

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

tuning of hidden layer that are widespread problems in other conventional neural network techniques. The algorithm is as follows:

1. Let P is the training set,

$$P = \left\{ (x_i, y_i), x_i \in R^n, y_i \in R^m, i = 1, 2, 3, \dots, N \right\}.$$

Activation function is represented as $f(x)$ and number of hidden neurons is NH . Randomly assign the input weights w_i and biases $b_i, i = 1$ to NH .

2. Compute H , the output matrix of hidden layer.
3. Compute the output weight

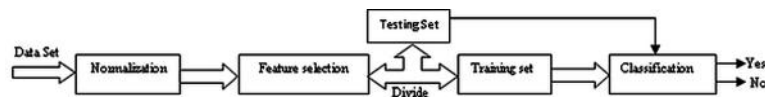
$$\beta = H^{-1}Y, \text{ where } Y = [y_1, y_2, \dots, y_N]^T$$

and H^{-1} is the Moore–Penrose generalized inverse of matrix H .

Development of Customer Churn Prediction (CCP) Model

Churn prediction is normally consisting of four main phases: Data collection, Preprocessing, Feature selection and Classification. Fig. 1 shows the various steps followed in the development of the CCP model. First the data are collected. After normalization of the data the features are selected using Information Gain(IG) feature selection method.

Figure 1. Steps in development of churn prediction model



Information Gain Feature Selection

Entropy is generally used inside the facts concept degree, which characterizes the purity of an arbitrary series of examples. It's far in the basis of the IG characteristic ranking strategies. The entropy degree is taken into consideration as a degree of device's unpredictability. The entropy of Y is

$$H(Y) = -\sum_{y \in Y} p(y) \log_2(p(y)) \quad (4)$$

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

wherein $p(y)$ is the marginal possibility density characteristic for the random variable Y . If the discovered values of Y within the training data set S are partitioned in step with the values of a second function X , and the entropy of Y with appreciate to the partitions induced via X is less than the entropy of Y previous to partitioning, then there is a dating among capabilities Y and X . Then the entropy of Y after looking X is

$$H(Y / X) = - \sum_{x \in X} p(x) \sum_{y \in Y} p(y / x) \log_2(p(y / x)) \quad (5)$$

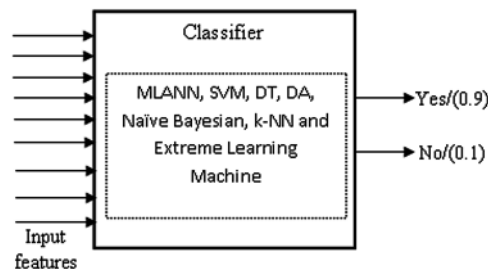
wherein $p(y/x)$ is possibility of y given x . Given the entropy as a criterion of impurity in a dataset S , we are capable of outline a degree reflecting extra statistics approximately Y furnished by way of X that represents the quantity by manner of which the entropy of Y decreases. This diploma is known as IG. It is given via

$$IG = H(Y) - H(Y/X) = H(X) - H(X/Y) \quad (6)$$

IG is a symmetrical degree. The information obtained about Y after watching X is same to the facts obtained about X after looking at Y . A weakness of the IG criterion is that it is miles biased in opt for of functions with more values even if they are not extra informative.

1. **Classification:** An adaptive classifier is designed to predict the churn status of the customers. Fig. 2(a) represents the classifier for churn prediction. For this purpose the chapter has used MLANN, SVM, DT, DA, K-NN, Naïve Bayesian and ELM techniques.

Figure 2. Churn prediction model



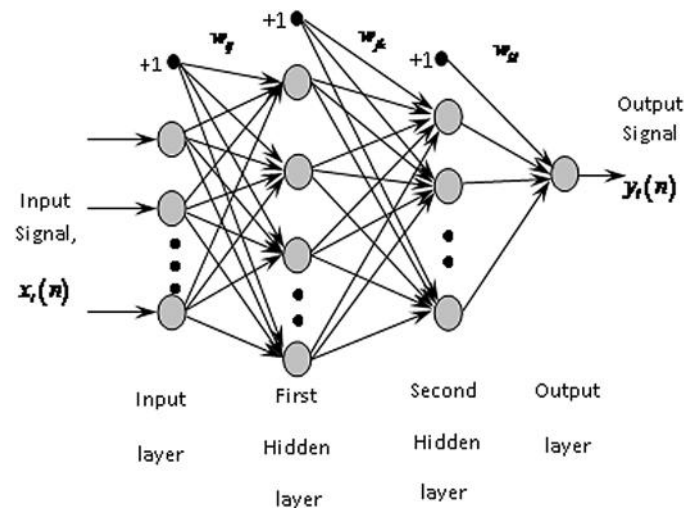
Development of a classifier consists of two phases: 1. Training phase and testing phase. During the training phase the classifier is trained using the past data. Once the classifier is ready then its performance is tested during testing phase. There are various methods of doing this such as holdout method, k-fold cross validation and leave-one-out method etc.

Holdout Method: In this method, the information is randomly divided into two: Training and Test/Validation set. Then the model is trained with the training dataset and examine the model on the Test/Validation dataset. Typically the training dataset is greater than the testing dataset. Typical ratios used for splitting the information set include 60:40, 80:20 etc. In our case we have taken the ratio of 80:20.

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

The development of a MLANN churn prediction model using holdout method is described below. Figure 3 shows the structure of a feed forward multilayer neural network model with one input, two hidden and one output layers.

Figure 3. Structure of a multilayer neural network model



Here a 9:5:1 structure is used as a classifier. The nine input features of training set (2333 tuples) are applied to the feed forward neural network sequentially. The inputs are weighted and summed together at each neuron of the hidden layer. These intermediate outputs are then passed through the activation functions, 'tanh' to give the final outputs. The process is repeated at each layer of the network until the final output at output layer is obtained. The obtained output is then compared with 0.9 if the features belong to 'Yes' class otherwise with 0.1 for 'No' class. This completes one iteration and the iteration is repeated 5000 times. The experiment is repeated until all training samples are applied. The connecting weights and bias weights are updated using the BP algorithm until the mean squared error (MSE) is minimized. The MSE value for each iteration is stored and the convergence characteristics is obtained and shown in the Figure 4.

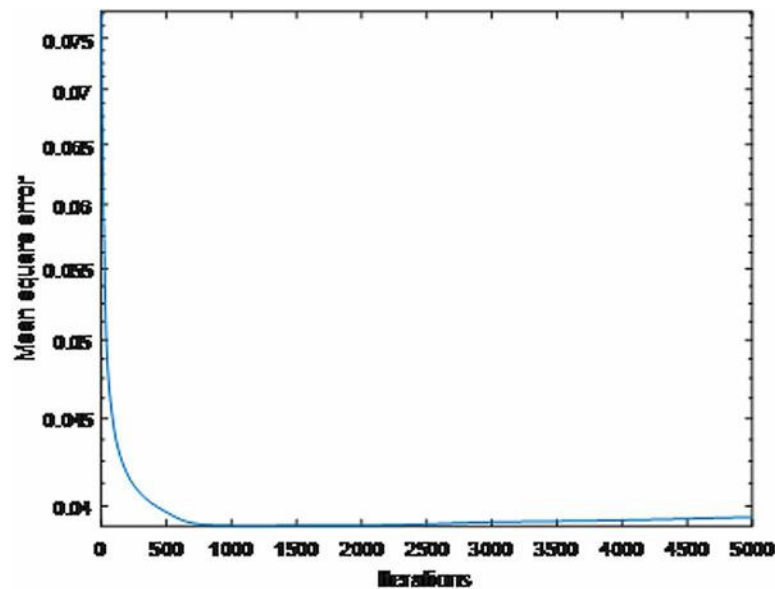
Once the training process is over the churn prediction model is tested using the testing features(1000 tuples) and accuracy of the classifier is calculated using (7). Similarly the other classifiers are developed using their respective techniques as described in Section II. Same way the k-fold cross validation method can also be used. The details of it are as follows:

k-Fold Cross Validation: Cross-validation is broadly speaking used in applied machine learning to estimate the talent of a system learning model on unseen records. That is, to apply a limited pattern to be able to estimate how the version is anticipated to perform in general while used to make predictions on statistics now not used at some point of the training of the model. The well known system is as follows

1. Shuffle the dataset randomly.
2. Split the dataset into k equal subsets.(k =10 in our case)
3. For every unique subset:

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

Figure 4. Convergence characteristics of MLANN model



- a. Take the subset as a hold out or take a look at records set
 - b. Take the remaining subsets as a training set
 - c. Fit a model on the training set and evaluate it on the take a look at set
 - d. Retain the assessment score and discard the version
4. Summarize the skill of the model using the pattern of version assessment scores

Performance Measures

To examine the class results, the quantity of True Positive (TP), True Negative (TN), False Positive (FP) and False Negative (FN) are counted. The FN price surely belongs to Positive P however is wrongly classified as Negative N, Similarly, FP price is certainly a part of N but wrongly categorized as P. Confusion matrix is a performance dimension for studying classification problem where output may be two or greater classes. It is a table with four exclusive mixtures of predicted and actual values in case of a binary classification problem as shown below in Table 1. The diagonal elements of the below given matrix, TP and TN show the amount of correct prediction for P and N classes respectively.

Table 1. Example of confusion matrix

Actual Values	Predicted Values	
	Positive(P)	Negative(N)
Positive (P)	TP	FP
Negative(N)	FN	TN

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

The percentage of classification accuracy is calculated as

$$\text{Percentage of Accuracy} = \frac{TP + TN}{P + N} \times 100 \quad (7)$$

where

TP= true positive

TN = true negative

P= Total positive tuples

N= Total negative tuples

Simulation Study

This chapter uses a data set of 3333 unique customers of telecommunication sector collected from (bigml.com) where 2850 customers are Non-churn (No) and 483 are Churn (Yes). Out of this 3333 data (80%) randomly used for training where 85.16% are No and 14.8% are Yes and rest 1000 data are used for testing of the model where 86.3% are No and 13.7% are Yes. The Matlab 2016 is used for the simulation study. The customer churn prediction process is comprised of three main stages: (i) normalization of the data (ii) feature selection and (iii) classification. In this study z-score normalization is used to normalize the data. Feature selection is an important and essential step in order to reduce the computational cost. If the number of features are more then unnecessarily they will increase the computational complexity and computation time. Out of the all features only nine features or attributes are selected based on their high information gain. The nine features are selected referring to (Amin et. al., 2016). Alternatively, these attributes are contributing more in the decision making in comparison to other features. The details of the attributes are given in Table 2. Referring to Figure 2 finally classification is done using various machine learning techniques such as MLANN, SVM, Naïve Bayesian, KNN, DA, DT and ELM. The different parameters used in simulation for the classifiers are given in Table 3. Once the classifiers are ready the testing of the models are done using the testing samples. The confusion matrices for best three models are shown in Table 4. Along with the hold out method, 10-fold cross validation is also carried out and the accuracy obtained are shown in the Table 5.

RESULTS AND DISCUSSION

It is exhibited from Table 5 that out of seven different techniques used for customer churn prediction ELM is giving the best prediction accuracy of 92.10% followed by SVM with polynomial kernel and MLANN with accuracy of 91.33% and 90.4% respectively in holdout method. The ELM is a single hidden layer neural network model which is faster in computation as compared to the MLANN model. Also the ELM is not using BP algorithm to update its weight which is the advantage of it. The minimum accuracy of 85.54% is obtained by using DA method. Rest of the methods are also performing average with an accuracy greater than 85.54%. Same is the observation in case of the 10-fold cross validation with accuracy of 92.09%, 91.37% and 90.64% for ELM, SVM(Polynomial) and MLANN models. On the basis

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of their performance the models can be ranked and suggested for practical use in telecommunication industries for CCP. The rank of ELM based prediction model is one. The SVM with polynomial kernel is at number two and the third rank is occupied by MLANN based CCP model.

CONCLUSION

The customer churn prediction is an important research topic for various business organizations as churn of their consumers have direct impact on the revenue of the enterprise. In recent past various machine learning algorithms are used by the researchers to find out a CCP model which will help the managers to know apriori about the probably customers whole are likely to churn. This chapter has collected 3333 telecom data and develop CCP models using seven different ML techniques. First the data are normalized, then feature selection is done to reduce the number of features based on maximum information gain. Finally classification is carried out. Out of all seven methods used ELM based prediction model outperformed all other models with an accuracy of 92.10%. The SVM with polynomial kernel based model is in second rank with accuracy of 91.33% and MLANN is at 3rd position with 90.4% of accuracy. Similar observation is noted for the 10-fold cross validation method. In future the CCP models can also be developed using convolution neural network, deep learning and other recent technology.

Table 2. Selected attributes on the basis of their Information gain

Sl. No.	Name of Attribute	Description	Different Counts	Minimum Value	Maximum Value
1	Voicemail_Message	Number of voice mail messages done by the customer	46	0	51
2	Day_minutes	Total number of minutes that a customer has used in daytime	1667	0	350.8
3	Day_charges	Call charges for total day time	1667	0	59.64
4	Evening_minutes	Total number of minutes that a customer has used at evening time	1611	0	363.7
5	Evening_charges	Call charges for total evening time	1440	0	30.91
6	International_minutes	Total number of minutes used during international calls	162	0	20
7	International_calls	Total number of calls used as international calls	21	0	20
8	International_charges	Charges for total amount of international calls	162	0	5.4
9	Customer_service_calls	Total number of calls made by a customer to customer service	10	0	9

(Amin et. al., 2016)

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction*Table 3. Parameters of the classifiers used in simulation*

Sl. No.	Technique Used	Parameters
1	MLANN	9:5:1 structure Learning parameter $\mu=0.001$ Total no. of iterations:5000 No. of independent run=20
2	SVM	Kernel: RBF, Polynomial, Linear
3	K-NN	K=5, Euclidean distance
4	DA	Linear Discriminant
5	DT	----
6	Naïve Bayesian	Distribution: Normal
7	ELM	No. of neurons =100 in hidden layer

Table 4a. Confusion Matrices obtained for hold out method during testing: ELM based classifier

Actual Values	Predicted Values	
	Yes	No
137 (Yes)	127	10
863(No)	69	794
Total = 1000		

Table 4b. Confusion Matrices obtained for hold out method during testing: SVM(Polynomial) based classifier

Actual Values	Predicted Values	
	Yes	No
137 (Yes)	124	13
863(No)	74	789
Total = 1000		

Table 4c. Confusion Matrices obtained for hold out method during testing: ELM based classifier

Actual Values	Predicted Values	
	Yes	No
137 (Yes)	124	13
863(No)	83	780
Total = 1000		

Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

Table 5. Comparison of accuracy obtained by different prediction models

Sl. No.	Type of Churn Prediction Models	Accuracy Obtained Using Holdout Method	Accuracy Obtained Using 10-Fold Cross Validation Method	Rank of Models
1.	MLANN	90.4%	90.64%	3
2.	SVM(Linear)	85.90%	85.94%	8
	SVM(RBF kernel)	88.93%	88.97%	6
	SVM(Polynomial kernel)	91.33%	91.37%	2
3.	KNN	89.80%	89.82%	4
4	DA	85.54%	85.65%	9
5	Naïve Bayesian	87.73%	87.83%	7
6	DT	89.47%	89.60%	5
7	ELM	92.10%	92.09%	1

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Performance Evaluation of Machine Learning Techniques for Customer Churn Prediction

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Contents

Preface

Acknowledgements

Editors

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- Chapter 1** Analytical Approach to Genetics of Cancer Therapeutics through Machine Learning
Ritu Shukla, Mansi Gyanchandani, Rahul Sahu and Priyank Jain
- Chapter 2** A Study on Behaviour of Neural Gas on Images and Artificial Neural Network in Healthcare
Rahul Sahu, Ashish Mishra and G. Suseendran
- Chapter 3** A New Approach for Parkinson's Disease Imaging Diagnosis Using Digitized Spiral Drawing
Megha Kamble and Pranshu Patel
- Chapter 4** Modelling and Analysis for Cancer Model with Caputo to Atangana-Baleanu Derivative
Ashish Mishra, Jyoti Mishra and Vijay Gupta
- Chapter 5** Selection of Hospital Using Integrated Fuzzy AHP and Fuzzy TOPSIS Method
Vikas Shinde and Santosh K. Bharadwaj
- Chapter 6** Computation of Threshold Rate for the Spread of HIV in a Mobile Heterosexual Population and Its Implication for SIR Model in Healthcare
Suresh Rasappan and Regan Murugesan
- Chapter 7** Application of Soft Computing Techniques to Heart Sound Classification: A Review of the Decade
Babita Majhi and Aarti Kashyap
- Chapter 8** Fuzzy Systems in Medicine and Healthcare: Need, Challenges and Applications
Deepak K. Sharma, Sakshi and Kartik Singhal

7 Application of Soft Computing Techniques to Heart Sound Classification

A Review of the Decade

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CONTENTS

- 7.1 Introduction
- 7.2 Related Literature Review
- 7.3 Steps for Heart Sound Classification
 - 7.3.1 Pre-Processing
 - 7.3.2 Feature Extraction
 - 7.3.3 Classification
- 7.4 Research Gap
- 7.5 Conclusion
- References

7.1 INTRODUCTION

Heart sound classification plays an important role in the diagnosis and prevention of cardiovascular disease and is used for automatic heart sound auscultation and cardiac monitoring [1]. As indicated by the World Health Organization, nearly 17.5 million individuals around the world have died because of cardiovascular illness, which is 31–32% of all deaths and its rate is expanding quickly [2]. The heart is one of the most significant organs of the human body and conveys blood to all parts. The heart works like a siphon and pulsates 72 times each moment for a normal individual under ordinary conditions [3]. The heart pumps blood through a network of arteries and veins called the cardiovascular system. The human heart has four chambers: the right atrium, the right ventricle, the left atrium and the left ventricle. The human heart performs the duties in two cycles: systole and diastole. The contraction of heart is known as systole and the relaxation of heart is known as diastole. The heart sound can be produced using two sounds, 'lub' and 'dub', in sequence that occur due to the closing of the valves of the heart [4]. The abnormal sound is produced due to damaged valves. Because of the disorder of the heart valve, the common disease of the heart occurs. Some of the diseases that occur are myocardial infarction (heart attack), congestive heart failure, heart murmur, coronary artery disease, heart valve disease, stable angina pectoris, unstable angina, pectoris and arrhythmia. The primary method is the auscultation used by the physicians to differentiate between normal and abnormal heart sounds. Any disorders can be detected by the physicians after listening these sounds using the stethoscope, digital applications and so on [4].

Traditionally, cardiologists use stethoscopes for examination of heart sounds. The accuracy of heart sound classification is based on the experience and skill of the physicians. But this manual clinical process is time-consuming and costly. To alleviate these limitations, recently a computer-based automatic computer assist tool is recommended for detection of abnormal heart sound. Hence this is becoming an emerging research for the biological signal processing and machine learning groups as it is computer based. Soft computing is one of the problem-solving approaches used to solve real life complex problems in the field of science and technology. Applications of various soft computing techniques such as

artificial neural network, fuzzy logic and evolutionary computing have been extensively used in the medical diagnosis. Various soft computing techniques are also applied by the researchers in the field of classification of heart sound.

The main objective of this chapter is to provide a systematic review of different existing approaches for the classification of heart sounds of the last 10 years from 2008 to 2018. Also, this chapter will provide the details about the databases, techniques applied in designing models, classifiers used, extract features, domain analysis and performance comparison between review papers. Lots of research has already been done on heart sound classification. However, there is still work to be done in this area through the development of different algorithms and techniques. In particular, the development of some smart mobile applications will be helpful in the improvement of cardiovascular disease diagnosis.

The rest of this chapter is organised in the following sections. [Section 7.2](#) provides the systematic related literature review. [Section 7.3](#) describes the three steps of heart sound classification: preprocessing, feature extraction and classification. The research gap (proposed work and future work) is discussed in [Section 7.4](#). Finally, [Section 7.5](#) is a conclusion of this chapter.

7.2 RELATED LITERATURE REVIEW

Reviewing literature is a key part of research, as it works as a guidepost, not only because it shows the quantum of work done in the field but also because it enables us to perceive the gap and lacuna in the related field of research. It helps in understanding the potentiality of the problem at hand and ensures the evidence of unnecessary duplication. The purposes of the survey of related literature are to locate comparative data useful in the interpretation of results and to provide ideas, theories and explanations in solving the problem.

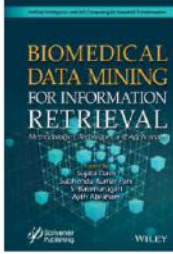
A systematic review of papers from 2008 to 2018 describing various works done in the field of heart sound (HS) classification are shown in [Table 7.1](#).

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Sujata Dash (Editor), Subhendu Kumar Pani (Editor), S. Balamurugan (Editor), Ajith Abraham (Editor)
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 Table Of Contents
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TABLE OF CONTENTS

Preface xv

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Preface xv

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 + Table Of Contents
 Series

1 Mortality Prediction of ICU Patients Using Machine Learning Techniques 1
Babita Majhi, Aarti Kashyap and Ritanjali Majhi

1.1 Introduction 2

1.2 Review of Literature 3

1.3 Materials and Methods 8

1.3.1 Dataset 8

1.3.2 Data Pre-Processing 8

1.3.3 Normalization 8

1.3.4 Mortality Prediction 10

1.3.5 Model Description and Development 11

1.4 Result and Discussion 15

1.5 Conclusion 16

title page_merged.pdf

12:15 PM 12/2/2021

Chapter 1

Mortality Prediction of ICU Patients Using Machine Learning Techniques

Babita Majhi, Aarti Kashyap, Ritanjali Majhi

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Summary

The Intensive care unit (ICU) admits highly ill patients to facilitate them serious attention and treatment using ventilators and other sophisticated medical equipments. These equipments are very costly hence its optimized uses are necessary. ICUs have a number of staffs in comparison to the number of patients admitted for regular monitoring of the patients. In brief, ICUs involve large amount of budget in comparison to other sections of any hospital. Therefore to help the doctors to find out which patient is more at risk mortality prediction is an important area of research. In data mining mortality prediction is a binary classification problem i.e. die or survive. As a result it attracts the machine learning group to apply the algorithms to do the mortality prediction. In this chapter six

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different machine learning methods such as Functional Link Artificial Neural Network (FLANN), Support Vector Machine (SVM), Discriminate Analysis (DA), Decision Tree (DT), Naive Bayesian Network and K-Nearest Neighbors (KNN) are used to develop model for mortality prediction collecting data from Physionet Challenge 2012 and did the performance analysis of them. There are three separate data set each with 4000 records in Physionet Challenge 2012. This chapter uses dataset A containing 4000 records of different patients. The simulation study reveals that the decision tree based model outperforms the rest five models with an accuracy of 97.95% during testing. It is followed by the FA-FLANN model in the second rank with an accuracy of 87.60%.

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Volume One

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8. A Woman in the Making: Can Sita Write in Chitra 80
Banerjee Divakaruni's *The Forest of Enchantments?*
~Debarghya Ganguli
9. *Karna's Wife: The Outcaste's Queen: A Retold* 95
Enunciation of the Disparaged Females
~Debalina Sengupta & Joydeep Banerjee
10. Concept of the 'Mother Goddess' and the Early 107
Nationalist Movement in Bengal (1905-1910)
~Kathakali Sengupta
11. A Structuralist Reading of the Trans-historical Myth 118
of Bon Bibi in Amitav Ghosh's *The Hungry Tide*
~Maitrayee Misra
12. Reimagining Surpanakha: From the Ugly in 132
Ramayana to the Tender Hearted in *The Liberation of Sita*
~Malavika Ajikumar
13. Shikhandi: Gender Trouble and Myth-Making 146
~Medha Bhadra Chowdhury
14. Transformative Corporeality vis-à-vis Love in 158
Mythological (Re)Tellings: A Comparative Inquiry
into Indian Revisionist Mythology
~Oindri Roy
15. Myths around Landscapes and Eco-Socio- 173
Spirituality in the Sanskrit Poem "Aye Neel Nadi" by
Prof Rewa Prasad Dwivedi
~Pallavi Mishra
16. Sujoy Ghosh's Short Film *Ahalya: A Mythical Story* 191
with a Feminist Twist?
~Rahul Nayak
17. Rediscovering Nature-Myths in *Mahabharata* and 198
Ramcharitmanas
~Mamta Srivastava

18. D
Re
~S
19. Th
M
O:
~S
20. W
th
~S
21. Is
Re
~N
22. My
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~A

A Structuralist Reading of the Trans-historical Myth of Bon Bibi in Amitav Ghosh's *The Hungry Tide*

Dr. Maitrayee Misra

Down through the ages stories have always been a repository of knowledge, inspiration; they have always proved themselves to be powerful enough to teach, convince, explain, warn and to make us conscious. However, in this vast realm of stories, there are some special ones which we had knowingly or unknowingly intertwined or attached to our lives, making them the integral part that strongly affects our existence. Such narratives or stories are popularly known as myths. Very often, it is a common human tendency to attach whatever is unbelievable or unthinkable or unimaginable with myth. e.g. whenever a science nerd listens to the story of *Ramayana*, especially comes to know about Dashanan or Raavana having ten heads, his/her rationality manipulates him/her to think of it as something absurd and insane. Among many meanings and definitions provided by the Merriam Webster Dictionary, one reflects that myth is an "unfounded or false notion". At this point, a set of questions may arise—if myths are reflective of the unimaginable, reasonably absurd and 'false notion', then why one should believe in myths? If myths are logically unacceptable, then why are they still alive and relevant even today?

While addressing these questions, it is necessary to understand the meaning of myth. The origin of the word myth is 'mythos' (Greek), which the Greek philosophers used in opposition to 'logos'. If 'logos' is "a logical form of expression

A Structuralist Reading of the Trans-historical Myth...

119

that is suitable to the analytical bent of mind" (Kohanski 17), then 'mythos' suggests utterances of the mouth, "simply a story which has an emotional effect on listeners and thus not a decisive account" (Hatab 334). Thus 'logos' which is logical, scientific and objective is in opposition to 'mythos' which is emotional, irrational and subjective. Myth considered to be a story or fiction is also regarded as a lie that counters logical reasoning. Nevertheless, still, it is valid, as it is "cultural and grounded in faith" (Pattanaik xiii). The scientific and objective truth of 'logos' can only focus on *how* things happen or function. The subjective truth of 'mythos' can explain *why* things happen or function, in contrast to 'logos'. In a way, from time immemorial, myths have given human beings the power to "express the inexpressible" (Menzies 207), to explain why s/he exists and why the existence is meaningful. So myth becomes an available tool of collective consciousness, and that makes us believe in the 'false notions'. Mircea Eliade in his *Myth and Reality* claims that myth is "living", as it "supplies models for human behaviour and, by that very fact, gives meaning and value to life" (2). Malinowski expresses that myth is a "vital ingredient of human civilization... [an] active force" (101). This idea makes the proposition evident that although having falsity, myths remain alive. Myths are trans-historical and cultural embodiments of traditional knowledge containing story elements passed on over the generations. Myths are transmitted from earlier generations to successively informed and erudite generations, transferring the stories to an even more "technologically advanced people", who accept the myths although possessed with the thoughts that they are "too educated to believe such stories" (Menzies 224). Therefore, myth is a "special kind of communication that establishes a relationship between the macrocosm (universe), mesocosm (society) and microcosm (humans)" (Pattanaik 14). It may seem that the fast process of urbanization has affected the strength and position of myth in our lives, but the fact is that we cannot think without myths, as they help us to locate

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AUTHORS P R E S S

8. Rethinking Nature: Wilderness in Arun Joshi's
The Strange Case of Billy Biswas
N. Lakshmi & G. Chenna Reddy 95

9. Ecological Crisis in Ruskin Bond's
Selected Short Stories
Annie Jane C Mawkhiew 104

10. Culture and Nature in Selected Poems of Shrutti Das:
An Eccritical Study
Samita Mishra 111

PART III. CLIMATE CHANGE REPRESENTATIONS

11. Climate Change and its Impact in
Barbara Kingsolver's Novel *Flight Behavior*
Sr. Imyasamma Gade 121

12. 'Not a drop of water, nor a blade of grass.'
Reading Haruki Murakami's *Colourless Tsukuru and
His Years of Pilgrimage* as a Postmodern Ecological Text
Minakshi Prasad Mishra 130

13. Dire Consequences of the Fall of an Ecosystem:
A Critique on Helon Habila's *Oil On Water*
Ramesh K. G., James Joseph & P. C. Roy 141

14. Environmental Scatology in Eni-Jolgho Umuko's
The Scent of Crude Oil
Ajumeze Henry Obi 151

PART IV. LOCATION, ANTHROPOCENE AND DEEP ECOLOGY

15. Creating a Sense of Place through Literature:
A Bioregional Reading of *Barragin (Smell the Wind)*
Aleena Manoharan 165

16. *Borbibi* and *Cetology*: The Confluence of the Mythic
and the Scientific in Armitav Ghosh's *The Hungry Tide*
Maitrayee Misra 176

17. From the Politics of the River to the Making
of the Dam: Locating Environmental Refugees in
Manoj Das' *The Submerged Valley*
Munira Salim 185

18. Towards Symbiogenesis: Re-Reading Carlos Saldanha's
Rio and Rio 2
Suranjana Bhadra 194

19. Entangled Bodies – The Symbiotic
Eco-Cosmo-Vision of *Tree Matters*
Pritha Banerjee 204

20. Anthropocentric Limits in Ecological Considerations:
Towards A Green Orientation
Gagana Bihari Purohit 219

PART V. ECO-THEOLOGY AND ECO-ETHICS

21. Natural Supernaturalism and Tribal Eco-theology in
Hansda Sowwendra Shekhar's *The Mysterious Ailment of
Ruphi Baskey*
Ruphi Baskey
Asis De 235

22. *Gitanjali* (*Song Offerings*): The Aesthetics of
Eco-Spirituality
Kalkinakar Pattanayak 243

23. Pantheism, Animism and Personalism:
Understanding Deep Ecology through the Poetry of
Robinson Jeffers
Shrabane Khatai 254

24. Ethical Praxis and the Ecological Aspects of
Khasi Folklore
Auswyn Winter Japang, 266

25. Ecoethics: A Philosophical Panacea for
Environmental Melancholia
Bhagabat Nayak 277

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Chimamanda Ngozi Adichie

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Contents

6. Dining Room & Kitchen
Food-Related Spaces & their Interfaces with the
Female Body in *Purple Hibiscus* 87
JESSICA HUME
7. The Paradox of Vulnerability
The Child Voice in *Purple Hibiscus* 101
OLUWOLE COKER
8. 'Fragile Negotiations'
Olanna's Melancholia in *Half of a Yellow Sun* 115
PAULINE DODGSON-KATIYO
9. The Biafran War & the Evolution
of Domestic Space in *Half of a Yellow Sun* 129
JANICE SPLETH
10. Corruption in Post-Independence Politics
Half of a Yellow Sun as a Reflection of *A Man of the People* 139
CHIKWENDU PASCHALKIZITO ANYANWU
11. Contrasting Gender Roles in Male-Crafted
Fiction with *Half of a Yellow Sun* 153
CAROL IJEOMA NJOKU
12. 'A Kind of Paradise'
Chimamanda Ngozi Adichie's Claim to Agency,
Responsibility & Writing 169
SILVANA CAROTENUTO
13. Dislocation, Cultural Memory
& Transcultural Identity in Select Stories
from *The Thing Around Your Neck* 185
MAITRAYEE MISRA & MANISH SHRIVASTAVA
14. 'Reverse Appropriations'
& Transplantation in *Americanah* 199
GICHINGIRI NDIGIRIGI

EXISTENTIALISM AND POSTMODERNISM

The Cult For Self

Editors:

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CHAPTER 13

Postmodernism, Virtual Reality and Popular Culture

Dr. Prasenjit Panda

Postmodernism is appeared to be a new historical movement which is by and large responsible for establishing a new cultural epoch after World War II. It does not endorse the modernist distinction between high and low culture not it aims for establishing any truth. Having an iconoclastic sensibility postmodernism is often raises its voice against any institutionalised concept of culture, knowledge, religion and aesthetics. Postmodernism rejects the cultural and aesthetic elitism of the modernism. The grand narrative or the metanarrative of the modernism is replaced with micronarratives. Popular culture like TV, Cinema or photography were even considered to be low art amidst the *avant garde* movement which considers Imagism, symbolism, Marxism, surrealism as high art. Postmodernism claims itself as an anti-philosophical since it rejects traditional concepts of truth, beauty, goodness and being and welcomes the fragmented version of truth and meaning. Centre collapses as the raise of the margins becomes inevitable. Postmodernity becomes "a journey into unknown territory where the old cultural constraints no longer apply, and our collective security is potentially compromised (17). In the words of French postmodern theorist Jean-Francois Lyotard,

We now live in a world where Eclecticism is the degree zero of contemporary general culture: you listen to reggae; you watch a western; you ate McDonald's at midday and local cuisine at night; you wear Paris perfume in Tokyo and dress retro in Hong Kong, knowledge is the stuff of TV game shows... Together, artist, gallery owner, critic, and public indulge one another in the Anything Goes – it is time to relax. (8)

Postmodernism rejects the traditional concept of culture which works as preexisting social ordering force that is transmitted to members



VOICES

A National Research Anthology on Northeast Indian English Poetry

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Rabindra Bharati University
NAAC ACCREDITED WITH GRADE 'A' (2016)

Date: 08th January 2021

I am overjoyed to see how Dr Subhashis Banerjee and Dr Tuhin Majumdar pulled off a well needed and timely event in the form of Voices: A National Research Anthology on Northeast Indian English Poetry. The Northeast has been producing for long poetry in especial and literature as a whole that is worth their salt and students and scholars in the Indian Academia have been in need of an anthology which must have been well researched and representative. The editors have stood up to the job so well. I do wish them all the best.

Professor Chidananda Bhattacharya

(Former HOD, Dept. of English & Dean, Faculty of Arts)
Rabindra Bharati University, Kolkata

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CHAPTER-4

TRACING THE PARADOX OF MEANING IN THE MIZO POETRY: A REVOLUTIONARY ROAD TOWARDS ELIMINATION, ASSIMILATION AND RESISTANCE

-Dr Prasenjit Panda

It is quite impossible to understand the poetry of North-East without understanding the socio-political situation of the land. Almost all the states of North East India share two common things with each other. First is the tribal culture and a beautiful landscape and the second is the unending trouble caused by insurgency, racial violence and bloodshed. The poets from the North East has been continuously voicing against the growing deterioration of oral culture and the loss of identity. The poets like Mamang Dai, Robin S. Ngangom, Desmond Kharmawphlang, Esther Syiem, Kynpham Singh Nongkynrih, Thanesia, Cherrie L. Chhangte, Mona Zote, Easterine Irabu, Monalisa Changkija, Lalrimawii Khiangte etc. represent the new voices of North-East. They with their unique style of writing have addressed the complexity of individual life amidst the violence, geopolitical conflict and corruption. As Saikat Guha opines that they are voices that represent "the disillusionment of the people" who constitute the marginalized and the neglected, living in underdeveloped regions (75). Their poetry reflects the brutalization of life, ethnic identity and the unending agonies. The poetry of North East India is diverse in nature as it is directly influenced by the oral tradition of folktales and folk



Colon Cancer Diagnosis and Therapy pp 271-308 | Cite as

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Authors Authors and affiliations

Chanchal Kumar, Rajat Pratap Singh, Mrigendra Kumar Dwiwedi, Ajay Amit

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Abstract

Colorectal cancer is responsible for more than half of all intestinal malignancies with very high metastatic rate. Although there are vast improvement and advancement made in recent time, surgery still remains the only potentially curative treatment choice. The success of colon cancer surgery depends upon early diagnosis, and it is not an effective choice in patients with advance stage or metastatic stage. Other traditional pharmaceutical therapeutic approaches including chemo-radiotherapy are associated with non-specificity and toxicity. These treatment regimens

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Chapter 14

IMPACT OF DROUGHT ON TROPICAL FORESTS AND PLANT MECHANISM TO MITIGATE DROUGHT STRESS

K. K. Chandra^{1,}, Atul Kumar Bhardwaj¹,
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ABSTRACT

Forests are vital for climate change but now the forest itself is in big trouble due to extreme weather events and frequent droughts. The earth warming expects to influence about 40% of the terrestrial area, and then most trees alive today would not be able to survive or will be functionally changed. The severe drought affects the terrestrial ecosystem leading to poor productivity and health. Drought impacts on trees directly by arresting growth, and causing death while indirectly by increasing their susceptibility to wildfire, insect pests, and disease. Trees evolve protective mechanisms to deal with drought stress through morphological, physiological, and molecular adaptations, however drought combined with many other external factors make forest trees highly vulnerable. This paper deals with the responses of drought on forest regeneration, forest fire, tree physiology, and plant-microbial interactions, incidences of insect and pathogens, and plant mechanisms to combat drought stress.

The information provided would help to understand the drought impact on forests, and to evolve management strategies for reducing the vulnerability of forest and to develop suitable tree species for successful afforestation.


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Chapter 25

Medicinal Attribution of Ginsenoside: A Huge Source of Plant Bioactive Compound



Dilipkumar Pal, Souvik Mukherjee, Satish Balasaheb Nimse,
and K. K. Chandra

Abstract Ginsenosides (G_N^D) are chemically triterpenoid saponin in nature. According to the presence of aglycones, dammarane and oleanane are the two types of G_N^D . These are mostly observed in species of Panax. The researchers have discovered over one hundred fifty substances from stocks, grasses, shoots, florets, drupes from the ginseng plant. G_N^D and their derivatives are the main chemical constituents of the ginseng plant. Recently, G_N^D are gaining increasing interests among natural product scientists. G_N^D have many significant pharmacological activities, including anti-oxidation, immunomodulation, and preventive actions in cancer, inflammation, stress, and hypertension, etc. The metabolism of G_N^D involves two significant metabolic reactions, including acid hydrolysis and hydrolytic reactions oriented from bacterial origins. After metabolism, G_N^D are transformed into a more active G_N^D derivatives. The utilization and changes of unblemished G_N^D , which appears to assume a significant job for their potential wellbeing impacts, are discussed in this chapter.

Keywords Triterpene · Ginseng · Saponin · Gut flora · Biosynthesis · Metabolism

List of Abbreviations

B_{syt}	Biosynthesis
C_N^R	Cancer
C_e^L	Cell

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845
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A Strategic Approach on Blockchain Technology in Software Testing Mechanism

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Abstract

The block-chain technology presents a very innovative and secure way of managing transactions in online platform. It is one of the greatest inventions after the Internet, has taken the digital world by various software and implementing in many industries. In the past few years this technology has gained huge importance and its application area has evolved into a wider context across the global wide. The adoption of block-chain based applications has increased periodically and this type of applications now available for high usage. As a result, block-chain based software development is also growing at a staggering rate day to day in the business environment. The aim of this paper is to develop different software testing techniques, methods and approaches for Block-chain oriented software platform as currently there is no such approach available in any sector. It defines the challenges currently faced while processing a Transaction and gives accurate results gives more importance to the customers to trust the application features and the procedure.

Keywords—BlockChain, Software Testing and Techniques

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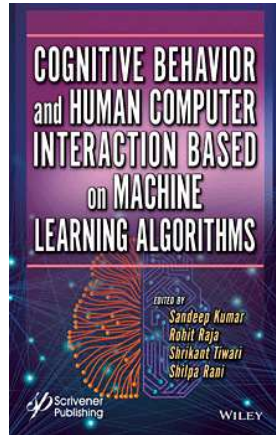
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A wide range of researchers, industry practitioners, and students will be interested in this book including those in artificial intelligence, machine learning, cognition, computer programming and engineering, as well as social sciences such as psychology and linguistics.

Description

Human-computer interaction (HCI) is the academic discipline, which most of us think of as UI design, that focuses on how human beings and computers interact at ever-increasing levels of both complexity and simplicity. Because of the importance of the subject, this book aims to provide more relevant information that will be useful to students, academics, and researchers in the industry who wish to know more about its real-time application. In addition to providing content on theory, cognition, design, evaluation, and user diversity, this book also explains the underlying causes of the cognitive, social and organizational problems typically devoted to descriptions of rehabilitation methods for specific cognitive processes. Also described are the new modeling algorithms accessible to cognitive scientists from a variety of different areas.

This book is inherently interdisciplinary and contains original research in computing, engineering, artificial intelligence, psychology, linguistics, and social and system organization as applied to the design, implementation, application, analysis, and evaluation of interactive systems. Since machine learning research has already been carried out for a decade in various applications, the new learning approach is mainly used in machine learning-based cognitive applications. Since this will direct the future research of scientists and researchers working in neuroscience, neuroimaging, machine learning-based brain mapping, and modeling, etc., this book highlights the framework of a novel robust method for advanced cross-industry HCI technologies. These implementation strategies and future research directions will meet the design and application requirements of several modern and

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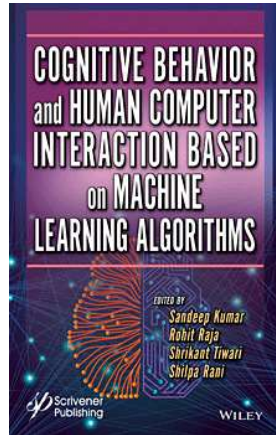
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Description

Human-computer interaction (HCI) is the academic discipline, which most of us think of as UI design, that focuses on how human beings and computers interact at ever-increasing levels of both complexity and simplicity. Because of the importance of the subject, this book aims to provide more relevant information that will be useful to students, academics, and researchers in the industry who wish to know more about its real-time application. In addition to providing content on theory, cognition, design, evaluation, and user diversity, this book also explains the underlying causes of the cognitive, social and organizational problems typically devoted to descriptions of rehabilitation methods for specific cognitive processes. Also described are the new modeling algorithms accessible to cognitive scientists from a variety of different areas.

This book is inherently interdisciplinary and contains original research in computing, engineering, artificial intelligence, psychology, linguistics, and social and system organization as applied to the design, implementation, application, analysis, and evaluation of interactive systems. Since machine learning research has already been carried out for a decade in various applications, the new learning approach is mainly used in machine learning-based cognitive applications. Since this will direct the future research of scientists and researchers working in neuroscience, neuroimaging, machine learning-based brain mapping, and modeling, etc., this book highlights the framework of a novel robust method for advanced cross-industry HCI technologies. These implementation strategies and future research directions will meet the design and application requirements of several modern and

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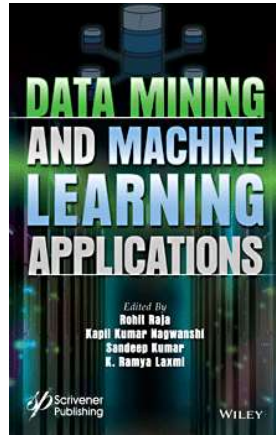
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Assessment Methods of Cognitive Ability of Human Brains for Inborn Intelligence Potential Using Pattern Recognitions

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Data Deduplication Approaches

Concepts, Strategies, and Challenges

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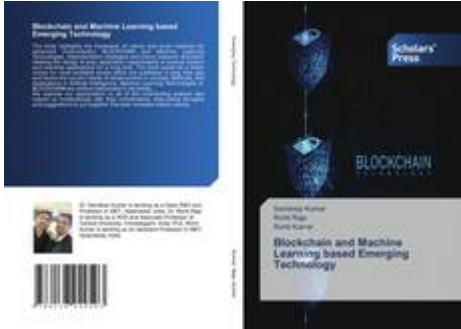
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2.7	Storage area network	21
2.8	Network attached storage	21
2.9	Comparison between direct attached storage, network attached storage, and storage area network	22
2.10	Data deduplication techniques	23
2.11	Benefits of data deduplication	23
2.12	How data deduplication operates	23
2.13	Hashing	24
2.14	Deduplication taxonomy	27
2.15	Deduplication versus compression	34
2.16	Challenges in data deduplication	34
	References	34
3.	Concepts, strategies, and challenges of data deduplication	37
	<i>PRAKASH CHANDRA SHARMA, SULABH BANSAL, ROHIT RAJA, PHYU MYO THWE, MOE MOE HTAY AND SU SU HLAING</i>	
3.1	Deduplication approaches	37
3.2	Required components for data deduplication approaches	39
3.3	Centered on granularity for elimination of data duplication	40
3.4	Centered on location for elimination of data duplication	45
3.5	Centered on time for elimination of data duplication	47
3.6	Comparative discussion on different studied and prevailing data deduplication approaches and its challenges	50
3.7	Summary	53
	References	53
4.	Existing mechanisms for data deduplication	57
	<i>DEVENDRA KUMAR MISHRA AND SANJIV SHARMA</i>	
4.1	Introduction	57
4.2	Classification of data deduplication techniques	57
4.3	Data deduplication in the cloud	65



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4 Detection of Nodule and Lung Segmentation Using Local Gabor XOR Pattern in CT Images

*Laxmikant Tiwari, Rohit Raja, Vineet Awasthi,
and Rohit Miri*

CONTENTS

4.1	Introduction.....	53
4.2	Histories.....	54
4.3	Concepts	55
4.4	Causes for Lung Cancer.....	57
4.4.1	Smoking.....	57
4.4.2	Familial Predisposition.....	58
4.4.3	Lung Diseases	59
4.4.4	Prior Tale Containing Stroke Cancer	59
4.4.5	Air Pollution.....	59
4.4.6	Exposure as Far as Engine Exhaust	59
4.4.7	Types Containing Tumor	60
4.4.8	Signs and Symptoms of Lung Cancer.....	61
4.5	Solution Methodology With Mathematical Formulations.....	62
4.5.1	Feature Extraction	63
4.5.2	Modified Area Starting to Be Algorithm	64
4.5.3	Gridding.....	64
4.5.4	Selection of Seed Point.....	64
4.6	Morphological Operation	66
4.7	Conclusions and Future Work	69
	References.....	71

13 Lung Segmentation and Nodule Detection in 3D Medical Images Using Convolution Neural Network

Rohit Raja, Sandeep Kumar, Shilpa Rani, and K. Ramya Laxmi

CONTENTS

13.1	Introduction.....	179
13.2	Review of Literature	181
13.3	Rationale of the Study	182
	13.3.1 Morphological Processing of the Digital Image.....	183
13.4	Objectives of Study.....	184
13.5	Proposed Methodology.....	184
	13.5.1 Evaluation Results for Medical Image Handling.....	185
	13.5.1.1 False Positive Rate (FPR)	185
	13.5.1.2 False Negative Rate (FNR)	185
	13.5.1.3 Sensitivity.....	186
	13.5.1.4 Specificity.....	186
	13.5.1.5 Accuracy.....	186
13.6	Expected Outcome of Research Work	186
13.7	Conclusion and Future work.....	187
	References.....	187

13.1 INTRODUCTION

Lungs are the most important organs for our cellular respiration system which is situated in the chest cavity. Lungs are a set of spongy organs which allow us to breathe properly. Lungs are responsible for providing oxygen to the human body and also expel carbon dioxide from the body. The exchange of these gases is called respiration. In today's lifestyle lung cancer is a common disease and it's also a reason of a greater number of deaths around the world. Lung cancer is a deadly

Teaching-Learning Process and Brain-Computer Interaction Using ICT Tools

Rohit Raja, Neelam Sahu, Sumati Pathak 

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Summary

Teaching is an aid in the process of learning. A teacher is, by default, a learner. A person who is a self-learner turns out to be a teacher, meaning he/she is capable of imparting knowledge to others who are not in a position to spend sufficient time for self-learning. Self-learning is a self-motivated mental exercise to observe, understand, and make a meaningful interpretation of various physical, logical, and philosophical entities. One can accomplish knowledge by self-learning only when one sacrifices the desire to consume time for physical sense-related experiences of pleasure and pain. Self-learning focuses on direct communication between external entities and processes and the brain for cognitive perception and understanding. Teaching should always be viewed as a regenerative feedback system. A brain-computer interface (BCI) provides a pathway for the direct communication between brain and an external device. BCIs provide augmentation, repairing human cognitive and sensory motor functions. Alternatively, “Neuroprosthetics” in neuroscience, which is concerned with neural prostheses of using artificial devices to replace the function of impaired nervous systems or sensory organs. The best examples of neuroprosthetic devices are “cochlear implants”, used to restore hearing, and optical neuroprosthetic devices like retinal implants used to restore vision.

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Chapter 4

Tracking an Object Using Traditional MS (Mean Shift) and CBWH MS (Mean Shift) Algorithm with Kalman Filter



Sandeep Kumar, Rohit Raja, and Archana Gandham

1 Introduction

Tracking can be referred to as a task in order to generate the trajectories of the objects which are moving and compute the motion of sequenced images. Numerous approaches are proposed for translating an object in a sequence of frames, MS is a common approach to perform the task for tracking an object. It is easy in implementing and robustly tracks the performance [1]. MS algorithm compares the target model with the current frame to obtain the region of an object which is selected. It is hard to deal with occlusion in the object and loss of an object in the frame [1]. So, MS procedure has to be improved by using a Kalman filter. Kalman filter estimates active systems state, though the exact form is not known. Other limitations of the MS approach are subjected to local minima where few features of the target are presented in the backdrop. BWH is implemented to reduce the backdrop interference which represents the target. But unfortunately the transformation formula is incorrect and BWH is similar to MS tracking with the usual representation of the target [1–4]. To achieve the improved target localization CBWH MS algorithm is implemented which is obtained by not changing the target candidate model but the target model in the frames. The advantage of CBWH is, in spite of having much information in backdrop CBWH can work robustly. An object position is tracked by using Kalman Filter and that position is observed by MS algorithm. Kalman filter composed with

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Immune response, inflammation pathway gene polymorphisms, and the risk of cervical cancer

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and Lakkakula V.K.S. Bhaskar^c

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Abstract

Numerous studies have provided novel insights into the potential role of genetic polymorphisms as prognostic markers in gynecologic cancers, particularly cervical cancer. Cervical cancer is the second most common and primary cause of cancer-related deaths in developing countries. Deep research into single-nucleotide polymorphisms (SNPs) may help to explain potential differences in distinct cancers. Candidate SNPs may be involved in immune cell regulation, cell-cycle control, DNA damage and repair, cancer metabolism, and apoptosis. In the present chapter, we have summarized important findings of genetic association studies exploring the role of glutathione-S-transferase (GST), interleukins (ILs), p53 codon 72, tumor necrosis factor A gene (TNFA), human leukocyte antigen (HLA), Fas gene polymorphism, murine double-minute two homologs (MDM2), and interferons- γ (IFNG) gene polymorphism with cervical cancer. Genetic association studies will require further validation to provide direction for future research leading to better clinical outcomes for patients with cervical cancer.

Abbreviations

CDC	Centers for Disease Control and Prevention (US)
GC	gynecologic cancer
GST	glutathione-S-transferase
GSTO	glutathione-S-transferase omega
HLA	human leukocyte antigen
HPV	human papillomavirus

Chapter 10

Association Between IL6 Gene Polymorphisms and Gastric Cancer Risk: A Meta-Analysis of Case-Control Studies



Henu Kumar Verma, Neha Merchant, and L. V. K. S. Bhaskar

Abstract Interleukin-6 (IL-6) is a multifunctional cytokine, which plays a vital role in inflammation as well as tumorigenesis. Several studies have demonstrated that the association of IL6 -174 G/C (rs1800795) and -572 G/C (rs1800796) promoter polymorphisms influences transcription and has been found to trigger the risk of gastric tumor advancement with inconsistent and controversial result. The present study aims at collecting eligible articles through extensive search in PubMed, MEDLINE, and Embase databases. Additionally, the analysis also included 15 case–control investigations. MetaGenyo web tool was used to perform the meta-analysis. No substantial association was observed between IL6 polymorphisms and GC. In conclusion, our study signifies that polymorphisms of IL6, -174 G/C, and -572 G/C are not linked with GC risk.

Keywords Gastric cancer · IL-6 gene · -174 G/C · -572 G/C · Meta-analysis

Abbreviations

GC	Gastric cancer
IL-6	Interleukin 6
<i>H. pylori</i>	<i>Helicobacter pylori</i>
NLM	National Library of Medicine
SNPs	Single nucleotide polymorphisms
CBLD	Chinese Biomedical Literature Database

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Chapter 10

An Intergenic Variant rs4779584 Between SCG5 and GREM1 Contributes to the Increased Risk of Colorectal Cancer: A Meta-Analysis



Samrat Rakshit and L. V. K. S. Bhaskar

Abstract Colorectal cancer (CRC) is very common malignancy all over the world. Adoption of Western diet (red meat and high fat foods) in many countries has increased the incidence of colorectal cancer. There are genetic factors as well as environmental factors contributed to the etiology of CRC. Current meta-analysis is envisioned to investigate the association between rs4779584 variant and risk of CRC. PubMed, Google Scholar, and Embase were used for the collection of publication to retrieve data. Odds ratios (ORs) with 95% confidence intervals (CIs) were calculated to evaluate the association between rs4779584 variant and risk of CRC. To determine heterogeneity, Cochran Q test and I^2 statistic were employed. Subgroup analysis and sensitivity analysis were performed to assess between-study heterogeneity. Publication bias was determined through Funnel plots and Egger's test. Total 14 publications with 26 different studies comprising 25,469 CRC cases and 32,745 controls were finally considered for meta-analysis. Overall, a positive association of rs4779584 polymorphism with CRC risk was found in all genetic models (allelic model: OR = 1.13; 95% CI 1.08–1.18; p = <0.001; I^2 : 53%; dominant model: OR = 1.14; 95% CI 1.08–1.21; p < 0.001; I^2 : 41%; and recessive model: OR = 1.19; 95% CI 1.09–1.30; p < 0.001; I^2 : 44%). The level of heterogeneity was significant for all ethnic groups. No significant publication bias was found in this meta-analysis. Based on this meta-analysis, it can be confirmed that the rs4779584 polymorphism and CRC risk shares a positive correlation in patients where T allele was a susceptible factor.

Keywords Colorectal cancer · Colorectal carcinoma · rs4779584

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CHAPTER 13

Pharmacoeconomics and cost-effectiveness of treatments related to breast and cervix cancers

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Abstract

Breast and cervix cancers are major diseases among women with increasing incidence worldwide. Apart from disease burden, costs related to treatments and diagnoses of breast and cervical cancers put a major stress on the health and economic status of patients as well as the countries they are from. In most low- and middle-income countries, treatments of these diseases cause a larger economic burden on patients. The introduction of pharmacoeconomics reduces the economic burden of disease management on both patient and governments. This chapter discusses the worldwide cost burden and cost-effective treatments of breast and cervix cancer, which may be a pharmacoeconomic input.

Keywords: Cervical cancer, Breast cancer, Pharmacoeconomic concepts, Cost-effectiveness treatments, Treatment cost burden.

Abbreviations

BRCA1	human tumor suppressor gene
CBA	cost-benefit analysis
CEA	cost-effective analysis
CMA	cost-minimization analysis
CRT	chemoradiation therapy
CT	computerized tomography
CUA	cost-utility analysis
ER	estrogen receptors
GDP	gross domestic product
HER2	human epidermal growth factor receptor 2
HPV	human papillomavirus
INR	Indian rupee
IV	intravenous
NAC	neoadjuvant chemotherapy
QALY	quality adjusted life years
TNM	tumor node metastasis
USD	United States of America Dollar

CHAPTER 16

CYP1B1 rs1056836 polymorphism and endometrial cancer risk: A meta-analysis

Samrat Rakshit and L.V.K.S. Bhaskar

Department of Zoology, Guru Ghasidas Vishwavidyalaya, Bilaspur, Chhattisgarh, India

Abstract

Endometrial cancer (EMC) is the most common gynecological cancer, accounting for more than 2% of cancer deaths in women worldwide. The present meta-analysis deals with the association between the CYP1B1 rs1056836 variant and risk of EMC. For the collection of data, we rigorously searched Google Scholar, PubMed, and Embase for relevant published articles. The association between CYP1B1 rs1056836 and EMC was assessed by calculating odds ratios (ORs) with 95% confidence intervals (CIs). Values of I^2 statistics were calculated with the help of the Cochran Q test to determine heterogeneity of the study. To understand between-study heterogeneity, subgroup analysis and sensitivity analysis were performed. Funnel plots as well as Egger's tests were performed to determine publication bias. A total of 4804 cases of EMC and 7185 control patients involving the CYP1B1 rs1056836 polymorphism and EMC risk were investigated from 17 independent studies. Pooled analysis in a dominant genetic model showed that there is significant association between the CYP1B1 rs1056836 polymorphism and development of EMC (OR = 1.31; 95% CI 1.08–1.59; $P = 0.005$). There is significant heterogeneity between ethnic groups with no publication bias observed. In summary, this meta-analysis revealed that rs1056836 is a major risk factor for developing EMC. Further research is still needed to investigate the clinical and biological implications of these associations.

Keywords: Endometrial cancer (EMC), Single nucleotide polymorphisms (SNPs), Meta-analysis, Polymorphism, Confidence intervals (CIs), Odds ratios (ORs).

Abbreviations

CI	confidence interval
CYP1B1	cytochrome P-450 1B1
EMC	endometrial cancer
OR	odds ratio
SNPs	single nucleotide polymorphisms

1. Introduction

Endometrial cancer (EMC) is the most common gynecological cancer and accounts for more than 2% of cancer deaths in women worldwide. EMC is a very common female malignancy, second only to breast cancer [1, 2]. In comparison to other parts of the world, North America and parts of Europe have greater numbers of EMC patients, which may be



Phenolic Compounds from Medicinal Herbs: Their Role in Animal Health and Diseases – A New Approach for Sustainable Welfare and Development **10**

Younis Ahmad Hajam, Seema Rai, Rajesh Kumar, Mudasir Bashir, and Javid Ahmad Malik

Abstract

Polyphenolic compounds have received a special attention from the scientific community, because of their pleiotropic properties. These polyphenolic compounds are the secondary metabolites synthesized in various components of the plants. They possess significant capability to influence different processes in biological systems. So, these are taken as supplementary foodstuffs, energizers, dietary sources, and medicines. These natural compounds attribute therapeutic and medicinal efficiencies. Phenolic compounds are of great interest in food manufacturing industries as they suppress the oxidative deprivation of lipids and therefore improve the nutritional value of foods. Ethnoveterinary medicine is a word usually applied for folk talent, beliefs, knowledge, practices, and methods associated to animal healthiness and cure of different health problems in the rural areas. Animal welfare is speedily becoming foremost aspect of production of animals worldwide, in the industrialized world and also in developing countries. Livestock plays an essential role in sustaining livelihood, nutritional and environmental security, and augmentation of agriculture. The enormous stride made in the livestock sector in the past decades is one of the main causes for positive growth rates recorded in agricultural sector. There is enormous need to attain vertical growth in terms of improving productivity. Animal husbandry and agriculture are associated with each other; rural communities utilize ethanobotanical culture for the curing of different animal diseases and in the biological control. Diseases in animals remain most important

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221

Hepatotoxicity: Its physiological pathways and control measures using phyto-polyphenols

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1. Introduction

Liver is one of the major organ involved in various metabolic pathways, especially energy production inside the body of animals. It stores glucose in the form of glycogen and also utilizes carbohydrates for synthesis of cholesterol. Metabolically, it is the most active organ and plays major role in regulating metabolic processes, namely, (i) metabolizing and detoxifying toxins, (ii) releasing glucose from glycogen and maintaining glycemic levels during fasting through glycogenolysis and gluconeogenesis, and (iii) regulating acetyl-CoA for the synthesis of fatty acids and cholesterol as it absorbs fat (triglycerides) and cholesterol from the diet.

Liver plays a major role in the conversion of extra fatty acids into ketone bodies, which provides energy to body parts during fasting/starvation. Thus it contributes to maintaining metabolic homeostasis inside the body of animals (Chang, 2014). It gets affected by high doses of paracetamol; thioacetamide (TAA); hepatitis A, B and C; viruses; carbon tetrachloride (CCl₄); and certain chemotherapeutic agents (Saleem et al., 2010). Liver is the primary site for the synthesis of various proteins like albumins and also carries fatty acids, amino acids, vitamins and drugs. Therefore it helps in maintaining osmotic pressures for coagulation of blood and production of immunoglobulins to be used in defense system of the body. It also synthesizes and degrades heme prosthetic groups in mitochondrial cytochromes, protoporphyrin IX in hemoglobins, and microsomal cytochrome P450 (Chang, 2014). The filtration of complete blood is carried out by the liver first, and then it is passed to various body parts. The



Exploitation of Plant Phenolics in Animal Farming

3

Javid Ahmad Malik, Monika Bhadauria, Rafiq Lone,
and Younis Ahmad Hajam

Abstract

Secondary metabolites are produced by the plants besides the primary metabolites which are not needed for the daily functioning of the plant. However, they are responsible for a myriad number of potential roles in the living system, such as protection, attraction, or signaling. Herbs and spices have been used since ancient times as folk medicine and as preservatives in foods as they contain many biologically active compounds, especially polyphenols, which possess antimicrobial, antioxidant, antiparasitic, antifungal, and anti-inflammatory properties. The production of these polyphenols is affected by various factors including both internal and environmental factors. These polyphenolics are of many forms and beneficial to the animal world in each of this form. The demand for these plant derivatives has increased alarmingly because they are natural and eco-friendly. Polyphenols are secondary plant metabolites which contain bioactive components and deliver positive effects for humans and animals and also protect the plant from various diseases. Likewise, they act as allelochemicals and suppress weed growth markedly. For better yield and crop management, a few traditional practices like cover crops, green manures, and crop rotation are being utilized. Besides other useful roles, plant phenolics improve ruminant fermentation by acting as antioxidant agents. They also help to improve

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Abstract

Cashew (Anacardium occidentale L.) is a versatile plant cultivated in several tropical countries. The crop is fast-growing, hardy, drought resistant, and it is familiar for its nut globally although all plant parts are valuable. It serves an immense importance with respect to global trade for its nuts. Although in the beginning it was considered a well-known agroforestry species used for the afforestation and soil binding purposes, its commercial exploitation started lately. Cashews are nutritionally very rich with a good fat and protein content. The main cashew-producing countries are Brazil, India, Mozambique, and Tanzania. Although cashew cultivation started in Brazil, it has reached to Asia, Africa, and Latin America. On global stage, India plays a major part on the cashew nut trade, being the second-largest country after Brazil for raw cashew nut production. The cashews are processed mostly through manual methods; however, some advancement in the methods has been achieved. Processing occurs through three main steps: drying, shelling, and then removal of testa. The fruit consists of cashew apple and cashew nut, which further consists of three parts: shell, coat, and nut. The increasing demand for the fruit owes to its beneficial uses of various by-products besides the nut. The fruit comprises many essential constituents which impart some essential roles to combat metabolic disorders, oxidative stress-induced manifestations, immune malfunctions, and cardiac dysfunctions.

Keywords

Cashew · Cashew by-products · Antioxidants · Immune malfunctions · Cardiac dysfunctions

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539

Chapter 18

Polyhydroxyalkanoates: An Indispensable Alternative

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ABSTRACT

*Human dependence on number of chemicals or chemical derivatives has increased alarmingly. Among the commodity chemicals, plastics are becoming independent for our modern lifestyle, as the usage of plastics is increasing worryingly. However, these synthetic plastics are extremely persistent in nature and accumulate in the environment, thereby leading to serious ecological problems. So, to build our economy sustainably, a need of replacement is necessary. Biomaterials in terms of bioplastics are an anticipated option, being synthesized and catabolized by different organisms with myriad biotechnological applications. Polyhydroxyalkanoates (PHAs) are among such biodegradable bioplastics, which are considered as an effective alternative for conventional plastics due to their similar mechanical properties of plastics. A range of microbes under different nutrient and environmental conditions produce PHAs significantly with the help of enzymes. PHA synthases encoded by *phaC* genes are the key enzymes that polymerize PHA monomers. Four major classes of PHA synthases can be distinguished based on their primary structures, as well as the number of subunits and substrate specificity. PHAs can also be produced from renewable feedstock under, unlike the petrochemically derived plastics that are produced by fractional distillation of depleting fossil fuels. Polyhydroxybutyrate (PHB) is the simplest yet best known polyester of PHAs, as the PHB derived bioplastics are heat tolerant, thus used to make heat tolerant and clear packaging film. They have several medical applications such as drug delivery, suture, scaffold and heart valves, tissue engineering, targeted drug delivery, and agricultural fields. Genetic modification (GM) may be necessary to achieve adequate yields. The selections of suitable bacterial strains, inexpensive carbon sources, efficient fermentation, and recovery processes are also some aspects important aspects taken into consideration for the commercialization of PHA. PHA producers have been reported to reside at various ecological niches with few among them also produce some byproducts like extracellular polymeric substances, rhamnolipids and biohydrogen gas. So, the metabolic engineering thereafter promises to bring a feasible solution for the production of “green plastic” in order to preserve petroleum reserves and diminish the escalating human and animal health concerns environmental implications.*

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