The MySQL database server has been utilized to attain effective management and storage of the data.

The extensive experimentation has been directed to evaluate the performance of the presented technique as it is one of the most vital components for assessing the system. The error managed by the system extracts the practicality of the approach to realize a much better understanding of the given approach.

The Mean Reciprocal Ratio is being used for the purpose of achieving the evaluation. This system provides a suggestion for the summary for the tour route which needs to be assessed by a human being. This can be attributed to the fact that the human being can accurately identify if the summary is appropriate or not.

Therefore, for evaluating the outcome of the accuracy of the analysis, a group of 10 users are assigned to test the system by supplying different words to the system. This is performed repeatedly and the ranks for the analysis provided by the system are recorded. The results in the form of women's safety analysis have been validated by the users to determine their accuracy.

The analysis delivered by the system is ranked by the users. The ranking is given in the range of 6 to 1, where 6 is the most inaccurate analysis, and 1 is the most accurate analysis. These ranks are provided to the output generated by the system and an effective reciprocal of these ranks is measured. This is calculated by transforming the rank 2 as  $\frac{1}{2}$  and rank 3 as  $\frac{1}{3}$  etc., and the rank 6 is designated as 0. These attained values are listed in the table 1 given below.

User	Women Safety Analysis Rank
1	1
2	1
3	1
4	1
5	0.5
6	1
7	0.5
8	1
9	1
10	1
<b>MRR</b>	<b>0.9</b>

Table 1: User Mean Reciprocal Ratio (MRR) for women safety analysis

F

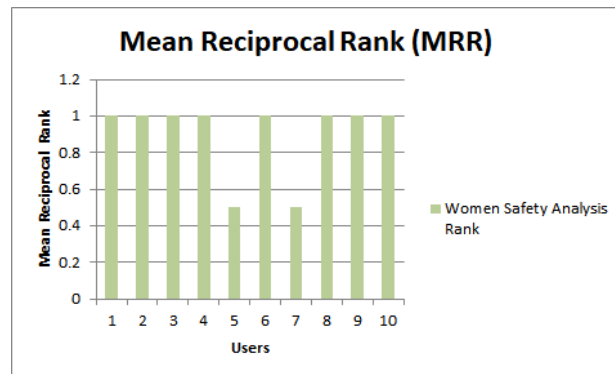


Figure 2: Graphical Representation of the MRR Values

The outcomes tabulated in the table 1 above are exposed to the line graph creation and the graph is illustrated in the figure 2 given above. As it is apparent from the graph, it can be realized that the accuracy of the analysis provided by the system for the women safety is reasonable as it manages a MRR of 0.90. The women safety analysis is highly accurate and can be exceptionally useful in providing the much needed evaluation to women through the valuable analysis based on the input tweets through the application of deep learning approaches.

### V. CONCLUSION AND FUTURE SCOPE

The presented approach for analysis of Women safety has been attained through the use of Deep Belief Neural Networks and Decision making methodologies. The safety of women has been a top priority for law enforcement authorities. These methods have proven to be quite efficient in minimizing incidents, but they have not as effective in enhancing female security. This causes the ladies a great deal of frustration and trauma, which is unwelcome and must be addressed. For this purpose a data set is provided as an input to this proposed system which is first read through the JXL library and preprocessed. This preprocessing process eliminates all the irrelevant and redundant data from the dataset and provides it for the labeling procedure. The labeling procedure converts the data into their effective integer formats which can be useful for the further processing. The preprocessed and labeled dataset is then clustered through



the use of Linear clustering algorithm. The cluster list is sorted and then provided to the next step for processing. The Bag of Words approach is also implemented to analyze the key words for identification of abuse of women. The clusters are effectively extracted and provided for Neuron creation in the Deep Belief Neural Network module. The Deep Belief Neural Network then effectively achieves the probability scores which are further classified by the decision making to achieve the accurate women safety analysis. The approach achieved respectable scores through the use of the Mean Reciprocal Rank for the performed analysis.

The future improvements in this research work can be made in the direction of implementing the women safety analysis system as a web application for easier access.

## REFERENCES

- [1] A. Z. M. TahmidulKabir, A. M. Mizan, and T. Tasneem, "Safety Solution for Women Using Smart Band and CWS App," 2020 17th International Conference on Electrical Engineering/Electronics, Computer, Telecommunications and Information Technology (ECTI-CON), 2020, pp. 566-569, doi: 10.1109/ECTI-CON49241.2020.9158134.
- [2] N. Viswanath, N. V. Pakyala and G. Muneeswari, "Smart foot device for women safety," 2016 IEEE Region 10 Symposium (TENSYP), 2016, pp. 130-134, doi: 10.1109/TENCONSpring.2016.7519391.
- [3] S. R. Mahmud, J. Maowa and F. W. Wibowo, "Women empowerment: One stop solution for women," 2017 2nd International conferences on Information Technology, Information Systems and Electrical Engineering (ICITISEE), 2017, pp. 485-489, doi: 10.1109/ICITISEE.2017.8285555.
- [4] S. Priyanka, Shivashankar, K. P. Roshini, S. P. Reddy and K. Rakesh, "Design and implementation of SALVUS women safety device," 2018 3rd IEEE International Conference on Recent Trends in Electronics, Information & Communication Technology (RTEICT), 2018, pp. 2438-2442, doi: 10.1109/RTEICT42901.2018.9012442.
- [5] Muskan, T. Khandelwal, M. Khandelwal and P. S. Pandey, "Women Safety Device Designed Using IoT and Machine Learning," 2018 IEEE SmartWorld, Ubiquitous Intelligence & Computing, Advanced & Trusted Computing, Scalable Computing & Communications, Cloud & Big Data Computing, Internet of People and Smart City Innovation (SmartWorld/SCALCOM/UIC/ATC/CBDCom/IOP/SCI), 2018, pp. 1204-1210, doi: 10.1109/SmartWorld.2018.00210.
- [6] D. Chand, S. Nayak, K. S. Bhat, S. Parikh, Y. Singh and A. A. Kamath, "A mobile application for Women's Safety: WoSApp," TENCON 2015 - 2015 IEEE Region 10 Conference, 2015, pp. 1-5, doi: 10.1109/TENCON.2015.7373171.
- [7] N. R. Sogi, P. Chatterjee, U. Nethra and V. Suma, "SMARISA: A Raspberry Pi Based Smart Ring for Women Safety Using IoT," 2018 International Conference on Inventive Research in Computing Applications (ICIRCA), 2018, pp. 451-454, doi: 10.1109/ICIRCA.2018.8597424.
- [8] M. Mahajan, K. Reddy and M. Rajput, "Design and implementation of a rescue system for safety of women," 2016 International Conference on Wireless Communications, Signal Processing and Networking (WiSPNET), 2016, pp. 1955-1959, doi: 10.1109/WiSPNET.2016.756648
- [9] A. Alrashdan, N. A. Saud, L. Almalik, D. A. Saud and N. Aljawini, "Car's Seat Belt Design based on Pregnant Women Anthropometry," 2019 IEEE 6th International Conference on Industrial Engineering and Applications (ICIEA), 2019, pp. 214-217, doi: 10.1109/IEA.2019.8715214.
- [10] R. R. Khandoker, S. Khondaker, Fatiha-Tus-Sazia, F. N. Nur and S. Sultana, "Lifecraft: An Android Based Application System for Women Safety," 2019 International Conference on Sustainable Technologies for Industry 4.0 (STI), 2019, pp. 1-6, doi: 10.1109/STI47673.2019.9068024.
- [11] V. Hyndavi, N. S. Nikhita and S. Rakesh, "Smart Wearable Device for Women Safety Using IoT," 2020 5th International Conference on Communication and Electronics Systems (ICCES), 2020, pp. 459-463, doi: 10.1109/ICCES48766.2020.9138047.
- [12] D. Kumar and S. Aggarwal, "Analysis of Women Safety in Indian Cities Using Machine Learning on Tweets," 2019 Amity International Conference on Deep Belief Intelligence (AICAI), 2019, pp. 159-162, doi: 10.1109/AICAI.2019.8701247
- [13] S. Ahir, S. Kapadia, J. Chauhan and N. Sanghavi, "The Personal Stun-A Smart Device For Women's Safety," 2018 International Conference on Smart City and Emerging Technology (ICSCET), 2018, pp. 1-3, doi: 10.1109/ICSCET.2018.8537376.



INNO  SPACE  
SJIF Scientific Journal Impact Factor

Impact Factor: 8.165

 **doi**<sup>®</sup>  
**cross** **ref**

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN COMPUTER & COMMUNICATION ENGINEERING

 9940 572 462  6381 907 438  [ijircce@gmail.com](mailto:ijircce@gmail.com)



[www.ijircce.com](http://www.ijircce.com)

Scan to save the contact details