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Neural & AI

Study on Basic Understanding

Multi-Attribute Decision-Making

Highlights

Enhancing Road Traffic Safety

Quality of Protection Environment

Discovering Thoughts, Inventing Future

VOLUME 19 ISSUE 4 VERSION 1.0

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Neural & Artificial Intelligence

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On Application of Artificial Neural Networks to Control Quality of Protection Environment

By Vladimir N. Ageyev

Abstract- The principles of constructing artificial neural networks for a quality control system for the operation of ship equipment related to environmental protection are considered. The concentration of harmful substances in exhaust gases and bilge waters depends on many factors related to both the condition of the equipment and external conditions. Analytically describing this dependence is extremely difficult, therefore, it is proposed to use artificial neural networks to monitor the state of equipment. The paper describes how to create a neural network such as a self-organizing feature map and methods for its training.

Keywords: environmental protection, monitoring, artificial neural network, training of the neural network.

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Introduction

Intensive use of fuel is accompanied by significant environmental pollution. The increasing spread of pollutants from fuel combustion, especially the emission of sulfur oxides into the atmosphere, is causing increasing concern, and this problem is compounded as global fuel consumption increases.

Despite the numerous studies conducted in the direction of combating environmental pollution, many issues remain unresolved. In particular, an important task remains the search for quality control methods for ship power plants and the development of modern means of analysis and processing of measurement results of various parameters characterizing the state of ship equipment and its impact on the environment.

In this regard, the urgent task is to identify factors affecting the appearance of harmful emissions, as well as the development of methods for monitoring the technical characteristics and operation modes of power plants and their elements in order to predict the occurrence of undesirable consequences associated with environmental pollution.

One of the main toxic components of exhaust gases is sulfur oxides. Based on an analysis of the literature, it was found that the combustible substance of a fuel consists mainly of three chemical elements: carbon, hydrogen, and sulfur. During combustion, oxygen combines rapidly with these combustible elements, accompanied by heat.

For the vast majority of fuels, only carbon and oxygen are important, since the sulfur content is too low to make a significant contribution to the heat generation. However, from the point of view of air pollution by combustion products, sulfur dioxide occupies the first place by mass. Sulfur oxides are formed during the burning of sulfur-containing fuels. The main sulfur oxide formed during the combustion of sulfur-containing fuel is sulfur dioxide (SO_2) and only 5-7% mole falls on sulfur trioxide (SO_3).

An analysis of literary sources over the past few years allows us to conclude that the study of the problem of environmental pollution comes down either to the search for new cleaning technologies, or to modernize, improve existing systems and methods. There are relatively few works related to the problem of diagnostics, the identification of relationships between the operating conditions of marine equipment and environmental pollution. However, this kind of research is of interest from the point of view of organizing the quality control of the cleaning systems and predicting the possible onset of undesirable consequences for the environment.

In order to be able to quickly influence the state of the environment, or at least to predict its changes, it is necessary to have a mathematical model that describes the relationship between the parameters of the power plant and the amount of harmful substances in emissions. However, as was said above, these relations are essentially nonlinear and very difficult to formalize.

The fact is that the amount of harmful substances in the emissions of a power plant depends not only on the cleaning method used and the type of treatment equipment, but also on many other factors, such as equipment wear, quality of the fuel used at the moment, ambient temperature, etc.

A power plant can be considered as a dynamic system, the state of which at each moment of time is characterized by a set of output parameters that can affect the state of the environment. The task of optimal control of such a system is to find input control actions, some integral indicator characterizing the damage to the environment is minimized.

To solve such a difficult formalized problem, two main approaches are traditionally applied. The first is associated with the use of expert systems, the basis of which is the knowledge base of the subject area under consideration. This knowledge base contains a set of rules of the form "if ... then ..." and a set of rules for constructing a chain of logical conclusions leading to the desired solution.

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Another approach is based on the use of neural networks [1]. An important property of a neural network is the ability to learn and to generalize the knowledge gained. Trained on a limited set of training samples, it summarizes the accumulated information and produces the expected response in relation to data that was not processed in the training process. The most suitable type of neural network for solving this problem is a self-organizing map of Kohonen signs [2].

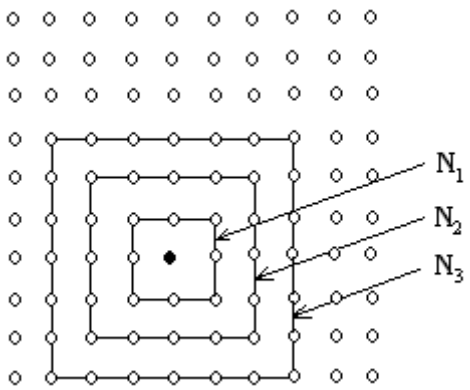
Consider some technical system or device, the state of which at each moment of time is described by a set of n real numbers, the range of possible values of which is given. We call this set the vector of n-dimensional space and denote

$$x = [\xi_1, \xi_2, \dots, \xi_n] \in \Re^n. \quad (1)$$

If the minimum and maximum possible values of these parameters are known, then they can be normalized, that is, go to dimensionless quantities whose values lie in the interval (0,1). We assume that all components of vector (1) satisfy this condition.

As components of the vector x, all device parameters available for measurement (power, crankshaft speed, air flow, etc.) and environmental parameters (temperature, pressure, humidity) can be used. This set should contain both examples of standard situations when the amount of harmful substances is within acceptable limits during the system's operation, and when measures are taken where the emission of harmful substances is higher than the permissible one. In some cases, abnormal situations can be reproduced during system tests, but in a number of cases it is too expensive to simulate serious failures. In such cases, emergency situations have to be modeled.

The division of the input signal vectors into subgroups is called the clustering problem. This problem can be solved using the Kohonen network, which is an effective software tool for visualizing multidimensional data. The network converts nonlinear statistical relationships between multidimensional data into simple geometric relationships between the points representing them on a low-dimensional display device, in the form of a regular two-dimensional grid of nodes, an example of which is shown in Fig. 1.



Fin.1: Kohonen Self-Organizing Feature Map 10x10 in size. For a node highlighted in color, its topological neighborhoods N1, N2, N3 are shown

The nodes of the output layer are numbered in a certain order, for example, in turn from left to right and from top to bottom. Each neuron of the output layer is associated with each input element, to which the input signals $\xi_1, \xi_2, \dots, \xi_n$ are applied.

Initially, n weight coefficients (according to the number of input parameters) are assigned to each neuron – the vector mi (0), i = 1,2, ..., k, where k is the number of nodes. In the learning process, for each vector x from the training set, the index c of that neuron is found, the weight vector of which is closest to the given:

$$c = \arg\min_i \{\|x - m_i\|\},$$

where || x - mi || – Euclidean distance between vectors.

The weighting coefficients of this neuron, as well as the closest to it (see Fig. 1), change according to the formula

$$m_c(t+1) = m_c(t) + h_{ci}(t)[x(t) - m_i(t)],$$

where t = 0, 1,2, ... is the discrete time, $h_{ci}(t)$ is a certain neighborhood function that monotonically decreases to zero (smoothing core).

In the learning process, the weighting factors are ordered and the map is divided into a number of areas (clusters), which at the end of the training can be marked out (for example, by coloring them with different shades of gray),

indicating acceptable combinations of the measured parameters and those that lead to deviations from the norm. If now we send a signal with data on the state of the controlled system to the network input, a neuron with a weight vector will be found, the closest to the input vector and a point in one or another cluster will be displayed on the map. Thus, it becomes possible not only to evaluate the current state of the equipment, but also to predict its behavior.

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Research Study on basic Understanding of Artificial Neural Networks

By Pritom Bhowmik
Institute of Engineering & Management

Abstract- Artificial neural networks are a computing system inspired by human neuron, designed to simulate the way human brain analyzes and processes information. They are the foundation of artificial intelligence and machine learning technology. This research paper focuses on the basic understanding of Artificial neural networks. ANN create a lots of excitement in Machine learning research and that results a huge development on many AI and machine learning systems like text processing, speech recognition, image processing. Neural networks consist of input and output layers, in many cases hidden layer consisting of units that transform the input into something that the output layer can use. They are essential tools for finding patterns which are far too complex or numerous for a human programmer to extract and teach the machine to recognize.

Keywords: *artificial neural network, artificial intelligence, neuron, perceptron model, back propagation, sigmoid.*

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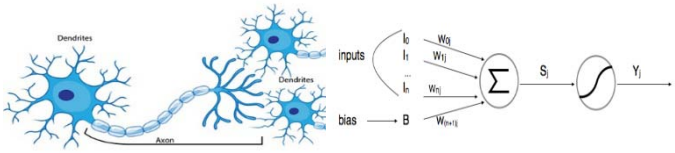

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I. Introduction

A human brain is highly complex, non-linear and parallel computer but it computes in an entirely different way from the conventional digital computer. Human brain can perform certain computations like motor control, recognition & perceptions much faster than the fastest digital computer in existence today. And to perform such tasks, human brain has the capability to organize brain's structural constituents, known as neurons. Artificial Neural networks are typically organized in layers. Layers are made up of a number of interconnected nodes which contain an activation function. Patterns are presented to the network via the input layer, which communicates to one or more hidden layers where the actual processing is done via a system of weighted connections.

Neurons in a neural net can be viewed as nodes in a layer network, but as a node in a neural net the neuron not only sums up the weighted inputs from other nodes in one of the neighboring layers but also performs a nonlinear transformation on the summation, then the output of this neuron will be sent to all neurons in the next layer with links to it. Nodes or computational elements in neural nets are nonlinear and typically realized by analog circuits. Different types of nodes, distinguished by types of nonlinearities, can be used in one network. So there are three key factors for specifying a neural net:

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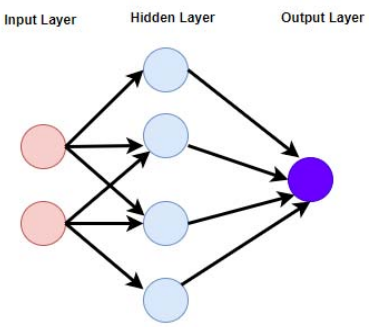
The net topology: Topological factors include feed forward type network or feedback type network, the number of layers, and the number of nodes in each layer.

The weights specification: There are two cases: predetermined weights and adapted weights. Adaptation or learning is the main feature of artificial neural nets. The ability to adapt and continue learning is essential in areas such as speech recognition.

The type of nodes (neurons): Different nonlinearities realized by analog circuits or more complex mathematical operations realized by digital circuitries can be considered. The type of neurons also determines the time feature of the network operation: the nodes operate continuously or at discrete amounts of time.

II. A Simple Artificial Neural Network

Artificial Neural Networks are relatively crude electronic models based on the neural structure of the brain. And the brain basically learns from experience. Artificial neural network is the basic tools used in machine learning. A neural network consists of input layers, hidden layers, output layers. A hidden layer is consisting of units that take data from input and process so that output layer can use it.



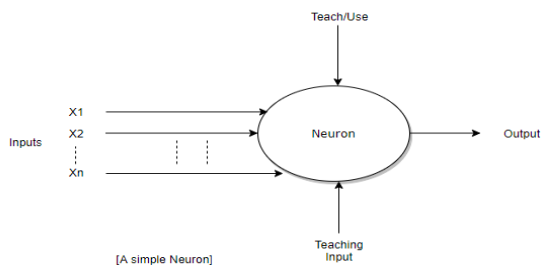
Neural networks are sometimes described in term of their depth, number of layers have between input and output. They are also described by the number of hidden nodes the model has. Also by the number of input output each of the node has.

III. An Artificial Neuron

The basic unit of computation in a neural network is the neuron, often called a node or unit. It receives input from some other nodes, or from an external source and computes an output. The working of an artificial neuron is completely different from human brain's neuron. An artificial neuron is a device with many inputs and one output. Training mode and using mode; are two modes of operation for an artificial neuron. In training mode, the neuron can be trained to fire or not to fire for a particular input patterns. In using mode, when trained input pattern in input, its associated output becomes the current output. But if the input pattern does not match with the pattern the neuron knows, means the input pattern does not belong in the taught list of the neuron, the firing rule is used to determine whether to fire or not.

IV. The *Perceptron* Model

The perceptron model, proposed by Minsky-Papert, is a general computational model than McCulloch-Pitts neuron. The most basic unit of Neural Network is known as artificial neuron that works as Sigmoid. It takes input, process it, passed it through an activation function and returned the activated output.



A perception can have any number of inputs. If we take binary inputs X1, X2, ------ Xn and produce binary output which is called its activation. Now the amount of influence each of the input has over output is weight (W). So X1 has a weight W1, X2 has a weight W2, Xn has a weight Wn. We take the weighted sum of each of the inputs and can determine if it is above or below a certain threshold. The formula can be presented by this.

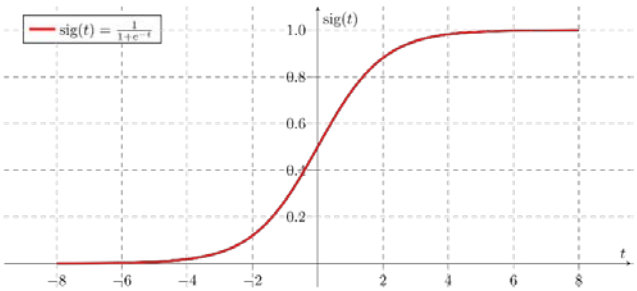
$$\text{Output} = \begin{cases} 0 \text{ if } \sum_j w_j x_j \leq \text{Threshold} \\ 1 \text{ if } \sum_j w_j x_j > \text{Threshold} \end{cases}$$

In this formula, Output is the activation of the perception. Output=0 presents the weighted sum is less or less than equal to the Threshold and output=1 presents the weighted sum is greater than the threshold.

V. A Single Neuron's Operation

A neuron's operation follows by perceptron model. Each neuron adds up the value of every neuron from the previous column it is connected to. And each of the value is multiplied by the weight of that neuron before addition. Weight determines the connection between two neurons and each connection has its own weight. Now when the learning process goes on, the weights of each connection between neurons changes. Then a bias value maybe added to the total value calculated. Bias is like the intercept added in a linear equation. It is an additional parameter in the neuron and that helps the model to fit best for the given data.

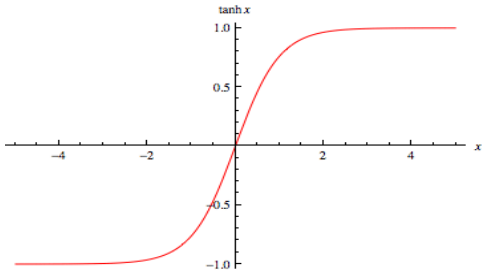
*Output = sum (weights * inputs) + bias*

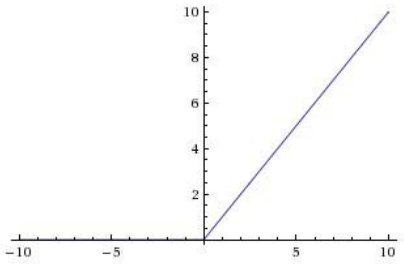


After that the neuron finally applies a function called activation function. The job of activation function is to turn the calculated output value into 0 and 1 using sigmoid function. Every activation function takes a single number and performs a certain fixed mathematical operation on it. There are several activation functions you may encounter in practice:

- *Sigmoid:* Takes a real-valued input and squashes it to range between 0 and 1

$\sigma(x) = 1 / (1 + \exp(-x))$





- *Tanh:* Takes a real-valued input and squashes it to the range [-1, 1]

$\tanh(x) = 2\sigma(2x) - 1$

- *ReLU:* ReLU stands for Rectified Linear Unit. It takes a real-valued input and thresholds it at zero (replaces negative values with zero)

$f(x) = \max(0, x)$

To compute the gradient of the cost function we use an algorithm that is known as backpropagation. This algorithm is much faster than the earlier approaches for learning and make it possible for neural nets to solve problems. The backpropagation algorithm looks for the minimum of the error function in weight space using the method of gradient descent. The combination of weights which minimizes the error function is considered to be a solution of the learning problem.

VI. Artificial Neural Networks and Beyond

Artificial Neural networks deals with big quantities of data and work on traditional computation system. ANNs or artificial neural networks work on such problems where human can perform way much better than computer system such as image recognition, handwritten recognition, face recognition etc. Computer system are not as good as to solve at these problems. But in last decades we progress significantly on Artificial intelligence or AI. And ANN is the most crucial part. Simulating human consciousness and emotion is still the realm of science fiction. Of course, there are huge philosophical arguments about what consciousness is. But scientists around the world are working on developing such AI system. Perhaps Artificial Neural Network can make it possible in future. So ANN might in near future allow robot to see, predict the world around them, improve the stock prediction, composition of music. Self-driving car is not a science friction anymore.

VII. Conclusion

Neural networks are suitable for predicting time series because ANN learn from experience. Neural Network is a complex decision making process but they are very much good at generating result. ANN emulate human brain. It plays a very key rule in some most successful machine learning algorithms. The development of Neural network teach computer to think and perform as human do. The machine learning has gain a lot from machine learning. The ability of Neural Networks to learn from experience make it very much flexible and powerful. Neural network contributes in medical industry as well. Neuro-technology, phycology. They are used to understand internal mechanism human brain and also making model parts of living organism. So Artificial Neural Networks are very promising in the field of machine learning industry. In near future we might see autonomous computer that can solve problems as human. And hope it will be used for the welfare of human being and for a better world.

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Cloud based Framework for Fake Review Detection

By Md. Towhidul Islam Robin
Stamford University

Abstract- Online reviews are one of the significant factors in a customer's purchase decision or to avail of any service. Online reviews give rise to the potential threats that fake reviewers may write a false review to artificially promote a product or defaming value of a service. Using Natural Language Processing, many methods have already been developed to detect fake reviews, especially reviews written in the English language. In this paper, I propose a novel framework where authenticity of a feedback will check through two perspectives. Firstly, the system checks whether the review is fake or not. Secondly, it also checks the authenticity of the reviewer. The outcome result accumulates in cloud storage for providing further business analytics.

Keywords: NLP, SLM, language modeling, LIWC, anagram, lexical feature.

GJCST-D Classification: F.1.m

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General Terms: natural language processing, machine learning, private cloud, cloud security, naïve byes, support vector machine.

Keywords: NLP, SLM, language modeling, LIWC, anagram, lexical feature.

I. Introduction

Online reviews generally generated for a variety of purposes. These reviews categorized into three groups, Untruthful Reviews, Reviews on Brands (comments only concerned with brand promotion), and Non-review (unrelated text or advertisements) [1]. There is a challenge to detect fake reviews because of the large verity of data and the quality level of data. Standard Machine Learning algorithms tend to inefficient because of a large number of unlabeled data. However, Fake review detection is inclined to opinion mining (find whether any opinion is positive or negative) but differs in terms of features selection. Lack of distinguishing features may outperform a robust classifier algorithm. It can also be associated with the reviewer behavior, for example, a fake review can be classified as genuine but, reviewer behavior can detect as suspicious. Therefore, features can be review centric, or features can be reviewer centric. Most common review centric features are a bag of words, LIWC (Linguistic Inquiry and Word Count), bag of words with POS (Part of Speech) tags, character and word-based lexical features, semantic features. As mentioned earlier, identifying forged reviewers can advance the accuracy of false review detection where for detecting fake reviewers most common features are the maximum number of reviews written by the reviewers.

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II. Literature Review

For identifying fake reviews Supervised, Unsupervised, and Semi-supervised methods have been used so far where most of the models based on supervised learning. Ott M [2] proposed and compared three different methods for identifying spam detection. For their study, they created a new dataset using Amazon Mechanical Turk. A group of people deliberately write 400 fake reviews with positive sentiment. Besides, 400 positive reviews collected from TripAdvisor. In a later work, they created same size dataset but balanced with negative comments. Their proposed model achieved 89.8% accuracy using SVM as a classifier. Another study performed by Jindal N [3] who summarized opinions from text. The result showed that characteristics of the aberrant behavior, which classified as spam. They collected 5.8 million reviews from Amazon and successfully identified fake reviews with a score of over 90%. One study by Hammad [4], first proposed review detection in Arabic language. Hammad also illustrated that their model could extend to multiple languages. A novel unsupervised learning Semantic Language Model first developed by Raymond [5]. Li [6] collected 6000 reviews from Epinions to construct a semi-supervised fake review classifier. Their model predicts the degree of untruthfulness through clustering. On the other hand, Mukharjee [7] showed that fake reviewers have different characteristics than genuine reviewers. They classified fake reviews by analyzing behavioral attributes using Yelp's real-life data.

III. Methodology

The above study observes the different researchers used different learner algorithms and performance metrics to evaluate their model.

a) Classifier

Support Vector Machine (SVM): SVM is a Linear model to map higher dimension features. For review centric features, it is needed to classify the review with different categories such as fake, genuine, biased, etc.

Naïve Byes: Probabilistic model to classify data and based on likelihood value driven from probabilistic scheming. Samples belong to a distinct class only after satisfying the threshold value.

Semantic Language Model (SLM): Unsupervised learning model to cluster data

b) Performance Metric

Area under the Curve (AUC): The region under ROC bend irregularly utilizes as a proportion of the nature of the arrangement models. An arbitrary classifier has under the turn of 0.5, while AUC for an ideal classifier is equivalent to 1. By and by, a large portion of the grouping models have an AUC somewhere in the range of 0.5 and 1.F-measure use for statistical analysis of binary classification.

Accuracy: Determines the number of correct predictions. It is the most natural presentation measure, and it is essentially a proportion of anticipated perceptions. If we have high precision, at that point, our model is ideal. Indeed, it is an extraordinary measure, yet just when you have symmetric datasets where estimations of false positive and false negatives are practically the same.

F1 Score: F1 Score is the weighted normal of Precision and Recall. Along these lines, this score considers both false positives and false negatives. Naturally, it isn't as straightforward as exactness.

IV. Proposed Cloud Model

For storing reviews for further analysis and better learning, I propose private cloud infrastructure because it requires data isolation and encrypted database. The private cloud also allows you to schedule updates and allows for direct access to your SQL database. This choice may require some contribution for inner IT. This choice can be accessible soon after buying into the administration. Integrity additionally offers the adaptability to go past our standard Cloud multi-occupant offering to have your private cloud arrangement that improves the security and confinement of your information. It is overseen by integrity, which means no licenses will require.

a) Cloud Security of Proposed Model

Private cloud security requires every one of the segments of a conventional resistance inside and out a methodology for ensuring strategic frameworks. Notwithstanding these accepted procedures, there are suggestions and provokes one of a kind to a private cloud that ought to consider. If it resolves that the information being put away in the private cloud is strategic, then further developed security systems might be required. It is an arrangement of activities, advancement, and security that should be carefully taken care of with the goal that one of these viewpoints are not ignored and effectively misused. The objective is for an association to build up a propelled security engineering structure that tends to every one of these suggestions.

A center's ability of virtualization is to extract the equipment from the product enabling various occasions of the product to imitate solitary equipment. Permeability into this virtualized registering framework is significant.

Lifecycle, the board of equipment parts, temperature controls, data security, stockpiling clusters, and system gadgets are altogether factors when building a versatile foundation. At every one of these layers, there is a need to settle on choices that will decide the accessibility and unwavering quality of the proposed cloud. In cloud executions, the edge of the system is re-imagined. An association's IT group should think outside about the container and accept that the whole Internet and each article interfacing with it is currently its border. Open system availability and interoperability with different mists generally come connected at the hip with the organization of another private cloud.

Data arrangement, security, and partition together help structure an information assurance methodology. When information is arranged, it very well may be isolated into zones and ensured at the degree of security merits.

In our model cloud executions, the edge of the system has redefined. Open system availability and interoperability with different mists generally come connected at the hip with the organization of another private cloud. Data arrangement, security, and partition together help structure an information assurance methodology. When information is arranged, it very well may be isolated into zones and appropriately ensured at the degree of security it merits.

Table 1: Comparison of performance, methods, and results of fake review detection

Method	Dataset	Features Used	Features	Metric	Score
SVM [2]	Amazon Mechanical Turk	Bigrams	Review Centric	Accuracy	89.6%
LR[3]	5.8 million review from Amazon website	Product characteristics	Review Centric	AUC	78%

NB [4]	Arabic reviews from tripvisr.com	LIWC	Review Centric	F-measure	.995
SLM[5]	Review from amazon.com	Lexical Feature	Review Centric	AUC	.998
NB [6]	6000 reviews from epinions.	LIWC	Review Centric	F-measure	0.63
SVM [7]	Behavioral Features	Behavioral Features	Reviewer Centric	Accuracy	86.1%

V. Result Analysis

Most of the datasets used for the previous studies created synthetically for which their model not efficient enough for the practical scenarios. Besides, no classifier is designed for Bangla fake review detection. Again, most of the study based on either review centric or either reviewer centric, not both. Therefore, a well written fake feedback may deceive such classifies. If review authenticity can check through a reviewer perspective, it may give better result. By analyzing the ratio of reviews from a particular vendor may help the user to become careful when availing services from them. It also helps the commercial organization to identify potential frauds who try to defame their reputation.

VI. Proposed Framework

In my proposed system, users have to give input to the system, including reviewer information. Features will extract for both review and reviewers and classify as fake whether the content is fake or the reviewer profile is not genuine. Store the result, including primary input into the cloud. After analyzing cloud data, the system can provide various business analytics.

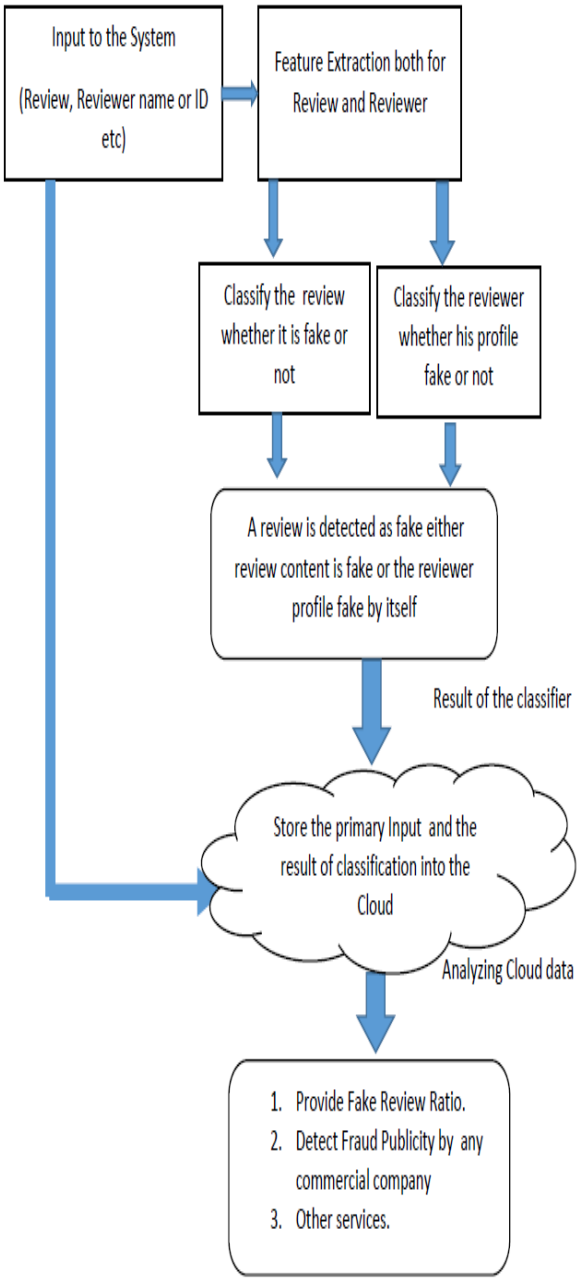

Figure 1: Conceptual block diagram of proposed fake review detection System

VII. Conclusion

Fake review detection has a significant impact on consumer behavior and purchasing decisions. To date, there is no cloud-based review detector exists, which can affect the decision of a potential consumer. Although the proposed system is just a prototype, many practical issues may arise when it will implement in real-world scenario.

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Enhancing Road Traffic Safety in- Kenya using Artificial Neural Networks

By Billington Muchiri, Dr. Solomon Mwanjele & Ms Grace Mwaura

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Abstract- The world loses a human live in every 24 second due to Road Traffic Accidents (RTAs). In Kenya approximately 3000 lives are lost annually due to RTAs. The interventions to improve road traffic safety (RTS) failed because they were not informed by any scientific research. In this paper we employed the multi-layer feed forward perceptron neural network model to classify the road traffic safety status (RTSS) as:-excellent, fair, poor or danger states which model's output are. We considered the vehicle internal factors that contribute to RTAs as model's inputs which included:-inside-vehicle-condition, entertainment, safety-awareness, passager's (attention, criminal-history, health-history, movement inside vehicle, body posture, frequency of journey, drunkenness', drug-influence, use-of-mobile-phone and load), luggage-type and the safetybelt. The model was trained, tested and validated with classical data collected from a sample of 1000 respondents from road traffic safety authority (RTSA) experts in Kenya.

Keywords: traffic, safety, neural-network, policy, model, MSE.

GJCST-D Classification: F.1.1

Strictly as per the compliance and regulations of:

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Abstract- The world loses a human live in every 24 second due to Road Traffic Accidents (RTAs). In Kenya approximately 3000 lives are lost annually due to RTAs. The interventions to improve road traffic safety (RTS) failed because they were not informed by any scientific research. In this paper we employed the multi-layer feed forward perceptron neural network model to classify the road traffic safety status (RTSS) as:-excellent, fair, poor or danger states which model's output are. We considered the vehicle internal factors that contribute to RTAs as model's inputs which included:-inside-vehicle-condition, entertainment, safety-awareness, passager's (attention, criminal-history, health-history, movement inside vehicle, body posture, frequency of journey, drunkenness', drug-influence, use-of-mobile-phone and load), luggage-type and the safety-belt. The model was trained, tested and validated with classical data collected from a sample of 1000 respondents from road traffic safety authority (RTSA) experts in Kenya. Forty three input variables and four output variables were probed. Several Neural networks architectures were examined and compared by minimum squared Error (MSE) achieved, mean-correct-classification-rate, precision and recall. A multi-layer perceptron neural network with learning rule backpropagation, 15 hidden neurons, momentum value 0.7 and a learning rate 0.5,maximum error 0.01,with weighted summation and sigmoid activation functions was able to accurately classify the RTSS and achieved the best Performance with classification accuracy exceeding 76%, high recall and high-precision. This Road Safety enhancing model can be applied for informing RTS policies and decisions hence reducing RTAs.

Keywords: traffic, safety, neural-network, policy, model, MSE.

I. Introduction

According to (*(K.N.B.S),* 2017) road traffic accident statistical abstracts,3000 persons die while approximately 14,000 persons are injured annually due to RTAs. The vehicles involved on RTAs are approximately 9,000. The levels of disability caused by RTAs are on rise. Economically Kenya incurs a loss of approximately US$50 million annually according to (Mutune Peter Kasau, Prof. Eng. G. N. Mang'uriu, Dr. Stephen Diang'a, 2017), due to RTAs.

According to (Consolata Wangari Ndung'u, Ratemo Matayo Bonface and Lydia K. Mwai,2015), the government of Kenya introduced key changes on Road Traffic Sector which included: fitting of speed governors in all PSV's and commercial vehicles whose weight limit should not exceed the 3,048 kilograms, speed limit of 80 kilometers per hour, fitting of seat belts on all vehicles, employment of drivers and conductors on permanent basis, indication of route details and painting of a yellow band on Matatus (a passenger Vehicle) for purposes of easy identification, re-testing of drivers after every two years and approval of all driver's identification by the police and also ban on night travelling. It also launched a six-month Road Safety Campaign in 2003 and declared war on corruption, which contributes and indirectly to the country's unacceptably high levels of RTAs. These policies failed to deliver the expected results which compelled the government to resort to intermitted crackdown on the public service vehicles in an attempt to reduce the RTAs. The crackdown increased the level of corruption which led to increased RTAs. The traffic act was amended to introduce the safety belt and blood alcohol level laws. The aim was to enhance the safety of passengers and ensure the drivers were always sober while driving. The inspection of road vehicles was also introduced. The government enacted the National Transport Safety Authority (NTSA) Act in 2012.The NTSA was mandated to ensure the safety of the roads was enhanced and managed well. This was to be achieved through registration road vehicles, licensing of drivers, testing the drivers, regulating the driving schools and also conducting research on road safety to provide the advice to the government on the RTS policies and also implementing of road safety policies. Under the NTSA people are still losing lives, the properties destroyed due to RTAs. This is attributed to the implementations of policies which are not informed by a scientific research.

An accurately classification of RTSS of inside the vehicle conditions using the artificial neural network can ultimately enhance the RTS and prevent the loss of human lives. By knowing the current safety state of vehicle, the necessary precautions can then be taken in advance to prevent an occurrence of RTA. According to (Maja Urosevic,2018), the trained neural network is an expert in the category of information it has been given to analyze, this expert can then be used to classify the RTSS of vehicle dynamically and give alerts in real time averting an impending occurrence of RTA in case of poor or danger safety state of vehicle. According to (Antonio Celesti, Antonino Galletta, Lorenzo Carnevale, Maria Fazio, Aime Lay-Ekuakille and Massimo Villar),

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modern vehicles have inbuilt sensors, control devices and micro-controller chips. By leveraging this emerging technologies in automobile industry compounded by the artificial neural network as the expert while sensors as input devices and control devices as RTS regulator, the RTA can be reduced.

In this study we applied a multi-layer perceptron feed-forward trained neural network with forty three selected input variables to model and to classify RTSS outcomes to determine the safety state of vehicle to inform the RTS vehicular policies and decisions in Kenya. The purpose of this study was to examine patterns of vehicular accidents, design and develop a neural network model and evaluate the model performance on classifying RTSS.

II. Materials/Tools

Materials used in study were data, statistical programming software i.e. R, database management system i.e. Oracle Database, Neural Network Framework i.e. Neuroph Studio.

a) Data Requirements

In this research data was collected from RTAs Reports from NTSA daily and fatal reports and KNBS statistical abstracts. This data is readily available in websites. The categorical data was collected from experts in RTSA which included:-traffic police, NTSA, drivers, St John's ambulance and the public via guided questionnaires. We primarily considered the factors that contributed to RTAs as models inputs and RTS status as model's output as shown in Fig.1

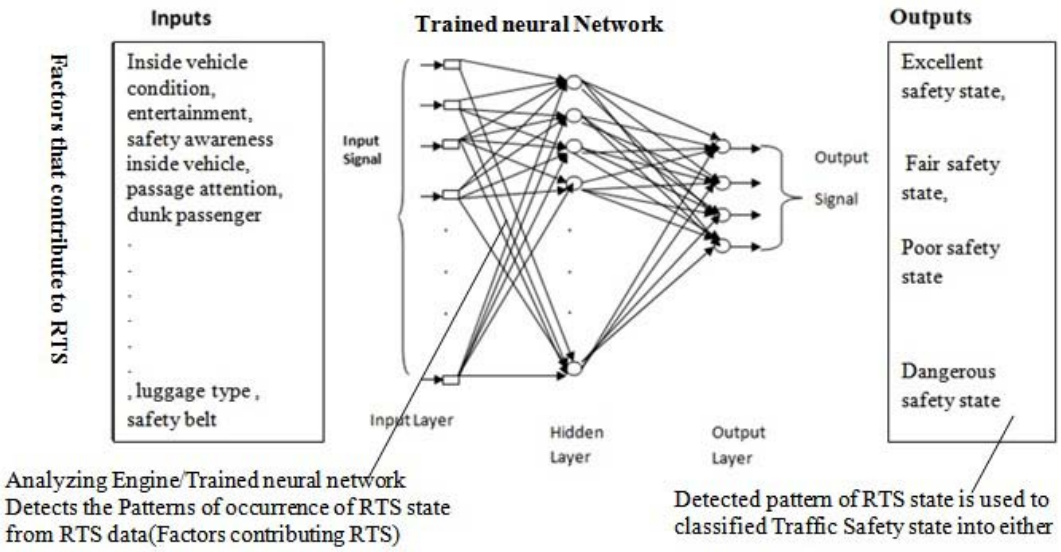

Fig. 1: The model's inputs, neural network and the outputs

b) Data Pre – Processing

The data was cleaned by screening for errors and missing data elements. We deleted samples with missing data or errors. The most common error was blank spaces in questionnaires and in correct data format in NTSA Daily fatal reports. After cleaning the data set there were 1,000 data samples from NTSA daily and fatal reports and KNBS statistical abstracts and 20,000 data sample of classical data. The major data pre-processing task required prior to development, training and testing of the neural network models was the conversion of categorical variables to binary values. All the forty three input variables were categorical. To convert the categorical variables into binary representations requires transforming a categorical variable into an equivalent number of binary variables. Binary representation of categorical variables was chosen to facilitate future reduction of model variables while minimizing the impact on model structure.

The pre-processed NTSA daily fatal road traffic reports and KNBS Road Traffic statistical abstracts data were uploaded into oracle Database for efficient data analysis as shown in Fig.2

Fig. 2: KNBS/NTSA RTAs data stored in an Oracle database 11g Express Edition

c) Road Traffic Safety Patterns in Kenya

The analysis tool applied in this paper is R which was connected to the oracle database 11g express edition as shown in the Fig 3.

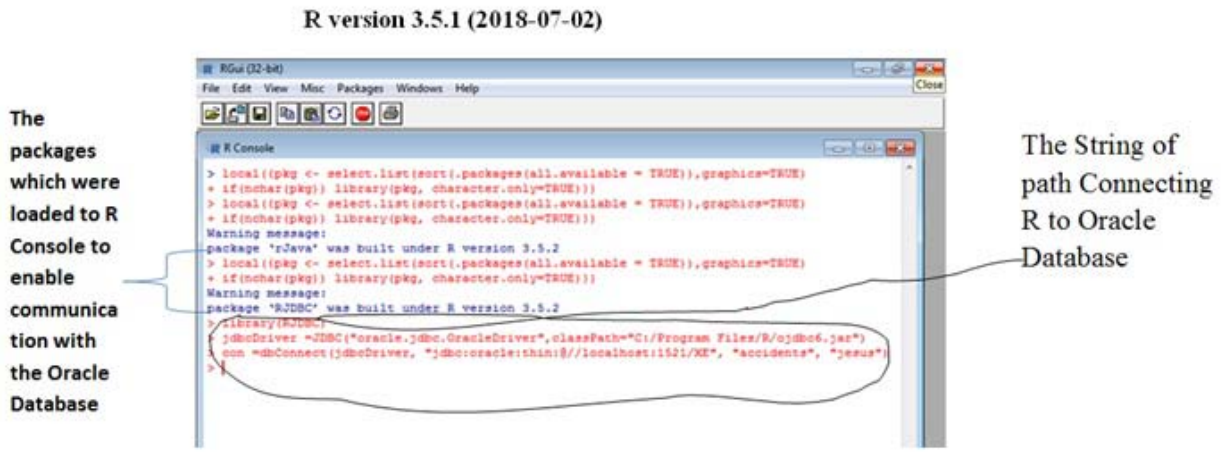

Fig. 3: Illustrates how R Version 3.5.1 was connected to an oracle database 11g Express Edition

The analysis of RTAs reports showed the following patterns:

1) According to ((K.N.B.S), 2017) road traffic accident statistical abstracts, the number of person who died per number of injured persons due to RTAs increased as shown in Fig 4.

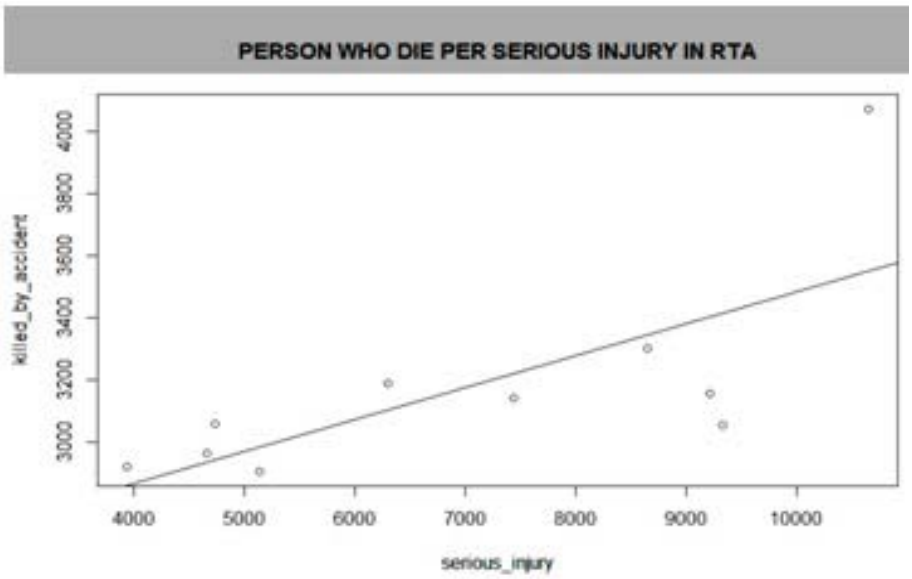

Fig. 4: Number of Persons Killed per injury due to RTAs in Kenya

This pattern was due to late reporting and response to incidences of RTAs. The poor handling of victims when freeing them from wreck and poor handling while transporting victims from scene of accident to hospital due to lack of rescue handling skills. The lack of specialized and functional equipment for diagnosing the internal injuries and extend of internal injuries. The late attendance to victims on arrival to hospital due to inadequate specialized medical personnel to attend injured victims. There was also lack of specialized expertise on trauma and accident victims. Lack of specialized technician to repair and maintain the specialized equipment. These factors have contributed to high rate of death of injured persons who could have been saved.

2) According to ((K.N.B.S), 2017) road traffic accident statistical abstracts, the pedal cycles are least involved in RTAs as shown in Fig 5.This was due to their easy to handle aspect by the riders making them ideal for busy towns to ease traffic congestion.

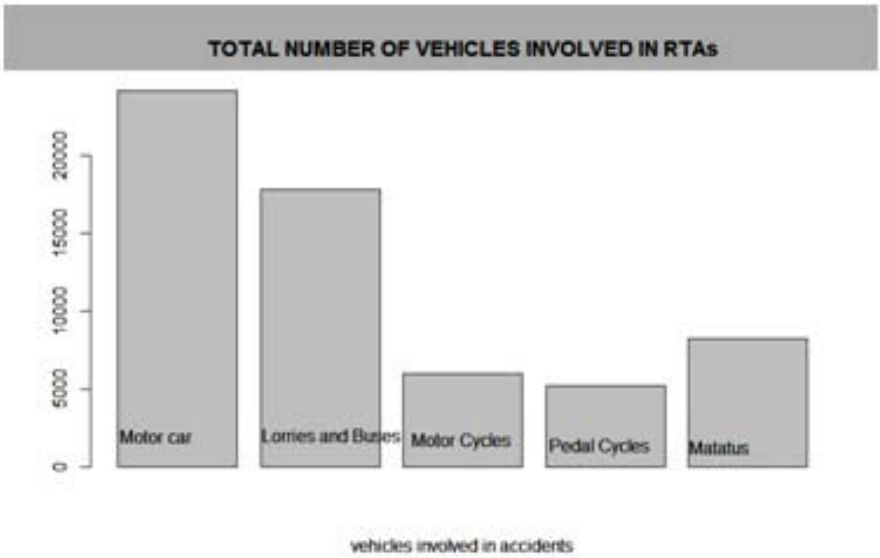

Fig. 5: Total number of vehicles involved in RTAs in Kenya

3) According to ((K.N.B.S), 2017) road traffic accident statistical abstracts, the general trend of RTS in Kenya increased as shown in Fig. 6, but there is need for further enhancement to save the 3000 lives which are lost annually and rescue the huge economic difficulties the victims go through on medications and other expenses they undergo.

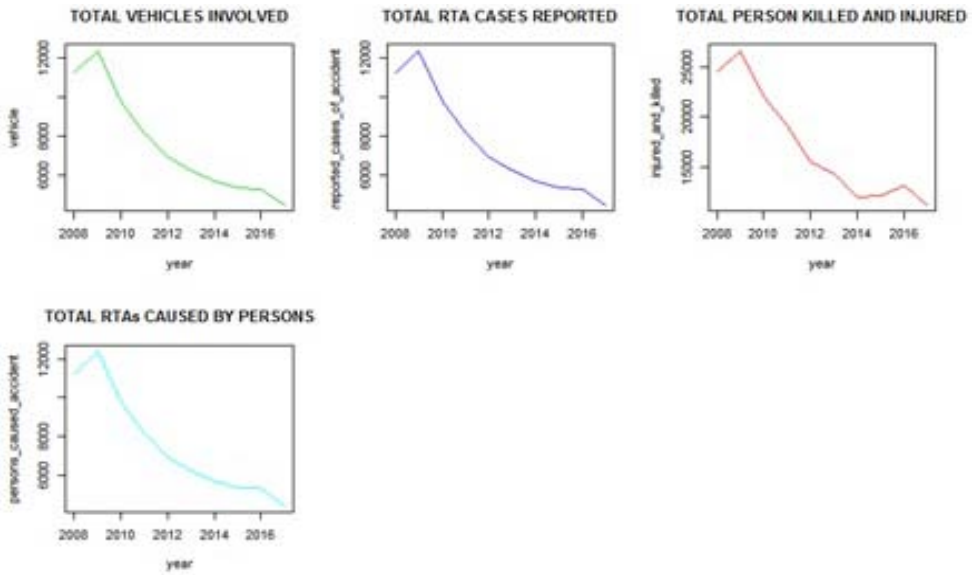

Fig. 6: Trend of Road Traffic Safety in Kenya

III. The Neural Network Model for Enhancing Road Traffic Safety

In this research we utilized a multi-layer neural network with one hidden layer of neurons. After pre-processing of classical data, there were 43 model inputs and 4 model outputs. The classical data was converted into binary number format as shown in Table 1 in the appendices for use in neural network. The number of hidden neurons are varied from 8-35 while examining the impact on model performance. The weighted summation activation function was employed for the hidden layer while the sigmoid activation function was used for the outputs. Momentum values and learning rates are varied, examining the impact on model performance. Fig.7 below highlights the general neural network architecture. Several training algorithms were explored including learning rules:- Backpropagation with momentum, Backpropagation, Resilient Backpropagation and Dynamic Backpropagation. All Neural network architectures were developed utilizing neuroph studio a java Artificial Neural Network framework. The performance metrics used to evaluate the performance of the competing neural network architectures included-: MSE achieved, number of epochs, Momentum, Learning rate, Hidden Neurons, classification accuracy, recall, precision and training.

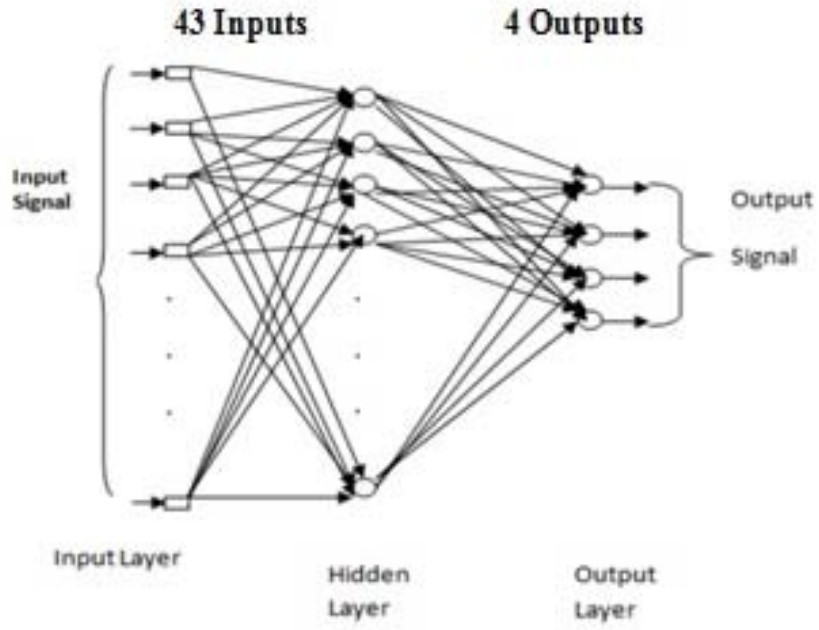

Fig. 7: Highlights of general neural network architecture

IV. Evaluation of Neural Network Architectures

The training data set was divided into 70% training, 15% testing and 15% validation to facilitate neural network model development, experimentation and performance assessment. The results of Evaluation of various neural network architectures are shown in Table 2 in the appendices. The best neural network architecture was Backpropagation, Momentum 0.7, Maximum error 0.01, learning rate 0.5, number of epochs 1, had a MSE 000166.The Resilient Backpropagation and Dynamic Backpropagation were not able to learn. The overall classification accuracy for the best model was 76.0%, it had the precision of 1.0, and the recall of 0.7666666666666667 as shown in Fig 8.

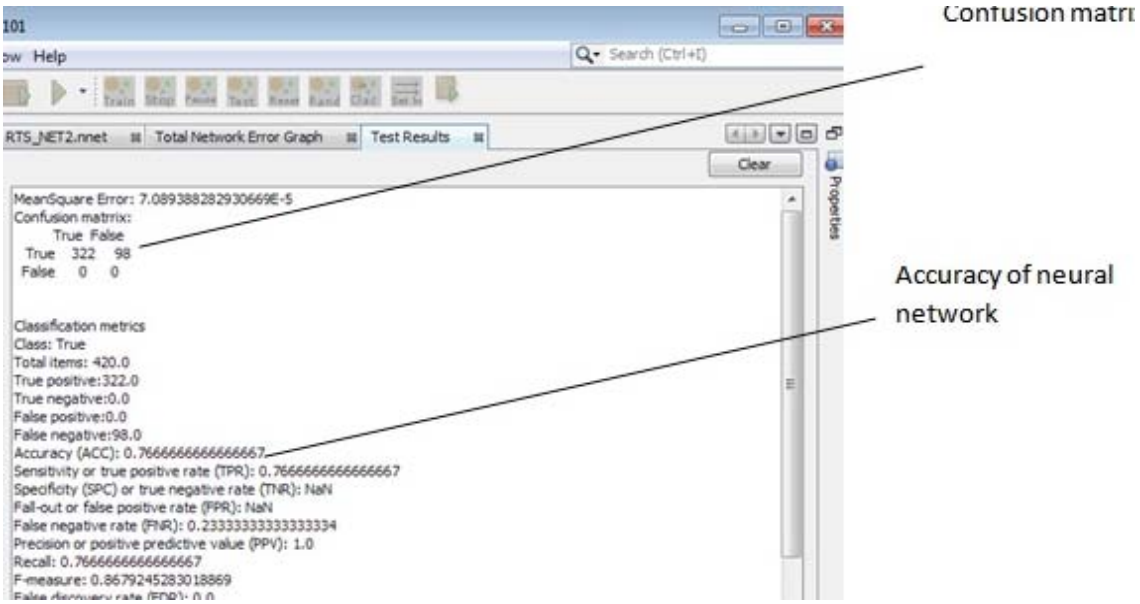

Fig. 8: Highlights the validation confusion matrix for the best model results

V. Conclusion

In this research we employed a multi-layer feedforward neural network with backpropagation learning rule to classify the Road Traffic Safety Status of Vehicle based on vehicle internal factors that contributed to RTAs. The model was trained, tested, and validated using 20,000data samples compiled from categorical data collected from experts in RTSA which included:- traffic police, NTSA, drivers, St John's ambulance and the public via guided questionnaires. Forty three input variables consist of categorical data elements including: inside-vehicle-condition, entertainment, safety-awareness, passager's (attention, criminal-history, health-history, movement-inside-vehicle, body-posture, frequency-of-journey, drunkenness', drug-influence, use-of-mobile-phone and load), luggage-type and the safety-belt. These inputs and the multi-layer neural network model were used to classify road traffic safety state as: excellent, fair, poor or danger state. The multi-layer perceptron feed forward neural network model with one hidden layer of fifteen neurons, variable learning rate of backpropagation, momentum value of 0.7, learning rate of 0.5 and weighted summation and sigmoid hidden activation functions achieved the best performance. The Resilient Backpropagation and Dynamic Backpropagation were not able to learn. Classification accuracy in most model architectures exceeded 74%. This model may be used to inform Road Traffic Safety policies and decisions. Model can be adopted in emerging vehicle automation technologies such as sensors, control devices, and micro controller chips as a safety measure hence saving loss of human lives on roads.

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Appendices

Table 1: Data Description and Definition

No.	Variable	Description	Data Type	Location	Code
1	Inside vehicle condition	Inside vehicle condition	categorical	input	Worse 1 0 0 0 Poor 0 1 0 0 Fair 0 0 1 0 Good 0 0 0 1
2	Entertainment	Entertainment	categorical	input	Low 1 0 0 High 0 1 0 Excess high 0 0 1
3	Safety awareness	Safety awareness inside vehicle	categorical	input	Lack 1 0 0 Few 0 1 0 Many 0 0 1
4	Passenger attention	Passenger attention	categorical	input	Sleeping 1 0 0 Dozing 0 1 0 Alert 0 0 1
5	Criminal history	Criminal history of passenger	categorical	input	law breaker 1 0 0 ever broken law 0 1 0 law abiding 0 0 1
6	Passenger health history	Passenger health history	Categorical	Input	no health issue 1 0 have health issue 0 1
7	Movement inside vehicle	Movement inside vehicle	categorical	input	Minimal movement 1 0 0 Much movement 0 1 0 Excessive movement 0 0 1
8	Body posture	Body posture	categorical	input	Improper sitting position 1 0 Proper sitting 0 1
9	Frequency of passenger journey	Frequency of passenger journey	categorical	input	Few number 1 0 0 Average-number 0 1 0 High number 0 0 1
10	Alcohol level of passenger	Alcohol level of passenger	categorical	input	Zero-alcohol 1 0 0 High-Alcohol 0 1 0 Addictive to alcohol 0 0 1
11	Drug influence level of passenger	Drug influence level of passenger	categorical	input	Zero influence 1 0 0 High-influence 0 1 0 Addictive to drug influence 0 0 1
12	Passenger use of mobile phone	Passenger use of mobile phone	categorical	input	Zero use of mobile 1 0 0 Occasional use of mobile 0 1 0 Excessive use of mobile 0 0 1
13	Number of passengers	Passengers load	categorical	input	Normal-size 1 0 0 Overload 0 1 0 Abnormal-load 0 0 1
14	Luggage type	Luggage type	categorical	input	Normal 1 0 0 Inflammable 0 1 0 Explosive 0 0 1
15	Safety belt fitting by passenger	Safety belt	categorical	input	fitted 1 0 not fitted 0 1
16	RTSS outcomes	RTSS outcomes	categorical	output	Excellent 1 0 0 0 Fair 0 1 0 0 Poor 0 0 1 0 Dangerous 0 0 0 1

Table 2: Results of Evaluation of various neural network architectures

Neural network architecture	Momentum	Maximum error	Hidden Neurons	Learning rate	Number of epochs	MSE	Train	Recall Rate	Accuracy %	Precision
Backpropagation with momentum	0.7	0.01	8	0.2	3	0.0010	yes	0.49	49	1.0
				0.5	1	0.000076	yes	0.74	74	1.0
				0.7	1	0.000051	yes	0.74	74	1.0
			15	0.2	1	0.00048	yes	0.74	74	1.0
				0.5	1	0.00011	yes	0.74	74	1.0
				0.7	1	0.000052	yes	0.74	74	1.0
			25	0.2	1	0.00032	yes	0.74	74	1.0
				0.5	1	0.00007	yes	0.74	74	1.0
				0.7	1	0.000033	yes	0.74	74	1.0
			35	0.2	1	0.00021	yes sec	0.74	74	1.0
				0.5	1	0.000049	yes	0.74	74	1.0
				0.7	1	0.000018	yes	0.74	74	1.0
Backpropagation	0.7	0.01	8	0.2	1	0.001365	yes	0.49	49	1.0
				0.5	1	0.0002361325	yes	0.49	49	1.0
				0.7	1	0.0000958	yes	0.49	49	1.0
			15	0.2	1	0.0000503	yes	0.74	74	1.0
				0.5	1	0.00101	yes	0.76	76	1.0
				0.7	1	0.000045	yes	0.74	74	1.0
			25	0.2	1	0.000289	yes	0.74	74	1.0
				0.5	1	0.0000677	yes	0.74	74	1.0
				0.7	1	0.0000149	yes	0.74	74	1.0
			35	0.2	1	0.000239	yes	0.74	74	1.0
				0.5	1	0.0000603	yes	0.74	74	1.0
				0.7	1	0.000028	yes	0.74	74	1.0

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Employee Culling based on Online Work Assessment through Machine Learning Algorithm

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Abstract- Job analysis, planning employee needs, recruiting the appropriate people, wages and salary management are the important theme of human resource management. Human resource management also includes evaluating performance, resolving problems, and create communication with all employees at all levels. On the other hand, Machine learning is a data analytics technique that teaches computers to do what comes naturally to humans. So through these two sectors such as computation and business administration, in this paper on employee culling based on work assessment by which machine learning algorithm such as KNN, SVM, The Decision tree can give the best result (perfect employee). We also focus on the accuracy that algorithm is performing. We marked an employee through their experience, language skills, skills, graduation, etc. we create e model by which we can get input through the companies and give them a perfect result through their requirement assessment and machine learning algorithm.

Keywords: *machine learning, employee culling, human resource management, KNN. SVM.*

GJCST-D Classification: *F.2.1*

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Khaled Redwan [α], Yeasin Ahammed [σ], Masum Akram Hridoy [ρ], Fernaz Narin Nur [ω] & A. H. M. Saiful Islam [¥]

Abstract- **Job analysis, planning employee needs, recruiting the appropriate people, wages and salary management are the important theme of human resource management. Human resource management also includes evaluating performance, resolving problems, and create communication with all employees at all levels. On the other hand, Machine learning is a data analytics technique that teaches computers to do what comes naturally to humans. So through these two sectors such as computation and business administration, in this paper on employee culling based on work assessment by which machine learning algorithm such as KNN, SVM, The Decision tree can give the best result (perfect employee). We also focus on the accuracy that algorithm is performing. We marked an employee through their experience, language skills, skills, graduation, etc. we create e model by which we can get input through the companies and give them a perfect result through their requirement assessment and machine learning algorithm.**

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I. Introduction

According to Human Resource Management, the process is culling employee, give them perfect training and development, appreciate their performance, maintain relationships, ensuring employee satisfaction, health and welfare management and maintain labor laws, etc. And now a day's machine learning is gaining the perfect analysis and prediction through data and they have the automated tools which can analyze the profile of business user. Through the machine learning algorithm, we provide the best employee to a company. In the busiest era, it is time-wasting matter to find the best employee from so many resumes and it is a challenging matter too. The HR department of any company has to put his valuable time to find an employee by a manual process if there is employee turnover in that company. So based on companies and online work requirement assessment, we have developed a model and through machine learning by which we can provide them the best employees from so many employees dataset, and thus the paper determines Employee culling based on online work assessment through the machine learning algorithm. Through our Process, we can find the best employee through the skill requirement of a client and company. The process will focus on the experience education, and the skills of an employee. This process can be a future human resource management application.

II. Related Work

In this paper, we create a model but, it has previous literature, which is known as the "Holy Grails" project to AMAZON. In which they put the information of the employee, and the algorithm will provide the best and talented one. But this company had some limitations in 2015. The company have realized their new system, which couldn't rating their candidates in a gender neutral way in the software developer jobs. The reason is the computer model have analyzed patterns in resumes which is submitted over a 10 year period. And in that tech industry most of the employees are male. At "Unilever" they select their employees through some process. They have to complete an application form. It is an easy process. They can apply through "Linked In" profile. On the application we can type many functions through varies and region. After that, they have to play 12 online analytical games. After completing the games they will receive personalized feedback. They have solve real- world problems through "Unilever" scenarios. A digital interview will occur. Where a candidate needs a suitable internet connection.

But "Unilever" has some limitations too, they got shortlisted employees but didn't get the perfect employee. [1][9].

Now the difference between manually employee selection process and employee selection through machine earning process is bellowed [1] [9].

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Step No.	Manually employee selection process	Employee selection through machine learning algorithm
1.	Identify your hiring needs	Load applicants list
2.	Analyze the position	Get input of client's requirement
3.	Evaluation, description and person specs	Mark an employee through his experience, skills, cgpa etc
4.	Develop a recruitment strategy	Mark an employee through his analytical skill
5.	Go through the applications	Put these marks in the algorithm
6.	Conduct interviews and tests and conduct a final interview	Get the employee according to the requirement

III. Methodology

Process 1: To find the best employee, we have to reduce the applicant's list through some basic requirements of the client.

Process 2: Remove those applicants who are not in the experience zone.

Through these two processes, we can reduce our dataset. Then the recruiter will provide some questions or games, and the workers have to answer it or should use their analytical skills. This exam will provide marks (50%)

The second stage is, the employee have to submit a video interview, where the assessor is not a human but a machine. The machine examines the candidates who has to answer questions for around 30 minutes. The natural language processing and body language analysis will determines who is fit for the job. This interview will provide the value of potentiality (50%) [4][7].

Total number= Mark (50%) + potentiality (50%) = 100%

Now a data set is given bellow

Number	Employee name	Marks	Potentiality
1	Jack	15	20
2	David	20	20
3	Jason	25	22
4	Francis	30	25
5	Chester	32	23
6	Marlin	35	32
7	Shuvashish	40	38
8	Arthur	42	39
9	Mary	43	40
10	Samuel	46	50

Dataset 1

Put the value GRAPH 1 where Here X-axis contains the value of Marks and Y-axis contains Potentiality

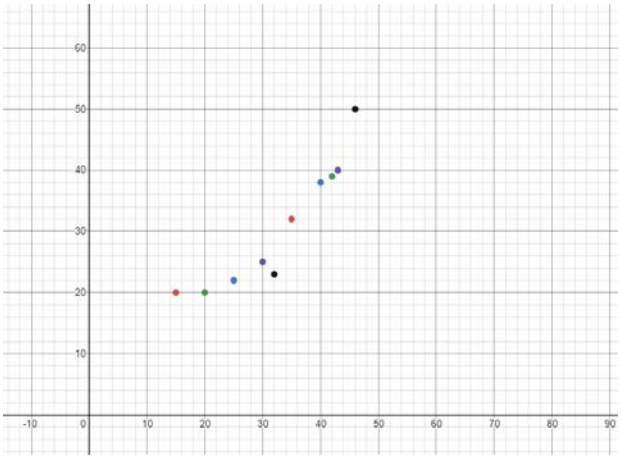

Figure 1: Graph 1

Now the client will input the value of marks and potentiality of the employee that he needs for his company.

Let the client need some of the best employees whose marks are = 40 and potentiality is= 40. And he wants to show four best employees out of 10 employees.

Here k = 4 and (x, y) = (40, 40)

Now, we have to put the point (40, 40) on the GRAPH 2

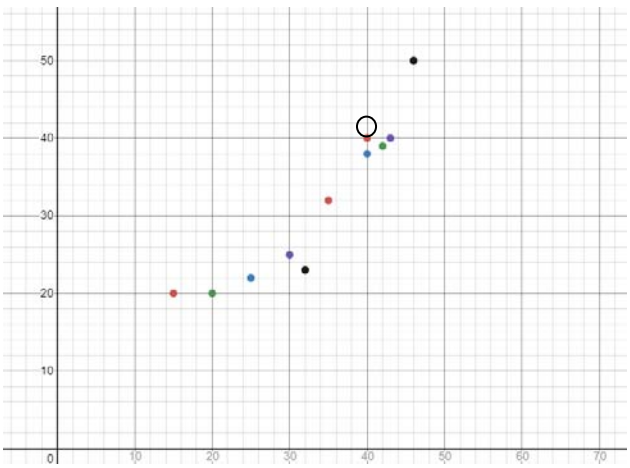

Figure 2: Graph 2

Now the K nearest neighbor algorithm will:

- Load the data
- Initialize the value = k
- For the predicted class, repeat from 1 to total number of training data points

- We have to calculate the distance between test data and training data (each row). We will use the "Euclidean distance" as our distance metric.
- We need to sort the distances in ascending order based on distance values
- We will get top k rows (from the sorted array)
- Get the most frequent class of these rows
- Return predicted class [11] [2][3]

Through this algorithm, we get Kth best employee list.

Now the process of decision tree algorithm is given bellow.

- Pick the best attribute/feature. The best attribute is one that best splits or separates the data.
- Ask the relevant question.
- Follow the answer path.
- Go to step 1 until we arrive at the answer [12]

According to the discussion, we can determine the summary of the methodology in such a process, which is defined as:

A. Load all the application list
B. Receive working tools (W) name from the client
C. Receive experience range from the client. The range should be (0<=N<=L); N= employee working experience and L = clients experience requirement
D. Remove applicants list

when W =! Skill of applicant

E. Remove applicant list

if, (0<=N<=K) is not true

F. Input the value of Marks and Potential from the client Load the final list after removing
G. Give analytical exam and a video interview by the employee
H. Input the value of K, K= the number of employee the clients need
I. Input the value of Marks and Potential from the client

Use K nearest neighbor, decision tree,

Find the employee list [8]

For accuracy, we tried a new dataset [5] [6]

Academic	CGPA	Experienc	Training	ProfessionalCer	Publications	Skill	EnglishSkill	ExtraCurricular	Availability	UserRatings
1	0.96	-0.75	0.2	2	0.2	0.7	0.92	2	1	3.48
0.6	0.925	-0.5	0.2	2	0.8	0.6	2	2	-1	2.7
0.8	0.9	-0.75	2	2	2	0.3	2	2	-1	1.85
0.8	0.9125	-1	2	2	2	2	1	2	1	2.45
1	0.82	0	2	2	0.6	1	1	2	-1	3.85
0.8	0.94	-1	2	2	2	0.9	2	2	1	2.65
0.8	0.945	0.5	2	2	2	0.9	1	2	-1	2.9
0.8	0.955	-1	0.8	2	2	0.9	2	2	1	2.65
1	0.56	1	2	1	2	0.6	2	2	1	4
0.8	0.93	-0.75	2	2	2	0.4	2	2	-1	1.9
0.8	0.955	-0.5	2	2	0.6	0.9	2	2	-1	2.85
1	0.75	1	0.4	1	1	1	2	2	-1	4
1	0.75	0.5	2	1	1	2	2	2	-1	3.3
0.8	0.9775	0	0.2	2	1	0.9	1	2	-1	3.3
1	1	1	1	1	1	2	2	2	-1	3.5
1	1	1	0.4	1	1	2	2	2	-1	3.5
0.8	0.9375	-0.75	2	2	2	0.6	2	2	1	2.5
0.8	0.8275	0	0.8	2	2	2	2	2	-1	2.1
0.8	0.89	-0.75	0.2	2	2	2	2	2	1	2.2
0.5	0.86	-0.75	2	1	2	0.3	0.785	2	1	2.55
0.6	0.8475	0	1	2	2	0.9	2	2	-1	2.35
0.5	0.925	-1	0.2	2	2	1	2	1	1	2.95
0.9	0.9	-0.75	2	2	2	0.9	0.928	2	1	3.39
0.8	0.8575	-0.75	2	2	2	0.7	2	2	-1	2.05
0.5	0.9125	0	0.2	2	2	0.9	2	2	-1	2.65
0.8	0.8625	-0.75	1	1	2	2	2	2	-1	1.7
0.6	0.6375	-0.75	0.2	1	2	0.8	0.928	2	1	2.84
0.8	0.895	-0.75	0.2	2	2	0.8	2	2	1	2.6
0.8	0.7475	0	0.4	2	2	0.8	2	2	-1	2.6
0.8	0.7875	0	2	2	2	1	2	2	-1	2.7
0.8	0.88	-1	0.2	2	2	0.4	2	2	1	2.4

Figure 3: Dataset 2

Explanation of the Dataset 2:

The attributes of the DATASET 2 given in are- Experience, Cumulative Grade Point Average, Skill,

Publication and Training and Language Proficiency. the explanation of all the attributes of Dataset 2 is bellowed.

a) Experience

According to the above-given scale, a fresher candidate gets the minimum score, which is -1 according to our range of values. A candidate with experience of more than eight years gets the maximum score, which is 1. Except for the score -0.75 for less than two years of experience, in case of all other intervals, the score changes with a step of 0.5.

Table 1: [Experience]

Number of years of experience	Score
No experience (fresher)	-1
Experience < 2	-0.75
2 < experience <= 4	-0.5
4 < experience <= 6	0
6 < experience <= 8	0.5
Experience > 8	1

b) Cumulative Grade Point Average

Scoring the CGPA is much simpler. As maximum CGPA possible is 4.00, we considered that to be one under our scoring range, which is the maximum. Any other CGPA in the scale of 4 is convert into the scale of 1.

For instance, a candidate with CGPA 4.00 gets a maximum score of 1 added to his CGPA feature. If the CGPA was 3.5 then the score would be, Score = 3.5 / 4 = 0.875

So here, the CGPA 3.5 out of the scale of 4 has got converted to 0.875, which is out of 1.

c) Skill

We have set the scoring policy depending on the types of CVs that we have come across. Candidates that have mentioned more than three skills, we fixed it to score their skills feature to be maximum that means 1. But, those who have mentioned three or less, then there we considered the degree of their skills in those areas or subjects. Which is bellowed.

Table 2: Skill

Good	Very good	Excellent
0.1	0.2	0.3

According to these criteria, suppose a candidate has mentioned about three skills MS Word, MS Excel, and PowerPoint. Consider the table below as an example,

Table 2.1 [Skill]

Skill	Good	Very good	Excellent
MS Word		√	
MS Excel		√	
PowerPoint			√

From the above skills and their degrees mentioned by a certain candidate if we calculate the score,

Score = MS word (Very good) + MS Excel (Very Good) + PowerPoint (Excellent) = 0.2 + 0.2 + 0.3 = 0.7

d) Publication and Training

In case of the features like training and publications, we have considered the number of training programs a particular candidate has attended and the number of publications they have made. We focused mostly on the numbers rather than anything else. For each of the publications that a candidate has made, 0.2 gets added to the publications feature. For example, someone with 4 publications get a score of 4 * 0.2 = 0.8. Just the same as that for each of the training programs attended, a candidate gets same score 0.2. A candidate with five pieces of trainings attended gets a score of 5 * 0.2 = 1.

e) Language Proficiency

For the enumeration of the feature English language proficiency, we considered the IELTS score to be the most standard scale to measure with an IELTS score of 7 or more will be taken as the maximum value 1 for this feature. If it is less than 7, then the feature value gets curbed according to the scale of 1.

For instance, if a candidate has an IELTS marks of seven then it adds 1 to the feature English Proficiency, where one is the maximum. If there is some other candidate that has a score of 6.5 then the score is, Score = 6.5 / 7 =0.928; which is approximately one and the score is good.

IV. Result Analysis

According to DATASET 1, which is applied in KNN and decision tree algorithm, we get that Shuvashish [7th employee from DATASET 1] is the perfect employee.

According to the accuracy from DATASET 2, we can deduce that SVM and Decision Tree algorithms provide the best results. Although the Decision Tree gives a higher percentage than the SVM algorithm.

Table 3: Result Analysis

Decision Tree	SVM	Multi-Linear
85%	80%	72%

But we would recommend SVM. The reason is, that a decision tree starts the process of building a tree from scratch every time the algorithm is calling but with a different root node and hence gives more volatile results as well as being more prone to over-fitting as the complexity of the dataset increases.

V. Conclusion

Human resources management has a vision that all the customers feel like a part of the community. Therefore a company will always be met with prepared and helpful employees. HR management considered their employees as important resources. On the contrary, today's innovation and development is machine learning. This innovative subject is much more than we think, which can develop anything as human wants. So in this paper, for employees and companies betterment, we create an internal and external bonding between human resource management and machine learning through the objective of the HR manager and machine learning algorithm.

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Disbursement of 40% Royalty earned through Global Journals : Researcher = 50%, Peer Reviewer = 37.50%, Institution = 12.50% E.g. Out of 40%, the 20% benefit should be passed on to researcher, 15 % benefit towards remuneration should be given to a reviewer and remaining 5% is to be retained by the institution.

We shall provide print version of 12 issues of any three journals [as per your requirement] out of our 38 journals worth $ 2376 USD.

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- The professional accredited with Fellow honor, is entitled to various benefits viz. name, fame, honor, regular flow of income, secured bright future, social status etc.

- In addition to above, if one is single author, then entitled to 40% discount on publishing research paper and can get 10%discount if one is co-author or main author among group of authors.
- The Fellow can organize symposium/seminar/conference on behalf of Global Journals Incorporation (USA) and he/she can also attend the same organized by other institutes on behalf of Global Journals.
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- • This individual has learned the basic methods of applying those concepts and techniques to common challenging situations. This individual has further demonstrated an in–depth understanding of the application of suitable techniques to a particular area of research practice.

Note :

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- In future, if the board feels the necessity to change any board member, the same can be done with the consent of the chairperson along with anyone board member without our approval.
- In case, the chairperson needs to be replaced then consent of 2/3rd board members are required and they are also required to jointly pass the resolution copy of which should be sent to us. In such case, it will be compulsory to obtain our approval before replacement.
- In case of "Difference of Opinion [if any]" among the Board members, our decision will be final and binding to everyone.

"

Preferred Author Guidelines

We accept the manuscript submissions in any standard (generic) format.

We typeset manuscripts using advanced typesetting tools like Adobe In Design, CorelDraw, TeXnicCenter, and TeXStudio. We usually recommend authors submit their research using any standard format they are comfortable with, and let Global Journals do the rest.

Alternatively, you can download our basic template from https://globaljournals.org/Template.zip

Authors should submit their complete paper/article, including text illustrations, graphics, conclusions, artwork, and tables. Authors who are not able to submit manuscript using the form above can email the manuscript department at submit@globaljournals.org or get in touch with chiefeditor@globaljournals.org if they wish to send the abstract before submission.

Before and during Submission

Authors must ensure the information provided during the submission of a paper is authentic. Please go through the following checklist before submitting:

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2. Authors must accept the privacy policy, terms, and conditions of Global Journals.
3. Ensure corresponding author's email address and postal address are accurate and reachable.
4. Manuscript to be submitted must include keywords, an abstract, a paper title, co-author(s') names and details (email address, name, phone number, and institution), figures and illustrations in vector format including appropriate captions, tables, including titles and footnotes, a conclusion, results, acknowledgments and references.
5. Authors should submit paper in a ZIP archive if any supplementary files are required along with the paper.
6. Proper permissions must be acquired for the use of any copyrighted material.
7. Manuscript submitted *must not have been submitted or published elsewhere* and all authors must be aware of the submission.

Declaration of Conflicts of Interest

It is required for authors to declare all financial, institutional, and personal relationships with other individuals and organizations that could influence (bias) their research.

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Plagiarism is not acceptable in Global Journals submissions at all.

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- Findings
- Writings
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- Graphs
- Illustrations
- Lectures

- Printed material
- Graphic representations
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- Any other original work

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The corresponding author should mention the name and complete details of all co-authors during submission and in manuscript. We support addition, rearrangement, manipulation, and deletions in authors list till the early view publication of the journal. We expect that corresponding author will notify all co-authors of submission. We follow COPE guidelines for changes in authorship.

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Unless specified in the notification, the Editorial Board's decision on publication of the paper is final and cannot be appealed before making the major change in the manuscript.

Acknowledgments

Contributors to the research other than authors credited should be mentioned in Acknowledgments. The source of funding for the research can be included. Suppliers of resources may be mentioned along with their addresses.

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Preparing your Manuscript

Authors can submit papers and articles in an acceptable file format: MS Word (doc, docx), LaTeX (.tex, .zip or .rar including all of your files), Adobe PDF (.pdf), rich text format (.rtf), simple text document (.txt), Open Document Text (.odt), and Apple Pages (.pages). Our professional layout editors will format the entire paper according to our official guidelines. This is one of the highlights of publishing with Global Journals—authors should not be concerned about the formatting of their paper. Global Journals accepts articles and manuscripts in every major language, be it Spanish, Chinese, Japanese, Portuguese, Russian, French, German, Dutch, Italian, Greek, or any other national language, but the title, subtitle, and abstract should be in English. This will facilitate indexing and the pre-peer review process.

The following is the official style and template developed for publication of a research paper. Authors are not required to follow this style during the submission of the paper. It is just for reference purposes.

Manuscript Style Instruction (Optional)

- Microsoft Word Document Setting Instructions.
- Font type of all text should be Swis721 Lt BT.
- Page size: 8.27" x 11'", left margin: 0.65, right margin: 0.65, bottom margin: 0.75.
- Paper title should be in one column of font size 24.
- Author name in font size of 11 in one column.
- Abstract: font size 9 with the word "Abstract" in bold italics.
- Main text: font size 10 with two justified columns.
- Two columns with equal column width of 3.38 and spacing of 0.2.
- First character must be three lines drop-capped.
- The paragraph before spacing of 1 pt and after of 0 pt.
- Line spacing of 1 pt.
- Large images must be in one column.
- The names of first main headings (Heading 1) must be in Roman font, capital letters, and font size of 10.
- The names of second main headings (Heading 2) must not include numbers and must be in italics with a font size of 10.

Structure and Format of Manuscript

The recommended size of an original research paper is under 15,000 words and review papers under 7,000 words. Research articles should be less than 10,000 words. Research papers are usually longer than review papers. Review papers are reports of significant research (typically less than 7,000 words, including tables, figures, and references)

A research paper must include:

a) A title which should be relevant to the theme of the paper.
b) A summary, known as an abstract (less than 150 words), containing the major results and conclusions.
c) Up to 10 keywords that precisely identify the paper's subject, purpose, and focus.
d) An introduction, giving fundamental background objectives.
e) Resources and techniques with sufficient complete experimental details (wherever possible by reference) to permit repetition, sources of information must be given, and numerical methods must be specified by reference.
f) Results which should be presented concisely by well-designed tables and figures.
g) Suitable statistical data should also be given.
h) All data must have been gathered with attention to numerical detail in the planning stage.

Design has been recognized to be essential to experiments for a considerable time, and the editor has decided that any paper that appears not to have adequate numerical treatments of the data will be returned unrefereed.

i) Discussion should cover implications and consequences and not just recapitulate the results; conclusions should also be summarized.
j) There should be brief acknowledgments.
k) There ought to be references in the conventional format. Global Journals recommends APA format.

Authors should carefully consider the preparation of papers to ensure that they communicate effectively. Papers are much more likely to be accepted if they are carefully designed and laid out, contain few or no errors, are summarizing, and follow instructions. They will also be published with much fewer delays than those that require much technical and editorial correction.

The Editorial Board reserves the right to make literary corrections and suggestions to improve brevity.

Format Structure

It is necessary that authors take care in submitting a manuscript that is written in simple language and adheres to published guidelines.

All manuscripts submitted to Global Journals should include:

Title

The title page must carry an informative title that reflects the content, a running title (less than 45 characters together with spaces), names of the authors and co-authors, and the place(s) where the work was carried out.

Author details

The full postal address of any related author(s) must be specified.

Abstract

The abstract is the foundation of the research paper. It should be clear and concise and must contain the objective of the paper and inferences drawn. It is advised to not include big mathematical equations or complicated jargon.

Many researchers searching for information online will use search engines such as Google, Yahoo or others. By optimizing your paper for search engines, you will amplify the chance of someone finding it. In turn, this will make it more likely to be viewed and cited in further works. Global Journals has compiled these guidelines to facilitate you to maximize the web-friendliness of the most public part of your paper.

Keywords

A major lynchpin of research work for the writing of research papers is the keyword search, which one will employ to find both library and internet resources. Up to eleven keywords or very brief phrases have to be given to help data retrieval, mining, and indexing.

One must be persistent and creative in using keywords. An effective keyword search requires a strategy: planning of a list of possible keywords and phrases to try.

Choice of the main keywords is the first tool of writing a research paper. Research paper writing is an art. Keyword search should be as strategic as possible.

One should start brainstorming lists of potential keywords before even beginning searching. Think about the most important concepts related to research work. Ask, “What words would a source have to include to be truly valuable in a research paper?” Then consider synonyms for the important words.

It may take the discovery of only one important paper to steer in the right keyword direction because, in most databases, the keywords under which a research paper is abstracted are listed with the paper.

Numerical Methods

Numerical methods used should be transparent and, where appropriate, supported by references.

Abbreviations

Authors must list all the abbreviations used in the paper at the end of the paper or in a separate table before using them.

Formulas and equations

Authors are advised to submit any mathematical equation using either MathJax, KaTeX, or LaTeX, or in a very high-quality image.

Tables, Figures, and Figure Legends

Tables: Tables should be cautiously designed, uncrowned, and include only essential data. Each must have an Arabic number, e.g., Table 4, a self-explanatory caption, and be on a separate sheet. Authors must submit tables in an editable format and not as images. References to these tables (if any) must be mentioned accurately.

Figures

Figures are supposed to be submitted as separate files. Always include a citation in the text for each figure using Arabic numbers, e.g., Fig. 4. Artwork must be submitted online in vector electronic form or by emailing it.

Preparation of Eletronic Figures for Publication

Although low-quality images are sufficient for review purposes, print publication requires high-quality images to prevent the final product being blurred or fuzzy. Submit (possibly by e-mail) EPS (line art) or TIFF (halftone/ photographs) files only. MS PowerPoint and Word Graphics are unsuitable for printed pictures. Avoid using pixel-oriented software. Scans (TIFF only) should have a resolution of at least 350 dpi (halftone) or 700 to 1100 dpi (line drawings). Please give the data for figures in black and white or submit a Color Work Agreement form. EPS files must be saved with fonts embedded (and with a TIFF preview, if possible).

For scanned images, the scanning resolution at final image size ought to be as follows to ensure good reproduction: line art: >650 dpi; halftones (including gel photographs): >350 dpi; figures containing both halftone and line images: >650 dpi.

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Tips for writing a good quality Computer Science Research Paper

Techniques for writing a good quality computer science research paper:

1. Choosing the topic: In most cases, the topic is selected by the interests of the author, but it can also be suggested by the guides. You can have several topics, and then judge which you are most comfortable with. This may be done by asking several questions of yourself, like "Will I be able to carry out a search in this area? Will I find all necessary resources to accomplish the search? Will I be able to find all information in this field area?" If the answer to this type of question is "yes," then you ought to choose that topic. In most cases, you may have to conduct surveys and visit several places. Also, you might have to do a lot of work to find all the rises and falls of the various data on that subject. Sometimes, detailed information plays a vital role, instead of short information. Evaluators are human: The first thing to remember is that evaluators are also human beings. They are not only meant for rejecting a paper. They are here to evaluate your paper. So present your best aspect.

2. Think like evaluators: If you are in confusion or getting demotivated because your paper may not be accepted by the evaluators, then think, and try to evaluate your paper like an evaluator. Try to understand what an evaluator wants in your research paper, and you will automatically have your answer. Make blueprints of paper: The outline is the plan or framework that will help you to arrange your thoughts. It will make your paper logical. But remember that all points of your outline must be related to the topic you have chosen.

3. Ask your guides: If you are having any difficulty with your research, then do not hesitate to share your difficulty with your guide (if you have one). They will surely help you out and resolve your doubts. If you can't clarify what exactly you require for your work, then ask your supervisor to help you with an alternative. He or she might also provide you with a list of essential readings.

4. Use of computer is recommended: As you are doing research in the field of computer science then this point is quite obvious. Use right software: Always use good quality software packages. If you are not capable of judging good software, then you can lose the quality of your paper unknowingly. There are various programs available to help you which you can get through the internet.

5. Use the internet for help: An excellent start for your paper is using Google. It is a wondrous search engine, where you can have your doubts resolved. You may also read some answers for the frequent question of how to write your research paper or find a model research paper. You can download books from the internet. If you have all the required books, place importance on reading, selecting, and analyzing the specified information. Then sketch out your research paper. Use big pictures: You may use encyclopedias like Wikipedia to get pictures with the best resolution. At Global Journals, you should strictly follow here.

6. Bookmarks are useful: When you read any book or magazine, you generally use bookmarks, right? It is a good habit which helps to not lose your continuity. You should always use bookmarks while searching on the internet also, which will make your search easier.

7. Revise what you wrote: When you write anything, always read it, summarize it, and then finalize it.

8. Make every effort: Make every effort to mention what you are going to write in your paper. That means always have a good start. Try to mention everything in the introduction—what is the need for a particular research paper. Polish your work with good writing skills and always give an evaluator what he wants. Make backups: When you are going to do any important thing like making a research paper, you should always have backup copies of it either on your computer or on paper. This protects you from losing any portion of your important data.

9. Produce good diagrams of your own: Always try to include good charts or diagrams in your paper to improve quality. Using several unnecessary diagrams will degrade the quality of your paper by creating a hodgepodge. So always try to include diagrams which were made by you to improve the readability of your paper. Use of direct quotes: When you do research relevant to literature, history, or current affairs, then use of quotes becomes essential, but if the study is relevant to science, use of quotes is not preferable.

10.Use proper verb tense: Use proper verb tenses in your paper. Use past tense to present those events that have happened. Use present tense to indicate events that are going on. Use future tense to indicate events that will happen in the future. Use of wrong tenses will confuse the evaluator. Avoid sentences that are incomplete.

11. Pick a good study spot: Always try to pick a spot for your research which is quiet. Not every spot is good for studying.

12. Know what you know: Always try to know what you know by making objectives, otherwise you will be confused and unable to achieve your target.

13. Use good grammar: Always use good grammar and words that will have a positive impact on the evaluator; use of good vocabulary does not mean using tough words which the evaluator has to find in a dictionary. Do not fragment sentences. Eliminate one-word sentences. Do not ever use a big word when a smaller one would suffice.

Verbs have to be in agreement with their subjects. In a research paper, do not start sentences with conjunctions or finish them with prepositions. When writing formally, it is advisable to never split an infinitive because someone will (wrongly) complain. Avoid clichés like a disease. Always shun irritating alliteration. Use language which is simple and straightforward. Put together a neat summary.

14. Arrangement of information: Each section of the main body should start with an opening sentence, and there should be a changeover at the end of the section. Give only valid and powerful arguments for your topic. You may also maintain your arguments with records.

15. Never start at the last minute: Always allow enough time for research work. Leaving everything to the last minute will degrade your paper and spoil your work.

16. Multitasking in research is not good: Doing several things at the same time is a bad habit in the case of research activity. Research is an area where everything has a particular time slot. Divide your research work into parts, and do a particular part in a particular time slot.

17. Never copy others' work: Never copy others' work and give it your name because if the evaluator has seen it anywhere, you will be in trouble. Take proper rest and food: No matter how many hours you spend on your research activity, if you are not taking care of your health, then all your efforts will have been in vain. For quality research, take proper rest and food.

18. Go to seminars: Attend seminars if the topic is relevant to your research area. Utilize all your resources.

19. Refresh your mind after intervals: Try to give your mind a rest by listening to soft music or sleeping in intervals. This will also improve your memory. Acquire colleagues: Always try to acquire colleagues. No matter how sharp you are, if you acquire colleagues, they can give you ideas which will be helpful to your research.

20. Think technically: Always think technically. If anything happens, search for its reasons, benefits, and demerits. Think and then print: When you go to print your paper, check that tables are not split, headings are not detached from their descriptions, and page sequence is maintained.

21. Adding unnecessary information: Do not add unnecessary information like "I have used MS Excel to draw graphs." Irrelevant and inappropriate material is superfluous. Foreign terminology and phrases are not apropos. One should never take a broad view. Analogy is like feathers on a snake. Use words properly, regardless of how others use them. Remove quotations. Puns are for kids, not grunt readers. Never oversimplify: When adding material to your research paper, never go for oversimplification; this will definitely irritate the evaluator. Be specific. Never use rhythmic redundancies. Contractions shouldn't be used in a research paper. Comparisons are as terrible as clichés. Give up ampersands, abbreviations, and so on. Remove commas that are not necessary. Parenthetical words should be between brackets or commas. Understatement is always the best way to put forward earth-shaking thoughts. Give a detailed literary review.

22. Report concluded results: Use concluded results. From raw data, filter the results, and then conclude your studies based on measurements and observations taken. An appropriate number of decimal places should be used. Parenthetical remarks are prohibited here. Proofread carefully at the final stage. At the end, give an outline to your arguments. Spot perspectives of further study of the subject. Justify your conclusion at the bottom sufficiently, which will probably include examples.

23. Upon conclusion: Once you have concluded your research, the next most important step is to present your findings. Presentation is extremely important as it is the definite medium though which your research is going to be in print for the rest of the crowd. Care should be taken to categorize your thoughts well and present them in a logical and neat manner. A good quality research paper format is essential because it serves to highlight your research paper and bring to light all necessary aspects of your research.

Informal Guidelines of Research Paper Writing

Key points to remember:

- Submit all work in its final form.
- Write your paper in the form which is presented in the guidelines using the template.
- Please note the criteria peer reviewers will use for grading the final paper.

Final points:

One purpose of organizing a research paper is to let people interpret your efforts selectively. The journal requires the following sections, submitted in the order listed, with each section starting on a new page:

The introduction: This will be compiled from reference matter and reflect the design processes or outline of basis that directed you to make a study. As you carry out the process of study, the method and process section will be constructed like that. The results segment will show related statistics in nearly sequential order and direct reviewers to similar intellectual paths throughout the data that you gathered to carry out your study.

The discussion section:

This will provide understanding of the data and projections as to the implications of the results. The use of good quality references throughout the paper will give the effort trustworthiness by representing an alertness to prior workings.

Writing a research paper is not an easy job, no matter how trouble-free the actual research or concept. Practice, excellent preparation, and controlled record-keeping are the only means to make straightforward progression.

General style:

Specific editorial column necessities for compliance of a manuscript will always take over from directions in these general guidelines.

To make a paper clear: Adhere to recommended page limits.

Mistakes to avoid:

- Insertion of a title at the foot of a page with subsequent text on the next page.
- Separating a table, chart, or figure—confine each to a single page.
- Submitting a manuscript with pages out of sequence.
- In every section of your document, use standard writing style, including articles ("a" and "the").
- Keep paying attention to the topic of the paper.
- Use paragraphs to split each significant point (excluding the abstract).
- Align the primary line of each section.
- Present your points in sound order.
- Use present tense to report well-accepted matters.
- Use past tense to describe specific results.
- Do not use familiar wording; don't address the reviewer directly. Don't use slang or superlatives.
- Avoid use of extra pictures—include only those figures essential to presenting results.

Title page:

Choose a revealing title. It should be short and include the name(s) and address(es) of all authors. It should not have acronyms or abbreviations or exceed two printed lines.

Abstract: This summary should be two hundred words or less. It should clearly and briefly explain the key findings reported in the manuscript and must have precise statistics. It should not have acronyms or abbreviations. It should be logical in itself. Do not cite references at this point.

An abstract is a brief, distinct paragraph summary of finished work or work in development. In a minute or less, a reviewer can be taught the foundation behind the study, common approaches to the problem, relevant results, and significant conclusions or new questions.

Write your summary when your paper is completed because how can you write the summary of anything which is not yet written? Wealth of terminology is very essential in abstract. Use comprehensive sentences, and do not sacrifice readability for brevity; you can maintain it succinctly by phrasing sentences so that they provide more than a lone rationale. The author can at this moment go straight to shortening the outcome. Sum up the study with the subsequent elements in any summary. Try to limit the initial two items to no more than one line each.

Reason for writing the article—theory, overall issue, purpose.

- Fundamental goal.
- To-the-point depiction of the research.
- Consequences, including definite statistics—if the consequences are quantitative in nature, account for this; results of any numerical analysis should be reported. Significant conclusions or questions that emerge from the research.

Approach:

- Single section and succinct.
- An outline of the job done is always written in past tense.
- Concentrate on shortening results—limit background information to a verdict or two.
- Exact spelling, clarity of sentences and phrases, and appropriate reporting of quantities (proper units, important statistics) are just as significant in an abstract as they are anywhere else.

Introduction:

The introduction should "introduce" the manuscript. The reviewer should be presented with sufficient background information to be capable of comprehending and calculating the purpose of your study without having to refer to other works. The basis for the study should be offered. Give the most important references, but avoid making a comprehensive appraisal of the topic. Describe the problem visibly. If the problem is not acknowledged in a logical, reasonable way, the reviewer will give no attention to your results. Speak in common terms about techniques used to explain the problem, if needed, but do not present any particulars about the protocols here.

The following approach can create a valuable beginning:

- Explain the value (significance) of the study.
- Defend the model—why did you employ this particular system or method? What is its compensation? Remark upon its appropriateness from an abstract point of view as well as pointing out sensible reasons for using it.
- Present a justification. State your particular theory(-ies) or aim(s), and describe the logic that led you to choose them.
- Briefly explain the study's tentative purpose and how it meets the declared objectives.

Approach:

Use past tense except for when referring to recognized facts. After all, the manuscript will be submitted after the entire job is done. Sort out your thoughts; manufacture one key point for every section. If you make the four points listed above, you will need at least four paragraphs. Present surrounding information only when it is necessary to support a situation. The reviewer does not desire to read everything you know about a topic. Shape the theory specifically—do not take a broad view.

As always, give awareness to spelling, simplicity, and correctness of sentences and phrases.

Procedures (methods and materials):

This part is supposed to be the easiest to carve if you have good skills. A soundly written procedures segment allows a capable scientist to replicate your results. Present precise information about your supplies. The suppliers and clarity of reagents can be helpful bits of information. Present methods in sequential order, but linked methodologies can be grouped as a segment. Be concise when relating the protocols. Attempt to give the least amount of information that would permit another capable scientist to replicate your outcome, but be cautious that vital information is integrated. The use of subheadings is suggested and ought to be synchronized with the results section.

When a technique is used that has been well-described in another section, mention the specific item describing the way, but draw the basic principle while stating the situation. The purpose is to show all particular resources and broad procedures so that another person may use some or all of the methods in one more study or referee the scientific value of your work. It is not to be a step-by-step report of the whole thing you did, nor is a methods section a set of orders.

Materials:

Materials may be reported in part of a section or else they may be recognized along with your measures.

Methods:

- Report the method and not the particulars of each process that engaged the same methodology.
- Describe the method entirely.
- To be succinct, present methods under headings dedicated to specific dealings or groups of measures.
- Simplify—detail how procedures were completed, not how they were performed on a particular day.
- If well-known procedures were used, account for the procedure by name, possibly with a reference, and that's all.

Approach:

It is embarrassing to use vigorous voice when documenting methods without using first person, which would focus the reviewer's interest on the researcher rather than the job. As a result, when writing up the methods, most authors use third person passive voice.

Use standard style in this and every other part of the paper—avoid familiar lists, and use full sentences.

What to keep away from:

- Resources and methods are not a set of information.
- Skip all descriptive information and surroundings—save it for the argument.
- Leave out information that is immaterial to a third party.

Results:

The principle of a results segment is to present and demonstrate your conclusion. Create this part as entirely objective details of the outcome, and save all understanding for the discussion.

The page length of this segment is set by the sum and types of data to be reported. Use statistics and tables, if suitable, to present consequences most efficiently.

You must clearly differentiate material which would usually be incorporated in a study editorial from any unprocessed data or additional appendix matter that would not be available. In fact, such matters should not be submitted at all except if requested by the instructor.

Content:

- Sum up your conclusions in text and demonstrate them, if suitable, with figures and tables.
- In the manuscript, explain each of your consequences, and point the reader to remarks that are most appropriate.
- Present a background, such as by describing the question that was addressed by creation of an exacting study.
- Explain results of control experiments and give remarks that are not accessible in a prescribed figure or table, if appropriate.
- Examine your data, then prepare the analyzed (transformed) data in the form of a figure (graph), table, or manuscript.

What to stay away from:

- Do not discuss or infer your outcome, report surrounding information, or try to explain anything.
- Do not include raw data or intermediate calculations in a research manuscript.
- Do not present similar data more than once.
- A manuscript should complement any figures or tables, not duplicate information.
- Never confuse figures with tables—there is a difference.

Approach:

As always, use past tense when you submit your results, and put the whole thing in a reasonable order.

Put figures and tables, appropriately numbered, in order at the end of the report.

If you desire, you may place your figures and tables properly within the text of your results section.

Figures and tables:

If you put figures and tables at the end of some details, make certain that they are visibly distinguished from any attached appendix materials, such as raw facts. Whatever the position, each table must be titled, numbered one after the other, and include a heading. All figures and tables must be divided from the text.

Discussion:

The discussion is expected to be the trickiest segment to write. A lot of papers submitted to the journal are discarded based on problems with the discussion. There is no rule for how long an argument should be.

Position your understanding of the outcome visibly to lead the reviewer through your conclusions, and then finish the paper with a summing up of the implications of the study. The purpose here is to offer an understanding of your results and support all of your conclusions, using facts from your research and generally accepted information, if suitable. The implication of results should be fully described.

Infer your data in the conversation in suitable depth. This means that when you clarify an observable fact, you must explain mechanisms that may account for the observation. If your results vary from your prospect, make clear why that may have happened. If your results agree, then explain the theory that the proof supported. It is never suitable to just state that the data approved the prospect, and let it drop at that. Make a decision as to whether each premise is supported or discarded or if you cannot make a conclusion with assurance. Do not just dismiss a study or part of a study as "uncertain."

Research papers are not acknowledged if the work is imperfect. Draw what conclusions you can based upon the results that you have, and take care of the study as a finished work.

- You may propose future guidelines, such as how an experiment might be personalized to accomplish a new idea.
- Give details of all of your remarks as much as possible, focusing on mechanisms.
- Make a decision as to whether the tentative design sufficiently addressed the theory and whether or not it was correctly restricted. Try to present substitute explanations if they are sensible alternatives.
- One piece of research will not counter an overall question, so maintain the large picture in mind. Where do you go next? The best studies unlock new avenues of study. What questions remain?
- Recommendations for detailed papers will offer supplementary suggestions.

Approach:

When you refer to information, differentiate data generated by your own studies from other available information. Present work done by specific persons (including you) in past tense.

Describe generally acknowledged facts and main beliefs in present tense.

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	A-B	**C-D**	**E-F**
Abstract	Clear and concise with appropriate content, Correct format. 200 words or below	Unclear summary and no specific data, Incorrect form Above 200 words	No specific data with ambiguous information Above 250 words
Introduction	Containing all background details with clear goal and appropriate details, flow specification, no grammar and spelling mistake, well organized sentence and paragraph, reference cited	Unclear and confusing data, appropriate format, grammar and spelling errors with unorganized matter	Out of place depth and content, hazy format
Methods and Procedures	Clear and to the point with well arranged paragraph, precision and accuracy of facts and figures, well organized subheads	Difficult to comprehend with embarrassed text, too much explanation but completed	Incorrect and unorganized structure with hazy meaning
Result	Well organized, Clear and specific, Correct units with precision, correct data, well structuring of paragraph, no grammar and spelling mistake	Complete and embarrassed text, difficult to comprehend	Irregular format with wrong facts and figures
Discussion	Well organized, meaningful specification, sound conclusion, logical and concise explanation, highly structured paragraph reference cited	Wordy, unclear conclusion, spurious	Conclusion is not cited, unorganized, difficult to comprehend
References	Complete and correct format, well organized	Beside the point, Incomplete	Wrong format and structuring

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