



SOCIAL SCIENCE ABSTRACTS

Volume XLVII, 2024

FOCAL THEME

**SCIENCE EDUCATION AND RESEARCH
IN SWARAJ INDIA**

**XLVII INDIAN SOCIAL SCIENCE CONGRESS
February 05–09, 2024**

**University of Science and Technology
Baridua, Ri-Bhoi, Meghalaya**

**भारतीय समाज विज्ञान अकादमी
INDIAN SOCIAL SCIENCE ACADEMY
INDIA**

One may ask here: why does psychology of politics promote conflict and war? Answer is simple but difficult to comprehend. Politics is about economics and economics is about production, distribution and ownership of production. Wealth is produced through collective mental and physical labour and no single individual (man and woman) can produce wealth on his/her labour. Also, no single individual through his/her mental and physical labour can produce wealth. Also, no single or group of individuals have created land, forest, rivers, seas, hills, etc. Therefore, no single or group of individuals can be owner of land, forest, rivers, hills, seas etc. But those who do not produce wealth or have not produced land, forest, rivers are owners of wealth, land, forest etc. How is it possible? It is possible through politics and not through science. Politics enslaves everything including science. To be precise, politics advocates privatization of land-forest-river-hills-seas and privatization of social wealth and science whereas science advocates collective sharing of social wealth produced through collective labour on the principles of reciprocity, equality, freedom and fraternity. Science advocates preservation of Nature and ecological equilibrium on the principles of reciprocity whereas politics advocates destruction of Nature and ecological equilibrium. How does politics do it? One answer is: By misleading people through all forms of deceptive manipulations including war superstition and religion. This is well expressed in following phrases:

मनुष्य रूपेण मृगाः चरन्ती

राम नाम जपना, पराया माल अपना

मुंह मे राम, बगल मे छूरी

मूड़ मुड़ाये योगी भये अब डर काहे का

Thus, there is continuous conflict between psychology of Science and Psychology of politics. Herein lies the answer of the question: Why did science not make all humans truly humane? Why are 7.5 out of 8 billion people on Planet Earth hungry, naked, shelterless, illiterates and living subhuman life even today? Why does wars continue killing innocent people? Why people are deprived of knowledge of Science of Nature-Human-Society? Why has science not created a healthy, happy and harmonious and peaceful social order?

0426149 MANJU, LIJIYA K.C. AND SASIDHARAN, T (Department of Psychology, Providence Women's College, Calicut, Kerala). AN EXPLORATION ON THE EXPERIENCE OF CHILDLESSNESS AND THE COPING MECHANISMS ADOPTED BY THE PROGENY FREE COUPLE.

The aim of this study is to explore the experience of childlessness among progeny free couples. Here the progeny free couple means the couple unable to have children because of infertility or any other biological reasons. For the same, the investigators by means of purposive sampling identified ten progeny free couples as the unit of analysis. Purposive sampling is used by keeping inclusion criteria: couples with marital longevity of 25 years or more. The 25 years is considered as a cut-off point as most of the women would be on the verge of menopause or in menopause and the couples would have been taken a decision regarding their progeny free life. The age of females ranges from 40 -60 years and males 45-70 years. They were stopped all the infertility treatment at the time of data collection and took a decision to live a childless life. Such ten couples were selected as the participants. Data were gathered by means of open ended questions used during semi structured interview. The gathered data were analyzed through case study method. Case study is a in-depth or detailed examination of individuals in their context.

Parenthood is one of the major transitions in the adult life for both men and women. Having a child is too close to the meaning of the existence of a person. The experiences of an event make sense at individual level and each individual undergo it differently, rendering meaning to each in different manner (Fransella & Frost, 1977). So the non fulfillment of such desire has been associated with a lot of psychological sequels. Choose to live a childless life is not an easy decision for any of the couple. The result shows that these couples go through intense sadness, frustration and depression for a prolonged period, and gradually they rationalize their childlessness by spiritual awakening. They eventually accommodate to the condition by either accepting others children or getting involved in social activities.

In case of progeny free couples as well reaching at a resolving situation of extending self to society took years of traumatic life events. Investigators hereby affirm the necessity of psychological assistance during normal or assisted pregnancies, during delivery period especially in case of caesarian and complication, treatment periods, decision making process regarding progeny free life.

Keywords: progeny free, childlessness and psychology

**0426150 RAMSHIDA, A.P. AND SASIDHARAN, T (Department of Psychology, University of Calicut).
MARRIAGE AS A SOCIAL INSTITUTION: A PSYCHOCULTURAL STUDY ON WOMEN.**

Marriages acquired different forms along the evolution of humans, across sociocultural and historical context. Investigator by acknowledging such changes intend to explore into the experience of women at marriage as it gets influenced and modified as an institution in accordance with the culture. There are debates on the history of marriage across decades; it is claimed that in parallel to history of humans (from savagery to civilization) marriages also have undergone an evolution in an upward direction, that is from a state of promiscuity to monogamy. An equally strong contention that monogamous marriages occurred from the beginning itself along with other forms of marriages.

The aim of the present study is to explore women's experience along the process of marriage, prerequisites, criteria and choice of marriage, criterion behind acceptance or rejection of a proposal, "how" and "when" marriage becomes difficult for women. Further marriages of recent times were compared and contextualized by the retrospective data collected from the same locality. Data was collected in two phases: First set was collected using semi-structured interview and participant observation by means of convenient sampling. Inclusion criteria for sample selection was all those married women with a marital longevity of ten years and below who reside in the locality selected for research (N=226). The second set of data consists of women belonging to the same locality, aged fifty and above (N=55), semi-structured interview and participant observation were the modes of data collection. Results obtained from the locality was validated by conducting a focus group discussion (N=8, Age group 18-65).

Method of constant comparison is the analytical process used to generate grounded theory. Theoretical sensitivity, theoretical sampling and theoretical saturation are prerequisites for formulation of grounded theory. While looking into data as a whole, there is a clear preference seen among women to choose a partner who is similar in attitudes, values and beliefs, who belong to known family and who is hierarchically higher in physical, personality and economic traits. Marriages as a whole is predominantly ruled by socioeconomic status and physical appearance; where an exchange happens between men and women regarding them. Across decades marital preferences have turned out to be conventional but within this conventionality an unconscious, unwritten and shared rule regarding whom to choose as a partner is prevalent. Choices one makes becomes detrimental of whole life especially when people as such and society attach unbound relevance to marriage. Failure to understand real and ironical nature of human choices turns out to be costly, both socially and scientifically.

Keywords: marriage, theoretical sampling, grounded theory

27. SOCIAL WORK

**0427151 DEVI, MANDIRA AND SINHA, RINITA (Department of Social Work, M.L.C University).
PARTICIPATION OF ADOLESCENTS IN ENTREPRENEURSHIP DEVELOPMENT IN
RURAL AREAS OF KAMRUP METRO DISTRICT, ASSAM.**

Entrepreneurship provides economic empowerment, job creation, and social security opportunities, particularly for marginalised or disadvantaged groups. Adolescents are generally out of the entrepreneurship process but interestingly the current study will highlight, *how adolescents are becoming part of the process*. This study will also reveal that Entrepreneurship can be started by the underaged also considering needs and requirements if it is part of survival concern. The *area of the study* was Sijubari, a slum under Guwahati

ISBN 978-93-340-9786-3

PROCEEDINGS OF
THE INTERNATIONAL SEMINAR
**BIODIVERSITY CONSERVATION:
IN SITU & EX SITU STRATEGIES**

Sponsored by
Kerala State Biodiversity Board & Directorate of Environment and Climate Change

24-25 JANUARY 2024



Edited by:

Pilty Peter A
Deena Meria Jose



PROVIDENCE WOMEN'S COLLEGE
KOZHIKODE, KERALA, INDIA

Reaccredited by NAAC with A++ grade (GP 3.65)

<https://www.providencecollegecalicut.ac.in>



Key note address..... Dr. N. S Pradeep
 Scientist-in-Charge, KSCSTE-Malabar Botanical Garden & Institute of Plant Sciences

Technical session 1:Dr.Udayan P.S.
 Senior Consultant, RCFC-Southern Region, KFRI

Technical session 2: (Online).....Prof. Juliette De Meaux
 Professor & Principal Investigator, Institute of Plant Sciences, Uty of Cologne, Germany

Technical session 3: (Onl.....Dr. Rebeca Menchaca
 Tropical Research Centre, Veracruz University, Mexico

Technical session 4:Dr.Joby Paul
 Assistant Professor, Department of Botany, St. Thomas College, Trichur

Technical session 5:Dr.Geetha S Pillai
 Dy. Project Director, CMPR, Arya Vaidya Sala , Kottakkal

Technical session 6:Mr.T.Suresh
 Deputy Range Forest Officer, Department of Forest and wildlife

CONTENTS

1. *Amitha Sajeev & Deena Meria Jose*..... 1-12
 Spectrophotometric determination of pigments of some marine algal species from the shore of thikkodi, kozhikode, using different solvents.
2. *Aparna Sudarsan & Savitha Rabeque C*..... 13-28
 Allelopathic potential of aqueous leaf extract of *amaranthusretroflexus l.*, *azadirachta indica a. juss.*, and *lantana camara l.* on *vigna radiata (l) r. wilczek* and *vigna mungo (l.) hepper*
3. *Athulya Sadanand C.P., Minoov Divakaran & Madhusoodanan P.V*..... 29-36
 A comparative study on *in vitro* spore germination and medicinal properties, for conservation and utilization of two *platycerium* species
4. *Gopika V M , Pilty Peter A. & Keerthana M S*..... 37-48
 Assessing the phytoremediation potential of *Acanthusilicifolius l.* towards nickel and chromium stress, with a note on morphological and biochemical parameters at maghunithodu, kozhikode.
5. *Keerthana M S, Pilty Peter A & Gopika V M*..... 49-58
 Assessing the phytoremediation potential of *acanthus ilicifolius l.* towards nickel and chromium stress, with a note on physiological and anatomical parameters at maghunithodu, kozhikode.
6. *K S Arunkumar, K A Sreejith, Neethu P, Jithin C K, & V B Sreekumar*..... 59-65
 KFRI Slimarium: A pioneer attempt to conserve Myxomycetes of Kerala
7. *Manju Devaraj Thattaril¹: Jaleetta Jayson; Jyothirmayi C H; Krishnapriya S; Neha S, Nithya P M; Nithyaraj O M; Sandra C; Shreya Sreekumar; Sona Boban; Teenamary Baiju; Akhilesh VP* 66-78

Genetic diversity in moths- *serrodes partita* & *peteliamadardaria*

8. *N. Ahamed Kabir & A. Doss*..... 79-103
The study compares the ethno-medico-botany of the *apatani* people in arunachalpradesh, india, with the *irula*, *lepcha*, *limboo*, and *maring* people in other regions of india.
9. *Navya S & Minoo Divakaran*..... 104-109
In vitro antioxidant activity and methanolic leaf extract in two medicinal plants
10. *Nishi Ann*..... 110-116
Unique Ecosystem of Little Rann of Katchch, Gujrat: Birding Paradise- And the Threats
11. *N.T. Fathima Rafieah, Anjana V Ajith, E.K. Abidha, & Minoo Divakaran*..... 117-132
Morpho-genetic analysis of a few medicinal *Ocimum* species.
12. *Sangeetha G Kaimal*..... 128-134
Elucidation of fine structural aberrations in leaf tissues of *Manihot esculenta L.* induced by infestation of vegetable spider mite

COMPREHENSIVE SURVEY ON SECURITY, AUTHENTICATION, AND ROUTING CHALLENGES IN VEHICULAR AD HOC NETWORKS (VANETS): RECENT DEVELOPMENTS AND FUTURE DIRECTIONS

SAVITHA S V
Research scholar
Department of Computer Science
Sathyabama Institute of Science and Technology
Chennai
savisudhi@gmail.com

Dr.S. Jancy
Assistant Professor
Department of Computer Science and Engineering
Sathyabama Institute of science and technology
Chennai
Jancy.cse@sathyabama.ac.in

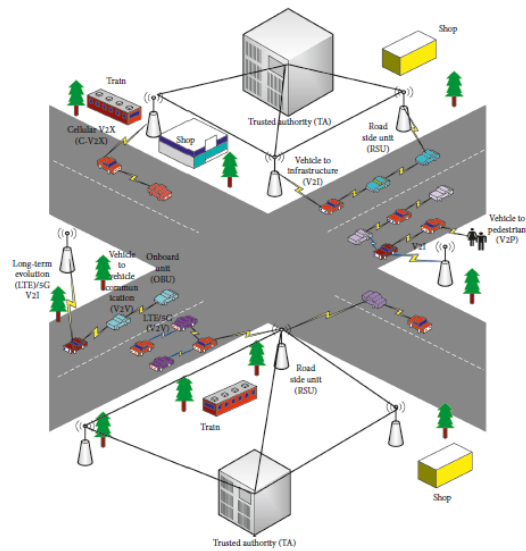
Abstract - Vehicular Ad Hoc Networks (VANETs) have garnered significant interest in wireless communication technology and Intelligent Transportation Systems (ITS) due to their potential to enhance road safety and provide precautionary measures for drivers and passengers. As an emergent form of Mobile Ad Hoc Networks (MANETs), VANETs exhibit unique characteristics, challenges, and architectural structures, distinguishing them from conventional networks. This paper comprehensively surveys the current state-of-the-art VANETs, emphasizing their architecture, communication methods, standards, and inherent security services. A detailed analysis of the threats and attacks prevalent in VANETs is provided, along with an extensive review of the latest countermeasures designed to ensure secure communication. The focus is on authentication schemes, which play a crucial role in protecting vehicular networks from malicious nodes and fake messages. Furthermore, an in-depth overview of the mobility and network simulators and other simulation tools used in the performance evaluation of these authentication schemes is presented. The survey also highlights the diverse applications of VANETs, particularly in enhancing comfort and safety in transportation systems. Lastly, the paper identifies open research challenges in the field and suggests potential directions for future research. This survey aims to bridge the gaps in the existing literature by offering a comprehensive view of the latest trends and developments in VANETs.

Keywords: Vehicular Ad Hoc Networks (VANETs), Intelligent Transportation Systems (ITS), security challenges, authentication schemes, routing protocols, threats and attacks, countermeasures, simulation tools, mobility simulators, network simulators, performance evaluation, applications, open research challenges, future directions.

Introduction to Vehicular Ad Hoc Networks (VANETs)

A. Definition and Significance of VANETs

Vehicular Ad Hoc Networks (VANETs) are networks formed by vehicles and roadside infrastructure that enable communication and data exchange. These networks play a significant role in Intelligent Transportation Systems (ITS) and are designed to improve various aspects of transportation [1]. VANETs are built upon advanced wireless communication technologies and protocols, allowing vehicles to establish dynamic and self-organizing networks. The communication in VANETs can be categorized into vehicle-to-vehicle (V2V), vehicle-to-infrastructure (V2I), and vehicle-to-everything (V2X) communication. V2V communication enables vehicles to exchange information directly with neighboring vehicles, facilitating cooperative applications such as collision warnings and platooning. V2I communication involves vehicles interacting with roadside infrastructure, such as traffic lights and road signs, enabling traffic management and efficient utilization of resources. V2X communication encompasses both V2V and V2I communication, expanding the scope of interactions to include other entities such as pedestrians and cyclists[2].



The significance of VANETs lies in their potential to enhance traffic safety, reduce congestion, and facilitate efficient traffic flow. By enabling vehicles to communicate with each other and with infrastructure components, VANETs allow the real-time exchange of information that can provide drivers and passengers with timely warnings about potential hazards, such as accidents, road obstacles, or adverse weather conditions[3]. This ability to share critical

information and warnings enhances overall road safety and helps prevent accidents.

Furthermore, VANETs offer opportunities for advanced applications and services that improve the driving experience and optimize transportation systems. These applications include intelligent routing to avoid congested areas, real-time traffic updates for navigation systems, emergency services coordination, and even entertainment and infotainment services for passengers. By leveraging the capabilities of VANETs, transportation systems can become more efficient, sustainable, and user-centric[4].

B. Unique Characteristics of VANETs

VANETs exhibit unique characteristics that differentiate them from traditional Mobile Ad Hoc Networks (MANETs) and pose specific challenges[5].

High Mobility: Vehicles in VANETs are constantly in motion, leading to frequent changes in network topology. This increased mobility introduces challenges in maintaining stable and reliable communication links within the network. Vehicles need to establish and maintain connections with neighboring vehicles, even in the presence of rapid changes in the network topology. Additionally, the high mobility of vehicles requires efficient and adaptive routing protocols to ensure timely and accurate delivery of messages.

Network Volatility: The network topology in VANETs is highly volatile due to vehicles entering and leaving the network frequently. This volatility requires communication protocols that can efficiently adapt to changing network conditions. Vehicles must be able to discover and communicate with nearby cars and infrastructure elements to exchange information effectively. Furthermore, the network volatility introduces challenges in achieving network scalability, as the number of participating vehicles and infrastructure components can vary significantly over time.

Wireless Communication Medium: VANETs rely on wireless communication technologies, making them susceptible to various interference sources and signal attenuation. The wireless nature of VANETs introduces challenges related to signal propagation, interference management, and ensuring reliable communication links in the presence of obstacles and varying environmental conditions.

These unique characteristics of VANETs necessitate the development of robust and adaptive communication protocols and security mechanisms. Ensuring reliable communication and secure data

exchange in a dynamic network environment is crucial for successfully deploying VANETs.

Researchers and engineers continuously develop innovative solutions to address the challenges of high mobility and network volatility. These solutions aim to establish reliable communication links between vehicles and infrastructure, ensure efficient routing of messages, and provide robust security mechanisms to protect against malicious attacks and unauthorized access.

In the following sections of this survey paper, we will explore the various security challenges in VANETs and the authentication and privacy issues specific to these networks. We will also review the existing literature on VANETs, including research on security measures, authentication schemes, and simulation tools. By comprehensively analyzing the state-of-the-art in VANET security, this survey aims to provide valuable insights into the advancements and challenges in this field. Additionally, we will identify open research questions and suggest potential directions for future research to enhance the security and effectiveness of VANETs further.

II. Security Challenges in VANETs

A. Vulnerabilities in VANETs

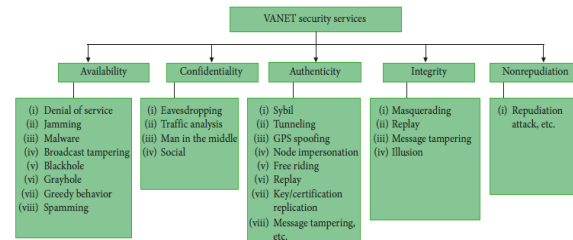


FIGURE 4: VANET security services.

TABLE 1: Security attacks and their countermeasures in VANETs [1, 4, 22, 66].

Attack	Compromised services	Countermeasures
DOS	Availability, authentication	Use the bit commitment and signature-based authentication technique
Jamming	Availability	Use frequency hopping technique, direct-sequence spread spectrum (DSSS)
Malware	Availability	Reliable hardware and digital signature of software
Broadcast tampering	Availability, integrity	Cryptographic primitives are enabled for prevention, but a nonrepudiation mechanism may exist
Blackhole, grayhole	Availability	Reliable hardware and digital signature of software
Greedy behavior	Availability	Use intrusion detection systems (IDS)
Spamming	Availability, confidentiality	Reliable hardware and digital signature of software
Eavesdropping	Confidentiality, integrity	Exploit physical layer security protocols
Traffic analysis	Confidentiality	Use encryption techniques
Man-in-the-middle	Authentication, confidentiality, integrity	Robust authentication technique such as digital certificates
Social	Confidentiality	Use digital signatures
Sybil	Availability, authentication	Deployment of central validation authority (VA), location and position verification, and efficient allocation of transmission resources.
Tunneling	Integrity	Reliable hardware and digital signature of software and sensors
GPS spoofing	Authentication	Signature-based authentication technique with positioning system and the usage of bit commitment
Free-riding	Authentication	Use strong authentication technique
Key and/or certificate replication	Confidentiality, authentication	Use certified keys, and check the validity of certificates in real time through CRL
Message tampering	Availability, authentication	Zero-knowledge schemes for authentic message
Masquerading	Authentication, nonrepudiation, integrity	Digital signature of software, and trusted and reliable hardware which makes impossible to change protocols
Replay	Authentication, integrity, nonrepudiation	Message authentication, using digital signature scheme
Illusion	Authentication, integrity	Software must be handled by authorized entity, sensors operation must be authenticated, and use the plausibility validation network (PVN)
Reputation	Nonrepudiation	Identity-based signature and ID-based online/offline (IBOOS) techniques with complex managing certificates may exist

VANETs are susceptible to various security vulnerabilities arising from their open-access nature

and the wireless communication medium. Malicious entities can exploit these vulnerabilities to compromise the network's integrity, confidentiality, and availability. Several studies have identified the following vulnerabilities in VANETs[6].

Unauthorized Access: Due to the broadcast nature of wireless communication, VANETs are prone to unauthorized access by malicious entities. Attackers can intercept communication and gain unauthorized access to sensitive information, compromising the network's overall security. For example, an attacker can eavesdrop on the messages exchanged between vehicles, obtaining access to personal data or confidential information.

Message Tampering: Attackers may tamper with messages exchanged between vehicles, leading to the dissemination of false or misleading information. By injecting fraudulent messages or altering genuine ones, attackers can disrupt the flow of information, create traffic congestion, and even cause potential accidents. For instance, an attacker can modify a traffic light message to indicate a false green signal, causing confusion and potentially leading to collisions.

Sybil Attacks: Sybil attacks involve malicious nodes creating multiple fake identities within the network. Attackers with multiple identities can disrupt communication, spread false information, and gain unauthorized advantages, such as influencing traffic routing decisions or exploiting resource allocation mechanisms. An example of a sybil attack in VANETs is a malicious vehicle creating multiple pseudonyms to flood the network with fake messages, overwhelming the system and causing congestion.

Denial-of-Service (DoS) Attacks: DoS attacks aim to disrupt the regular operation of a network by overwhelming it with excessive traffic or resource requests. In VANETs, attackers can launch DoS attacks to flood the network with forged messages or to exhaust the resources of individual vehicles or infrastructure components. Such attacks can render the network inaccessible or significantly degrade its performance, hampering the exchange of critical safety information. For instance, an attacker can flood the network with a high volume of fake collision warning messages, preventing genuine safety messages from being delivered.

B. Need for Secure VANETs

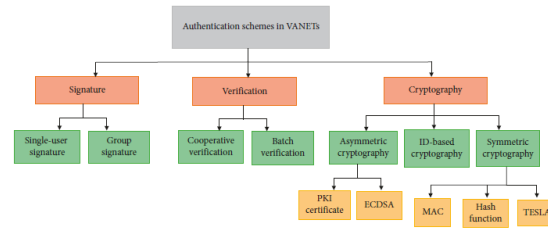


FIGURE 5: Categories of authentication in VANETs.

Secure VANETs are crucial to ensure these networks' trust, reliability, and effectiveness. Implementing robust security measures offers several benefits, improving transportation systems and enhancing the user experience.

Traffic Safety: Secure VANETs enable the reliable exchange of critical safety-related information among vehicles and infrastructure components. By securely disseminating collision warnings, road hazard alerts, and traffic congestion notifications, VANETs can enhance traffic safety and minimize the risk of accidents [7]. For example, secure and accurate collision warnings can help drivers take appropriate actions to avoid potential accidents.

Data Integrity: Security mechanisms in VANETs ensure the integrity of data exchanged between vehicles. Data integrity is crucial to maintaining the trustworthiness of the information shared within the network[8]. Cryptographic techniques, such as digital signatures and message authentication codes, can verify the authenticity and integrity of messages, preventing unauthorized modifications or tampering. By ensuring data integrity, VANETs can prevent the dissemination of false or manipulated information.

Privacy Preservation: Protecting the privacy of individuals within VANETs is of utmost importance. VANETs involve exchanging sensitive information, including location data and vehicle identities. Robust security measures, such as pseudonym systems and anonymous communication protocols, can safeguard users' privacy, preventing unauthorized tracking or disclosure of personal information (Kargl et al., 2009; Zhou et al., 2018). For instance, pseudonym systems allow vehicles to use temporary identities, protecting their actual identities from being revealed during communication.

By addressing these security challenges and ensuring secure VANETs, the potential benefits of these networks can be fully realized. Secure VANETs improve traffic safety and efficiency and protect users' privacy and trust, fostering widespread adoption and acceptance of these technologies.

III. Authentication and Privacy Issues in VANETs

A. Key Management Schemes in VANETs

Effective key management schemes are essential in VANETs to establish secure communication channels and authenticate the entities within the network. These schemes involve the secure generation, distribution, and revocation of cryptographic keys among vehicles and infrastructure elements[9].

Public Key Infrastructure (PKI):

PKI-based schemes utilize digital certificates to authenticate vehicles and establish secure communication channels. In this approach, a Certification Authority (CA) issues and signs digital vehicle certificates containing their public keys. Vehicles use these certificates to verify the authenticity of messages received from other vehicles or infrastructure components[10]. However, PKI schemes can introduce computational and transmission overhead, as vehicles must verify the certificates and maintain a trust infrastructure. Efficient management of certificates and keys is crucial to ensure the scalability and performance of PKI-based key management schemes.

Pseudonym Systems:

Pseudonym systems involve the generation, distribution, and management of pseudonyms and mechanisms to link them to the actual identities of vehicles when necessary. Pseudonym systems provide privacy by enabling vehicles to use temporary identities, known as pseudonyms, instead of their actual identities. Vehicles can protect their privacy by periodically changing pseudonyms and preventing unauthorized tracking. Effective pseudonym management schemes are required to prevent pseudonym misuses, such as Sybil or pseudonym correlation attacks[11].

Emerging Authentication Mechanisms:

In addition to PKI and pseudonym systems, there are several emerging authentication mechanisms that can enhance security and privacy in VANETs. These include lightweight and efficient schemes, group-based authentication, and trust management techniques. Lightweight schemes focus on reducing the computational and communication overhead associated with authentication while maintaining a high level of security. Group-based authentication allows vehicles to authenticate themselves as part of a group, enabling efficient group communication and reducing the computational burden[12]. Trust management techniques aim to establish trust relationships among vehicles based on their past behavior, reputation, or recommendations from

trusted entities, facilitating secure communication and decision-making.

B. Privacy Concerns in VANETs

Privacy in VANETs is crucial to protect user information and prevent unauthorized tracking or profiling. In addition to location privacy and identity privacy, there are other important privacy aspects that need to be addressed.

Data Dissemination Privacy:

VANETs involve the dissemination of data, such as traffic conditions or road hazard alerts. Preserving the privacy of this data is essential to prevent unauthorized access or disclosure. Privacy-preserving data dissemination techniques, such as data anonymization, encryption, or differential privacy approaches, can be employed to protect the privacy of shared data and prevent sensitive information from being exposed[13].

Privacy-Aware Routing:

Routing protocols in VANETs should consider privacy concerns when selecting paths for message delivery. Privacy-aware routing aims to minimize the disclosure of sensitive information during route establishment and message forwarding. Techniques such as mix-zone routing, onion routing, or route obfuscation can be used to enhance privacy in routing decisions [13].

Pseudonym Management:

Effective pseudonym management is crucial for preserving identity privacy and preventing unauthorized tracking of vehicles. Advanced pseudonym systems that incorporate pseudonym change strategies, pseudonym revocation, or pseudonym correlation detection can enhance privacy protection and prevent attacks based on pseudonym misuse[14].

By addressing these authentication and privacy issues, VANETs can achieve secure and privacy-preserving communication among vehicles and infrastructure elements, ensuring user trust and confidence.

IV. Survey of Existing Literature

A. Overview of Previous Surveys

Previous surveys have been conducted to explore various aspects of Vehicular Ad Hoc Networks (VANETs), including architecture, protocols, security, and privacy. These surveys have contributed to understanding the fundamentals of VANETs but

often have limitations in scope and coverage[15][16][17].

Engoulou et al. [18] surveyed security issues and challenges in VANETs, discussing security requirements and applications but with limited coverage of the overall security landscape. Al-Sultan et al.[19] conducted a survey that provided an overview of VANET architecture, protocols, simulation; and The survey focused on the general characteristics and components of VANETs but did not delve deeply into security and privacy aspects. Similarly, Sharef et al.[20]presented a survey explicitly focusing on the routing characteristics and challenges in VANETs. While it addressed routing protocols, it did not cover other security and privacy issues extensively.

B. Research Gap and Motivation for the Present Survey

The existing surveys have laid the foundation for understanding VANETs but often lack comprehensive coverage of VANET security, authentication schemes, and simulation tools. Hence, there is a research gap that needs to be addressed. This survey aims to bridge that gap and provide an in-depth analysis of the state-of-the-art VANET security, authentication mechanisms, and simulation tools.

This survey aims to offer a more comprehensive and up-to-date examination of VANET security, considering the evolving landscape of threats and countermeasures. By exploring the existing literature and incorporating recent advancements, this survey provides valuable insights and a holistic view of VANET security to researchers, practitioners, and policymakers.

C. Structure and Methodology of the Survey

The survey will be structured into several sections, each focusing on different aspects of VANET security. The following subsections will be included:

Security Threats and Attacks in VANETs:

In this subsection, a comprehensive examination of various security threats and attacks targeting VANETs will be conducted. It will involve an analysis of both internal and external threats that VANETs are susceptible to. Some critical threats and attacks to be discussed include:

Message Tampering: Attackers may tamper with messages exchanged between vehicles, leading to misinformation, traffic congestion, and potential accidents. This could involve modifying content,

injecting false messages, or replaying previously captured messages.

Denial-of-Service (DoS) Attacks: Attackers may launch DoS attacks to overwhelm the VANET network with excessive traffic, rendering it inaccessible or significantly degrading its performance. This can disrupt communication and cause delays in critical safety messages.

Sybil Attacks: Sybil attacks involve malicious nodes creating multiple fake identities within the network to disrupt communication and gain unauthorized advantages. This can lead to the spread of false information, loss of trust, and compromised security.

The potential impact of these threats and attacks on the security and functioning of VANETs will be discussed. The challenges associated with detecting, mitigating, and preventing these threats will also be explored, along with potential countermeasures and solutions proposed in the literature.

Authentication Schemes in VANETs:

This subsection will provide a comprehensive review of authentication schemes employed in VANETs. It will cover various authentication mechanisms to establish trust and verify the authenticity of vehicles and infrastructure components within the network. Some commonly used authentication schemes to be discussed include:

Public Key Infrastructure (PKI): PKI-based schemes utilize digital certificates to authenticate vehicles and establish secure communication channels. This involves using a Certification Authority (CA) that issues and signs digital certificates for vehicles containing their public keys. Vehicles use these certificates to verify the authenticity of messages received from other vehicles or infrastructure components.

Identity-Based Cryptography: Identity-based cryptography schemes leverage user-friendly identifiers for authentication, such as email addresses or vehicle identification numbers. This eliminates the need for complex public key infrastructure and simplifies authentication.

The strengths, weaknesses, and suitability of different authentication mechanisms for VANETs will be evaluated. Factors such as computational overhead, scalability, resilience against attacks, and privacy preservation will be considered in the analysis. The

goal is to identify the most suitable authentication schemes for VANETs that balance security and efficiency.

Simulation Tools for Evaluating VANET

Security:

This subsection will provide an overview of state-of-the-art simulation tools for evaluating VANET security. It will cover various simulation platforms and frameworks commonly employed in VANET research. Some special simulation tools to be discussed include:

Veins: Veins is an open-source framework that integrates the network simulator OMNeT++ with the traffic simulator SUMO. It enables the simulation of realistic VANET scenarios, considering both vehicular mobility and communication aspects.

NS-3: NS-3 is a widely used network simulator that extensively supports VANET simulations. It offers a range of communication protocols, mobility models, and realistic channel models, allowing researchers to evaluate the performance and effectiveness of security mechanisms in VANETs.

iTETRIS: iTETRIS is a comprehensive simulation platform designed explicitly for evaluating VANETs. It incorporates realistic traffic scenarios, mobility patterns, and communication models, enabling researchers to assess the impact of security measures on VANET performance.

Conclusion:

In this survey, we have provided a comprehensive analysis of the current state-of-the-art in VANETs, focusing on security, authentication schemes, and simulation tools. We highlighted the unique characteristics of VANETs, such as high mobility and network volatility, which present challenges for communication and data exchange. We discussed vulnerabilities including unauthorized access, message tampering, Sybil attacks, and denial-of-service (DoS) attacks, emphasizing their impact on network integrity, confidentiality, and availability. Addressing these vulnerabilities is crucial for secure VANETs that enhance traffic safety, protect data integrity, and preserve user privacy. We explored key management schemes like PKI and pseudonym systems, evaluating their strengths, weaknesses, and suitability in VANETs. Additionally, we provided an overview of simulation tools like Veins, NS-3, and iTETRIS for evaluating VANET security. By analyzing existing literature and incorporating recent

advancements, this survey fills the research gap, offering insights to researchers, practitioners, and policymakers. Future research should focus on efficient authentication mechanisms, privacy-preserving techniques, and adaptive security solutions. Overall, this survey contributes to VANET research, facilitating the development of secure and reliable vehicular communication systems that enhance road safety and transportation.

References

1. Wahid, I., Tanvir, S., Ahmad, M., Ullah, F., AlGhamdi, A. S., Khan, M., & Alshamrani, S. S. (2022, July 23). *Vehicular Ad Hoc Networks Routing Strategies for Intelligent Transportation System*. MDPI. <https://doi.org/10.3390/electronics11152298>
2. *Novel path similarity aware clustering and safety message dissemination via mobile gateway selection in cellular 5G-based V2X and D2D communication for urban environment*. (2020, March 26). Novel Path Similarity Aware Clustering and Safety Message Dissemination via Mobile Gateway Selection in Cellular 5G-based V2X and D2D Communication for Urban Environment - ScienceDirect. <https://doi.org/10.1016/j.adhoc.2020.102150>
3. Sheikh, M. S., Liang, J., & Wang, W. (2019, August 17). *A Survey of Security Services, Attacks, and Applications for Vehicular Ad Hoc Networks (VANETs)*. PubMed Central (PMC). <https://doi.org/10.3390/s19163589>
4. H., Shrestha, R., Bajracharya, R., & Nam, S. Y. (2018, May 2). *Challenges of Future VANET and Cloud-Based Approaches*. Challenges of Future VANET and Cloud-Based Approaches. <https://doi.org/10.1155/2018/5603518>
5. Weber, J. S., Neves, M., & Ferreto, T. (2021, May 6). *VANET simulators: an updated review - Journal of the Brazilian Computer Society*. SpringerOpen. <https://doi.org/10.1186/s13173-021-00113-x>
6. H., Mahmood, J., Duan, Z., Yang, Y., Wang, Q., Nebhen, J., & Mumtaz Bhutta, M. N. (2021, June 30). *Security in Vehicular Ad Hoc Networks: Challenges and Countermeasures*. Security in Vehicular Ad Hoc Networks: Challenges and Countermeasures. <https://doi.org/10.1155/2021/9997771>
7. Vegni, A. M., Biagi, M., & Cusani, R. (2013, February 13). *Smart Vehicles, Technologies and Main Applications in Vehicular Ad hoc Networks*. Smart Vehicles, Technologies and Main Applications in Vehicular Ad Hoc Networks | IntechOpen. <https://doi.org/10.5772/55492>
8. *BAIV: An Efficient Blockchain-Based Anonymous Authentication and Integrity Preservation Scheme for Secure Communication in VANETs*.
9. Liu, L., Wang, Y., Zhang, J., & Yang, Q. (2019, January 24). *A Secure and Efficient Group Key Agreement Scheme for VANET*. MDPI. <https://doi.org/10.3390/s19030482>
10. Sevewandi Perera, M. N., Nakamura, T., Hashimoto, M., Yokoyama, H., Cheng, C. M., & Sakurai, K. (2022, April 25). *Certificate Management Scheme for VANETs Using Blockchain Structure*. MDPI. <https://doi.org/10.3390/cryptography6020020>
11. *PUCA: A pseudonym scheme with strong privacy guarantees for vehicular ad-hoc networks*. (2015, October 8). PUCA: A Pseudonym Scheme With Strong Privacy Guarantees for Vehicular Ad-hoc Networks - ScienceDirect. <https://doi.org/10.1016/j.adhoc.2015.09.011>
12. *Secure authentication and privacy-preserving techniques in Vehicular Ad-hoc NETWORKS (VANETs)*. (2020, February 21). Secure Authentication and Privacy-preserving Techniques in

- Vehicular Ad-hoc NETWORKS (VANETs) - ScienceDirect. <https://doi.org/10.1016/j.vehcom.2020.100247>
13. Chen, W., Wu, H., Chen, X., & Chen, J. (2022, December 19). *A Review of Research on Privacy Protection of Internet of Vehicles Based on Blockchain*. MDPI. <https://doi.org/10.3390/jsan11040086>
 14. *IEEE Xplore Full-Text PDF*: (n.d.). IEEE Xplore Full-Text PDF: <https://ieeexplore.ieee.org/stamp/stamp.jsp?arnumber=9208777>
 15. H., Sheikh, M. S., Liang, J., & Wang, W. (2020, January 17). *Security and Privacy in Vehicular Ad Hoc Network and Vehicle Cloud Computing: A Survey*. Security and Privacy in Vehicular Ad Hoc Network and Vehicle Cloud Computing: A Survey. <https://doi.org/10.1155/2020/5129620>
 16. <https://arxiv.org/ftp/arxiv/papers/1903/1903.01541.pdf>
 17. Gillani, M., Niaz, H. A., Farooq, M. U., & Ullah, A. (2022, January 10). *Data collection protocols for VANETs: a survey - Complex & Intelligent Systems*. SpringerLink. <https://doi.org/10.1007/s40747-021-00629-x>
 18. *VANET security surveys*. (2014, March 11). VANET Security Surveys - ScienceDirect. <https://doi.org/10.1016/j.comcom.2014.02.020>
 19. *A comprehensive survey on vehicular Ad Hoc network*. (2013, March 21). A Comprehensive Survey on Vehicular Ad Hoc Network - ScienceDirect. <https://doi.org/10.1016/j.jnca.2013.02.036>
 20. *Vehicular communication ad hoc routing protocols: A survey*. (2013, October 10). Vehicular Communication Ad Hoc Routing Protocols: A Survey - ScienceDirect. <https://doi.org/10.1016/j.jnca.2013.09.008>

A Comparative Survey of Machine Learning Approaches for Alzheimer's Disease Prediction and Detection

SHILKA. M. V.^{1,2}

1. Research Scholar, School of Computing
Sathyabama Institute of science and Technology
Chennai, India 600119.
shilkamv@gmail.com

2. Department of computer science
Providence women's college
Kozhikode, Kerala, 673009

DR. R. SUBHASHINI¹

School of Computing
Sathyabama Institute of science and Technology
Chennai, India 600119.
subhaagopi@gmail.com

Abstract—Alzheimer's disease (AD) is a neurological illness that affects a large proportion of the senior population. Early detection and prognosis are crucial for improving patient care and developing effective treatment strategies. Machine learning methods, such as voice analysis, neuroimaging, and clinical data, have showed promise in detecting and predicting Alzheimer's disease. This study presents a thorough assessment and comparative analysis of 15 research papers, highlighting their contributions to the area. Deep learning models like convolutional neural networks and recurrent neural networks have demonstrated great accuracy in differentiating between cognitively normal, dementia, and Alzheimer's dementia. Incorporating hybrid data sources, developing interpretive approaches, and researching disease specific traits and mechanisms are all possible future paths. Overall, machine learning approaches have the potential to increase the accuracy and efficiency of Alzheimer's disease detection, resulting in earlier intervention and better patient outcomes.

Index Terms—Machine Learning, Alzheimer's disease, Prediction, Detection, Robustness, Generalizability, Previous Results.

I. INTRODUCTION

ALZHEIMER'S disease (AD) is a crippling neurological illness that causes cognitive decline, memory loss, and behavioral disorders. It is the leading cause of adult dementia, impacting millions of people globally. The prevalence of Alzheimer's disease is predicted to rise dramatically as the world population ages, providing a significant

challenge to the healthcare system and society as a whole. [1]. The formation of amyloid plaques and neurofibrillary tangles in the brain is one of the pathological characteristics of Alzheimer's disease, leading to progressive neuronal death and synaptic dysfunction. The specific cause of Alzheimer's disease is unknown, and no disease modifying medicines have been identified. Early identification and prediction of Alzheimer's disease, on the other hand, has emerged as a crucial technique for improving patient outcomes and facilitating the development of treatment interventions. [2].

A. The importance of early detection and prognosis

Early detection of AD offers several advantages from a clinical and research perspective. For starters, it provides timely intervention and therapy, which can help delay illness development and enhance sufferers' quality of life. Early intervention has been demonstrated to be more beneficial in preserving cognitive function and lowering disease load. [3]. Second, early detection makes it possible to identify those at risk of developing AD before significant symptoms appear. This opens the door to preventive interventions and lifestyle adjustments that can postpone or prevent the beginning of the disease. Furthermore, early detection makes it easier to register qualified people in clinical trials, enabling for the evaluation of new medicines and the creation of personalized treatment plans. [4].

B. Overview of machine learning in AD research

Machine learning techniques have attracted

considerable attention and show great potential in AD research. This approach leverages the power of computational algorithms to analyze and interpret complex patterns across a variety of data modalities, including neuroimaging scans, genetic data, clinical assessments, and biomarkers [5]. Machine learning algorithms offer the ability to extract meaningful features and patterns from large scale databases, enabling the development of reliable models for AD detection, prediction, and classification. This model can help identify different biomarkers, distinguish between different stages of cognitive impairment, and provide insight into disease progression. In addition, the machine learning approach has the advantage of being non-invasive, cost effective, and able to process multimodal data, allowing for a comprehensive assessment of changes related to AD [6] [7] [8] [9]

C. Purpose and Scope of the Survey Paper

The purpose of this research paper is to provide a comprehensive review and comparative analysis of machine learning approaches for AD detection and prediction. This paper aims to review the available literature, including 15 selected research studies, and synthesize their findings, methodology, and contributions to the field.

The content of this research paper covers various aspects of machine learning in AD research, including the use of deep learning methods, the use of multimodal data, the study of new features and biomarkers, challenges, and future directions in the field. By reviewing and analyzing these studies, this research paper aims to provide the state of the art, identify trends, and provide insight into strengths, limitations, and possible avenues for future research in machine learning based approaches to identify and predict AD.

Fig.1 Shows us how many publications posted in the given year and shows us the year wise distribution of papers in the survey

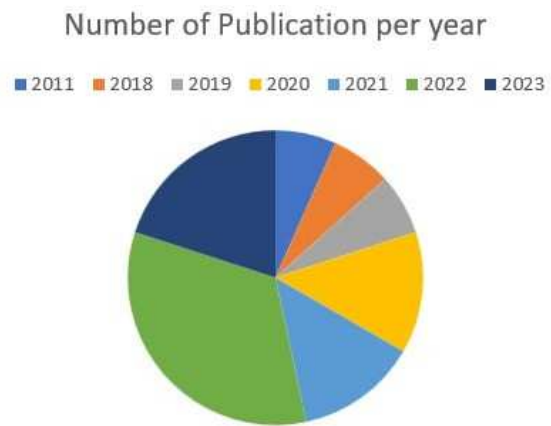


Fig. 1. Survey of Papers

II. LITERATURE REVIEW

A. Overview of the current status of AD detection and prognosis

Alzheimer's disease (AD) is a progressive neurological illness that, due to its prevalence and catastrophic impact on individuals and their families, poses a tremendous challenge to health care systems and society. Early diagnosis and prediction of Alzheimer's disease has emerged as a critical method for improving patient outcomes and facilitating the development of effective treatments. Traditional methods for diagnosing AD, such as clinical assessment and neuropsychological tests, have limitations in terms of accuracy, cost, and scalability. Therefore, researchers have turned to machine learning approaches to improve AD detection and prediction.

B. Discuss conventional methods and limitations of AD detection

Conventional methods for diagnosing AD rely on subjective assessments, which are prone to intergroup variability and subjectivity. Clinical tests like the Mini-Mental State Examination (MMSE) are useful, although they lack sensitivity and specificity in the early stages of the disease. Neuropsychological tests and neuroimaging techniques such as magnetic resonance imaging (MRI) provide objective assessments, but their capacity to capture the complex patterns and subtle alterations associated with Alzheimer's disease (AD) is restricted. These limitations highlight the need for more advanced and accurate approaches, such as machine learning, in AD research.

C. Machine learning approach to detect and predict AD

Machine learning techniques have attracted considerable attention in AD research due to their ability to analyze large scale databases and extract meaningful patterns and features. This approach uses computational algorithms to develop models that can classify, predict, and differentiate AD-related data. Machine learning algorithms can use multiple data methods, including neuroimaging scans, genetic data, clinical assessments, and biomarkers, to improve the accuracy and efficiency of AD detection and prediction. This approach has the potential to identify new biomarkers, detect subtle changes in brain structure and function, and facilitate personalized medicine for AD.

D. Review of research on machine learning in AD detection and prediction

The ADReSS-M Challenge Task of the ICASSP-SPGC- 2023 explores the generalization and transfer of acoustic characteristics for Alzheimer's disease prediction. The approach differentiates the speech of AD patients and healthy people and infers MMSE scores from it. The system achieves 69.6% accuracy on classification and 4.788 RMSE on regression by extracting paralinguistic and auditory information, proving its promise for automatic multilingual Alzheimer's Disease detection through spontaneous speech. [1]

Alzheimer's disease affects around 45 million people and must be discovered early. To predict symptoms, automated methods were applied, and a dataset from the Open Access Series of Imaging Studies (OASIS) was used. Several machine learning models were used, including decision trees, support vector machines, random forests, and logistic regression, with the SVM surpassing all others with an accuracy of 88.88%. [2]

Alzheimer's disease is a progressive dementia causing mild memory loss and affecting daily activities. Early diagnosis is crucial for better treatment and preventing further deterioration. Magnetic resonance imaging (MRI) is widely used for brain tissue study. This research presents a strategy for improving diagnosis accuracy by utilizing a 3D convolutional neural network and

ensemble learning. The suggested approach enhances training speed while achieving 95.2 percent accuracy in AD vs. NC tasks and 77.8 percent accuracy in sMCI vs. pMCI tasks. [3]

Alzheimer's disease (AD) is a brain condition that causes loss of daily activity. The ability to detect and classify diseases accurately is critical for minimizing disease progression. This review assesses recent research on Alzheimer's disease early detection and classification using deep learning techniques. It focuses on structural, functional, and molecular imaging and involves imaging, preprocessing, learning, and classification. The article highlights popular deep learning techniques used in classification as well as preprocessing approaches. Although great performance with preprocessing images has been obtained, obstacles remain in the categorization and preprocessing image process. [4]

Alzheimer's disease is growing more common throughout the world, prompting the development of diagnostic and detection approaches such as Automatic Pipeline approaches and Machine Learning. These approaches accurately identify the phases of Alzheimer's disease, with a success rate of more than 95% for single and binary classifications. However, difficulties persist in multiclass classification, namely distinguishing between AD and MCI and substages. [5]

This paper focuses on the use of deep learning techniques to analyze speech and language patterns to identify AD. Exploring the potential of speech-based biomarkers and language processing algorithms to improve early detection and monitoring of AD. [6]. The performance of manual features based on traditional domain knowledge and state of the art BERT based models for AD detection is compared in this work. It examines the benefits and drawbacks of each strategy and evaluates their possible implications on AD diagnosis. [7]

This article explores the importance of nanotechnology in early diagnosis and treatment. It discusses the use of nanomaterials and nanodevices to detect AD related biomarkers and deliver targeted therapies. [8]

This study investigated the application of

multiclass classification techniques using brain MRI data to diagnose AD. AD explores the transfer of knowledge from problems related to the database to improve the performance of prediction models. [9]

This paper emphasizes the importance of using homogeneous databases to detect AD and highlights the need for models that can generalize to various issues. Discuss the challenges and benefits of combining different data sources to improve the effectiveness of AD detection. [10]

Using MRI data, this work presents a multiobjective segmentation learning technique for detecting AD and predicting Mini-Mental State Examination (MMSE) scores. It investigates the advantages of studying numerous related subjects concurrently in order to increase overall performance. [11]

This research investigates the application of multiple machine learning techniques for AD prediction, including decision trees, random forests, and support vector machines (SVM). It covers each algorithm's merits and weaknesses, as well as its potential in clinical use. [12]

Based on MRI data, this study studies the use of deep convolutional neural networks (CNN) for discriminating persons with Alzheimer's disease (AD), mild cognitive impairment (MCI), and normal cognition. It explores the potential of CNNs in capturing subtle structural differences and improving diagnostic accuracy. [13]

This research presents an in depth discussion of deep learning algorithms for Alzheimer's disease diagnostic categorization utilizing neuroimaging data. It summarizes the many deep learning architectures and approaches that have been employed, highlighting their benefits and weaknesses, and discussing future directions. [14]

This literature review aims to provide insight into the current state of AD detection and prognosis by reviewing and analyzing these studies, discussing the limitations of conventional methods, introducing the potential of machine learning approaches, and reviewing specific studies that have contributed to this field. This detailed analysis serves as the foundation for the following section of the research article, which will give a comparative analysis of machine learning algorithms for AD detection and prediction.

III. COMPARATIVE ANALYSIS OF MACHINE LEARNING APPROACHES

A. Comparison of different machine learning algorithms used in the reviewed papers

Various machine learning methods have been utilized to construct models with excellent accuracy and robust performance in the detection and prediction of Alzheimer's disease (AD). A comparison of the publications analyzed shows the various algorithms utilized and their efficiency in addressing the issues of AD detection and prediction.

One of the paper explores the comparison between hand crafted features based on domain knowledge and BERT based models for AD diagnosis. This study demonstrates the potential of a BERT based model using a transformer architecture and a pretrained language representation to weaken artificial features in capturing complex linguistic patterns associated with AD. [7]

Another paper, focuses on the use of transfer learning in multiclass classification using brain MRI to detect AD. By using knowledge from related problems and databases, learning to improve the performance of AD detection models, thus for better generalization and improved accuracy. [9]

The following study investigates the application of machine learning techniques for AD prediction, such as decision trees, random forests, and support vector machines (SVM). This study sheds light on each algorithm's merits and weaknesses, as well as its appropriateness for various AD prediction scenarios. [12]

Another article uses MRI data to illustrate the efficiency of deep convolutional neural networks (CNN) in discriminating persons with Alzheimer's disease (AD), mild cognitive impairment (MCI), and normal cognition. CNNs use the learning of hierarchical characteristics and spatial correlations in brain pictures to increase diagnostic classification accuracy. [13]

B. Model performance evaluation and accuracy measures are used

Model performance evaluation is an important aspect of comparing machine learning approaches for AD detection and prediction. The reviewed papers use different accuracy measures to evaluate

model performance.

Kavitha. C and Amar Shukla both assess the model's performance in terms of classification accuracy, precision, recall, and F1 score. These measures provide detailed information about how models differ between cognitive stages and their capacity to appropriately categorize patients with AD. [9] [13] [15]

The prediction of Mini-Mental State Examination (MMSE) results as an evaluation tool is presented in Abstract 11. This measure measures the model's ability to predict the cognitive function of individuals with AD. This allows for a quantitative assessment of the predictive ability of the model in terms of clinical relevance. [11]

C. Discuss the advantages and limitations of each approach

Each machine learning approach has advantages and limitations in the context of AD detection and prediction.

Xian demonstrates the power of BERT based models in capturing complex linguistic patterns that may aid early detection of AD. However, the limitation lies in the interpretation of the learning Representation and the requirement of a large amount of labeled data for preparation. [7]

Kavitha. C shows the advantages of transfer learning in improving the generalization and performance of AD detection models. Learning from problems with relational databases reduces the need for large databases. However, the success of training depends on the availability of pretrained models and the similarity of the source and target problem. [9]

Amar Shukla emphasizes the power of deep CNNs to capture subtle structural differences in MRI data, resulting in increased diagnostic accuracy. CNN has the advantage of automatically learning relevant features from raw input data. However, the complexity and computational requirements of deep models may limit their use in some resource constrained settings. [13]

Overall, the comparative analysis revealed a wide variety of machine learning algorithms used in AD detection and prediction. Each approach has advantages and disadvantages, and the algorithm chosen is determined by unique research objectives,

accessible data, and computational resources.

By reviewing performance metrics and discussing the strengths and limitations of each approach, this comparative analysis provides valuable insight into the effectiveness and applicability of different machine learning algorithms in AD detection and prediction.

Table 1 shows the noteworthy the research done by the researchers and is shown in the paper

IV. COMMON CHALLENGES AND FUTURE DIRECTIONS

A. Identify common challenges in AD detection and prediction using machine learning

Despite the promising potential of machine learning in AD detection and prediction, there are some common challenges. These challenges arise from the complexity and heterogeneity of AD, as well as the limitations of available data and methodologies. By analyzing 15 research abstracts, we were able to identify some of these challenges.

First, a common challenge is the availability and quality of data. AD research relies on multiple data methods, including neuroimaging scans, genetic data, and clinical assessments. However, accessing large, diverse, and well annotated databases can be difficult. In addition, it is important to harmonize and standardize data for reliable analysis and comparison between studies. [5] [8] [14]

Another challenge is the interpretation and interpretation of machine learning models. Deep learning approaches, while powerful, often operate like a black box, making it difficult to understand how they achieve their predictions. Explanatory models that provide insight into underlying mechanisms can increase confidence and facilitate the translation of research findings into clinical practice. [6] [9] [13]

Furthermore, the data's great dimensionality presents issues. Many machine learning approaches suffer from the curse of dimensionality, which occurs when the number of characteristics exceeds the number of examples available. The use of feature selection or dimensionality reduction approaches is critical in order to offer a reliable and efficient model for extracting the most trustworthy and useful

features. [6] [7] [9] [13]

B. Discuss potential solutions and future directions to improve accuracy and reliability

To solve the aforementioned issues, several viable solutions and future possibilities can be investigated.

Collaboration and data sharing: Building partnerships and sharing databases across research institutions can overcome the problem of data limitations. This facilitates the creation of larger and more diverse databases that allow the development of more reliable models. [8] [10] [12]

Transfer learning and generalization models: Using transfer learning approaches can increase model performance, particularly in settings with sparse data. Adapting a model based on a problem or related database to detect and forecast AD can enhance accuracy and generalization. [9] [11]

Multimodal data integration: Integrating data from multiple modalities, including neuroimaging, genetics, and clinical data, can provide a comprehensive picture of AD development.

Combining these different data sources can improve the accuracy and reliability of the model. [10] [13]

Development of interpretable AI: Improving the understanding and reliability of machine learning models in AD research requires the advancement of the field of interpretable AI. Prediction mechanisms and visualization techniques, for example, can aid in model prediction and clinical decision making. [6] [7]

Longitudinal and real time monitoring: Incorporating longitudinal data and real time monitoring can capture disease progression more accurately. Continuous monitoring using wearable devices and Internet of Things (IoT) technology can provide valuable information for early detection and prediction. [9] [11]

C. Consideration of Ethical Implications and Data Privacy Issues

Algorithm	Advantages	Limitations	Research
BERT-based Models	Captures complex linguistic patterns	Interpretability issues, requires large labeled data	Xian
Transfer Learning	Improves generalization and performance	Dependency on pretrained models, source target problem similarity	Kavitha.C
Decision Trees	Interpretable, suitable for different prediction scenarios	Limited complexity and may not capture intricate patterns	Liu.S
Random Forests	Interpretable, handles high dimensional data effectively	Computationally expensive, may overfit data	Liu.S
Support Vector Machines (SVM)	Effective in binary classification, handles complex decision boundaries	Computationally expensive, requires careful selection of kernel	Liu.S
Deep Convolutional Neural Networks (CNN)	Captures subtle structural differences, improved diagnostic accuracy	Computationally expensive, complexity, resource intensive	Amar Shukla

TABLE IA COMPARISON OF MACHINE LEARNING ALGORITHMS FOR ALZHEIMER'S DISEASE DETECTION AND PREDICTION

Although machine learning holds great promise in AD research, ethical implications and data privacy issues must be addressed. AD research often involves sensitive personal information, and appropriate safeguards must be in place to protect patient privacy and confidentiality. [8] [9] [12]

Informed consent, anonymization methods, and secure data storage are important to protect data privacy. Researchers and practitioners must adhere to ethical guidelines and regulations to protect the rights and welfare of people participating in AD studies. [8] [12]

Additionally, transparency in model development and decision making is essential. The potential strengths and limitations of machine learning models should be recognized and mitigated. Ensuring fairness and accountability in model predictions is important to avoid bias or discrimination against certain populations. [6] [7] [9] [13]

Future research should focus on developing specific ethical frameworks and guidelines for machine learning in AD research. Collaboration between researchers, clinicians, policy makers, and ethicists is important to address this issue and develop best practices that prioritize patient wellbeing and privacy. [8] [9] [12]

In summary, addressing challenges related to data availability, model interpretation, and ethical considerations are key to improving accuracy.

V. CONCLUSION

A. Summary of key findings of the comparative study

In this comparative examination of machine learning algorithms for the diagnosis and prediction of Alzheimer's disease (AD), we examined 15 academic publications to assess the current state of the field. Our analysis' principal conclusions are summarized below:

Voice analysis and language processing algorithms based on deep learning have the ability to diagnose Alzheimer's disease. [6]. This approach uses speech patterns and linguistic features to identify subtle changes associated with cognitive decline.

A comparison of handcrafted features based on domain knowledge and BERT based models reveals the potential of using contextual information to detect AD [7]. The use of pretrained language

models such as BERT can improve the accuracy and reliability of AD prediction models.

Nanotechnology has potential in early diagnosis and treatment of AD [8]. Nanoparticles and nano sensors facilitate targeted drug delivery and sensitive detection of AD-related biomarkers, facilitating early detection and intervention.

Multiclass classification training using brain MRI data demonstrates the effectiveness of learning from relevant problems [9] By applying pre-trained models to a larger database, transfer learning can improve the performance of AD detection models.

The importance of homogeneous databases for AD detection and generalization in various problems is shown. [10] Integrating data from different sources, including neuroimaging, genetics, and clinical assessment, improves the accuracy and generalizability of AD prediction models.

An MRI based multitasking segmentation learning method shows promise for AD detection and Mini-Mental State Examination (MMSE) score prediction [11]. This model can simultaneously assess cognition and provide insight into disease progression based on neuroimaging data.

To forecast AD, machine learning methods such as decision trees, random forests, and support vector machines (SVM) have been explored [12]. This algorithm offers interpretation and can effectively distinguish between AD and non-AD individuals.

Deep Convolutional Neural Networks (CNNs) demonstrate the ability to discriminate between AD, mild cognitive impairment (MCI), and normal individuals using MRI data [13]. CNN can capture complex patterns in neuroimaging data and improve classification accuracy.

A review of deep learning approaches for AD diagnostic classification using neuroimaging data revealed their potential in aiding clinical diagnosis [14]. Deep learning models can distinguish AD from other neurodegenerative diseases and help doctors make an accurate diagnosis.

B. Reiterating the importance of machine learning in AD detection and prediction

Machine learning approaches play an important role in AD detection and prediction. Analyzing complex patterns in different databases allows accurate identification of biomarkers, classification of disease stages and prediction of disease progression. Machine learning models can

provide early detection, timely intervention, personalized treatment strategies and enrollment in clinical trials

C. Concluding remarks about the potential impact of machine learning approaches in AD research

Machine learning approaches have the potential to revolutionize AD research and clinical practice. They provide a valuable tool for early detection, accurate diagnosis, and prognosis of AD. The integration of different data modalities, such as neuroimaging, genetics, and clinical data, improves the comprehensive assessment of AD-related changes. However, to exploit the full potential of machine learning in AD research, challenges such as data availability, model interpretation, and ethical considerations must be overcome. Collaborative efforts, progress in clear AI, and the establishment of ethical principles will lead to the successful implementation of machine learning approaches in the detection and prediction of AD

In summary, machine learning approaches have demonstrated their potential in detecting and predicting Alzheimer's disease. By combining different data sources, developing advanced models, and solving key challenges, this approach holds promise for early diagnosis, improving personalized care, and increasing our understanding of disease. Continued research and collaboration is needed to realize the full impact of machine learning in AD research.

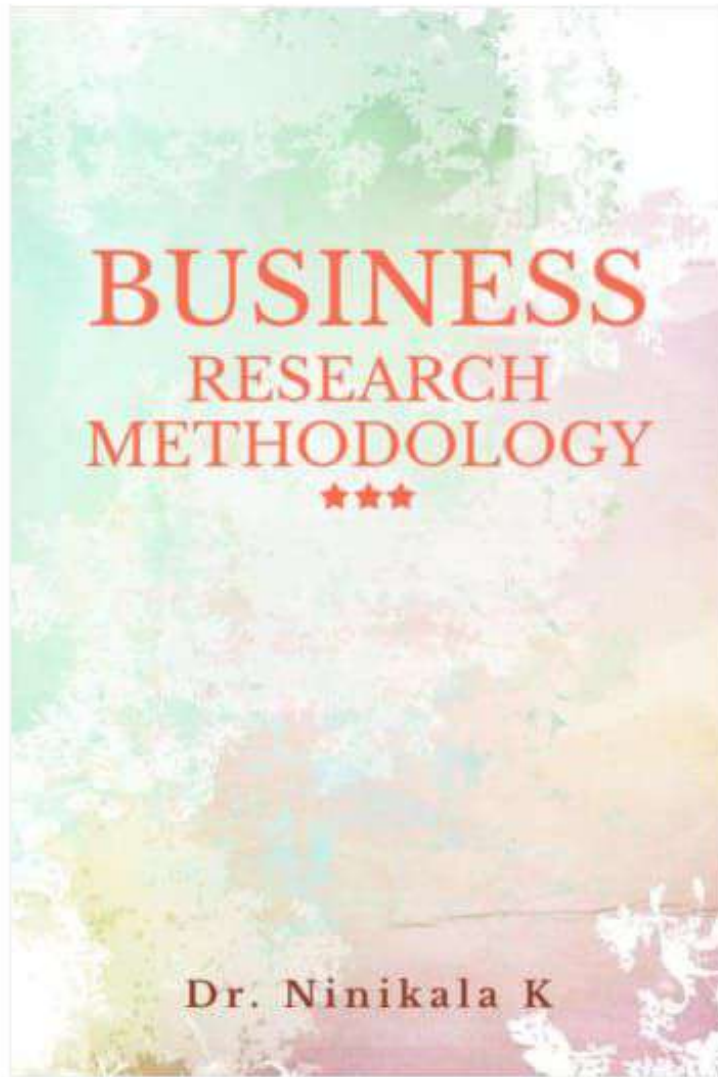
VI. REFERENCES

- [1] X. Chen, Y. Pu, J. Li, and W. -Q. Zhang, "Cross-Lingual Alzheimer's Disease Detection Based on Paralinguistic and Pre-Trained Features," ICASSP 2023 - 2023 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Rhodes Island, Greece, 2023, pp. 1-2, doi: 10.1109/ICASSP49357.2023.10095522.
- [2] S. Ravi, V. R. P. K, Y. Satuluri, S. M. Ali, C. Nekkanti and P. Ramesh, "GUI Based Machine Learning Algorithms to Predict Alzheimer's Disease," 2023 10th International Conference on Signal Processing and Integrated Networks (SPIN), Noida, India, 2023, pp. 296-300, doi: 10.1109/SPIN57001.2023.10116616.
- [3] Zhang, P. (2021). "Improving Alzheimer's Disease diagnosis using 3D convolutional neural networks, ensemble learning, and data denoising." Retrieved from [Department of Computer Science and Engineering, Northeastern University, Shenyang 110819, China; zhangpeng.coder@gmail.com (P.Z.); qiaojianzhong@cse.neu.edu.cn (J.Q.); 1810615@stu.neu.edu.cn (Y.T.)].
- [4] Nazem, Amir and Mansoori, G Ali, year = 2011, month = 10, pages = 169-193, title = Nanotechnology for Alzheimer's disease detection and treatment, volume = 1, journal = Insiciencies, doi = 10.5640/insc.0104169
- [5] The Effect of Heterogeneous Data for Alzheimer's Disease Detection from Speech Aparna Balagopalan, Jekaterina Novikova1, Frank Rudzicz and Marzyeh Ghassemi <https://doi.org/10.48550/arXiv.1811.12254>
- [6] Balagopalan, Aparna Eyre, Benjamin Rudzicz, Frank Novikova, Jekaterina. (2020). To BERT or not to BERT: Comparing Speech and Language-Based Approaches for Alzheimer's Disease Detection. 10.21437/Interspeech.2020-2557.
- [7] Tian, Xu Liu, Jin Kuang, Hulin Sheng, Yu Wang, Jianxin Initiative, The. (2022). MRI-based Multi-task Decoupling Learning for Alzheimer's Disease Detection and MMSE Score Prediction: A Multi-site Validation.
- [8] Harika, S. Yamini, T. Nagasaikamesh, T. Basha, S. Kumar, S. DurgaKameswari, Mrs. (2022). Alzheimers Disease Detection Using Different Machine Learning Algorithms. International Journal for Research in Applied Science and Engineering Technology. 10. 62-66. 10.22214/ijraset.2022.46937.
- [9] Early stage alzheimer's disease prediction using machine learning models Front. Aging Neurosci., 20 August 2019 Sec. Alzheimer's Disease and Related Dementias Volume 11 - 2019 | <https://doi.org/10.3389/fnagi.2019.00220>
- [10] Arafa, D.A., Moustafa, H.ED., Ali-Eldin, A.M.T. et al. Early detection of Alzheimer's disease based on the state-of-the-art deep learning approach: a comprehensive survey. Multimed Tools Appl 81, 23735–23776 (2022). <https://doi.org/10.1007/s11042-022-11925-0>
- [11] Yang Q, Li X, Ding X, Xu F, Ling Z. Deep learning-based speech analysis for Alzheimer's disease detection: a literature review. Alzheimers Res Ther. 2022 Dec 14;14(1):186. doi: 10.1186/s13195-022-01131-3. PMID: 36517837; PMCID: PMC9749308.
- [12] Liu S, Masurkar AV, Rusinek H, Chen J, Zhang B, Zhu W, Fernandez-Granda C, Razavian N. Generalizable deep learning model for early Alzheimer's disease detection from structural MRIs. Sci Rep. 2022 Oct 17;12(1):17106. doi: 10.1038/s41598-022-20674-x. PMID: 36253382; PMCID: PMC9576679.
- [13] Shukla, Amar Tiwari, Dr Rajeev Tiwari, Shamik. (2023). Review on Alzheimer Disease Detection Methods: Automatic Pipelines and Machine Learning Techniques. Sci. 5. 13. 10.3390/sci5010013.
- [14] Ghazal, Taher Abbas, Sagheer Munir, Sundus Khan, Muhammad Ahmad, Munir Issa, Ghassan Zahra, Binish Hasan, Mohammad. (2021). Alzheimer Disease Detection Empowered with Transfer Learning. Computers, Materials and Continua. 70. 5005-5019. 10.32604/cmc.2022.020866.
- [15] A Survey of Deep Learning for Alzheimer's Disease Qinghua Zhou 1 , Jiaji Wang 1 , Xiang Yu 1 , Shuihua Wang 1 and Yudong Zhang 1,2,* 1 School of Computing and Mathematical Sciences, University of Leicester, Leicester LE1 7RH, UK; qz105@le.ac.uk (Q.Z.); jw933@le.ac.uk (J.W.); xy144@le.ac.uk (X.Y.); shuihuawang@ieee.org (S.W.) 2 Department of Information Systems, Faculty of Computing and Information Technology, King Abdulaziz University, Jeddah 21589, Saudi Arabia * Correspondence: yudongzhang@ieee.org; Tel.: +44-754-870-0453



[Home](#) / [Books By Genre](#) / [Educational & Professional](#)

/ [Business Research Methodology](#)



Business Research Methodology

Author Name: [Dr. Ninikala K](#) | Format: [Paperback](#) | Genre : [Educational & Professional](#) | [Other Details](#)

ADD TO CART

BUY NOW

International Seminar on
Plant Systematics:
Present Status and Future Prospects

ISPS 2024

BOOK OF ABSTRACTS



Department of Botany
University of Calicut

Calicut University PO., Malappuram District,
Kerala – 673635, India



INTERNATIONAL SEMINAR ON PLANT SYSTEMATICS: PRESENT STATUS AND FUTURE PROSPECTS

15 – 17 FEBRUARY 2024

Book of Abstracts



Organized by

Department of Botany, University of Calicut
Malappuram – 673 635, Kerala, India

Cosponsored by



TO4-04

**Pollination biology of the mountain day flower, *Dictyospermum montanum*
(Commelinaceae)**

Veena V.^{1,2*} and Santhosh Nampy¹

¹Department of Botany, University of Calicut, Malappuram District,
Kerala – 673 635, India

²Department of Botany, Providence Women's College, Kozhikode District,
Kerala – 673 009, India

*Email: v.veena8@gmail.com

Dictyospermum montanum Wight (Comelinaceae), commonly called 'mountain day flower', is an erect to partly decumbent herb distributed in South India, Assam, Sri Lanka and Indo-China. The present study was carried out at two locations viz., Vellanippacha in Thrissur District and Calicut University Botanical Garden in Malappuram District. The flower structure of *D. montanum* allows access by a variety of pollinating insects. The inflorescence architecture and flower orientation show adaptability for entomophily. Flowers are pollinated by insects. However, viable seeds are also produced independent of insect pollination. Plants can also reproduce and spread vegetatively subsequent to founding events. The composition of the pollinator fauna is dominated by syrphid flies, halictid bees and the aphid bees and most insect visitors observed have broad flower host ranges.

Sixth Semester
B.Sc. Degree Programme
UNIVERSITY OF CALICUT

Manjusha



Core Course Elective in BOTANY

Genetics and Crop Improvement

Prof. K.K. Bhaskaran
Dr. Sanoj E.
Dr. Archana E.R.

- Manjusha
Core Course
ELECTIVE IN BOTANY
Genetics and Crop Improvement
- For Sixth Semester B.Sc. Degree Programme
- Prof. K. K. Bhaskaran
Dr. Sanoj E.
Dr. Archana E. R.
- First edition : January, 2024
- Price : Rupees One hundred eighty only
- All rights reserved by publishers
ISBN : 978-93-90930-98-2
- Cover : Third eye, creative studio, Clt.
- Publishers : Manjusha Publications
Shiva Arcade, Pratheeksha Road
Thiruthiyad, Calicut - 673 004
Ph: 0495-2920816, 7025659274
9447425735, 9895765050
www.manjushapublications.com
email: manjushapublications@gmail.com
- DTP : National graphics, Clt.
- Printers : Sankar offset printers, Clt.

CONTENTS

Chapter	Page No.
1 Plant breeding and crop improvement	5-10
2 Plant genetic resources	11-41
3 Genetics and crop improvement	42-76
4 Plant introduction	77-87
5 Plant selection	88-95
6 Hybridization	96-112
7 Heterosis and plant breeding	113-119
8 Polyploidy in crop improvement	120-122
9 Mutation in crop improvement	123-126
10 Genetics of nitrogen fixation and photosynthesis	127-141
11 Breeding for disease resistance	142-149
12 Breeding for resistance to biotic stresses	150-159
13 Breeding for resistance to abiotic stresses	160-170
Appendices	
i) Laboratory experiments	171-178
ii) Syllabus	179-180
iii) University model question paper	181
iv) Previous University question paper	182-183

Unraveling the Labyrinths of Literature and Language



First Volume

Editors

D. K. Mandal
Dr. Sukhdev Singh
Abhilasha Agrawal



11. On Subverted Ideals of Peace: The 'Text' and Pragmatics in Indian Polity

.....
Hridya Joly

12. Beyond Fixities: The Female Self and the Diasporic Space in *Interpreter of Maladies* and *The Namesake*

.....
Dr. Surya. K

13. Blurring Boundaries: Reconceptualising Childhood in Crossover Fiction

.....
Nancy Yadav

14. Nation, Nationalism and Diasporic Consciousness: A Postcolonial Reading of Indian Indentureship System

.....
Nada Nasrin

15. Cultural Amnesia and Destabilization of Identity in Santha Rama Rau's By Any Other Name

.....
Ishani Hazarika Singha

Beyond Fixities: The Female Self and the Diasporic Space in *Interpreter of Maladies* and *The Namesake*

Dr. Surya. K

Abstract

The present study attempts to explore the interrelationships between conditions of the diaspora and the woman's cultural positioning so as to acknowledge spaces of indeterminacy as being transformative and generative of newer discourses about gender and power. The analysis of texts written by a writer who represents the various emotions and upheavals associated with the diasporic experience is intended to provide pertinent insights regarding the nature and significance of multiculturalism and meanings about the category of the woman. *Interpreter of Maladies* and *The Namesake* by Jhumpa Lahiri are read so as to comprehend the extent to which texts authored by diasporic women writers give voice to the feminist concern for renewal and reformulation with regard to gendered identities. The idea is to understand the ways in which these narratives provide instances that are subversive and oppositional to conventional discourses about the woman and the multiple layers of meanings conveyed in relation to such a goal. Equally significant is the attempt to probe the complex ways in which cultural memory, individual identity and diasporic ambivalences merge to create situations of displacement and dilemma that are also emblematic of a flexibility shattering hierarchical pretensions.

Keywords: diaspora, power, identity, gender

1. Introduction

Cultural conflict and its concomitant realities have always shaped the literature emanating from the diaspora to the extent that ideas pertaining to spaces and contexts continue to be examined and perused in the light of contemporary global situations. A host of writers who form part of the Indian diaspora have tried to imbibe the different nuances of cultural displacement by relating the experiences of migration and rootlessness to individual identities and conflicts. The ever-increasing movement of people across cultures has also

led to the evolution of perspectives and attitudes that try to re-define cultural meanings, attitudes, power equations and relationships and most importantly, the very crisis of identity. Cultural identity is itself subject to constant transformation, initiating new discourses about social structures and meanings. For, as Stuart Hall (1990) points out, cultural identities are "subject to the continuous 'play' of history, culture and power." (p.225). Writers of the diaspora strive to probe the different ways in which individuals become engaged in such a problematic process of identity constitution necessitated by the interplay of societal forces.

Jhumpa Lahiri is one such writer who endeavours to capture the lives of individuals caught between deviant spaces, enduring contradictory feelings of belongingness and detachment, struggling to identify themselves with a cultural locale that sometimes seems unreal and imagined. Her works strive to delineate the unique sensibility of a writer who is keenly aware of the strong undercurrents of meaning that inform expatriate experience. She draws continuously from her own experience of straddling between different cultures and weaves her works in ways that represent the ambivalence, the angst and ennui of immigrant identities. She is particularly sensitive to the Indian immigrant experience and deftly portrays characters who typify a plethora of issues related to the diaspora. Lahiri exists as a representative of the emergent bunch of women writers of the Indian diaspora who are eager to come out of the shackles of cultural and ethnic stereotyping, making use of their relocated position. It is imperative for their works to provide instances that command a close analysis in this regard.

The intersection of gender and diaspora assumes relevance, in particular, when seen in relation to contexts of hybridity and cultural exchange engendered by the diaspora. This is because diasporic experiences also pave the way for a re-definition of gendered positionings that tend to be usually structured within specific locales and cultural landscapes. It would be pertinent to examine the ways in which narratives that foreground the voice of the female create new meanings about gender by integrating an agenda of subversion and reversal, countering existing discursive values about masculinity and femininity, into a framework of cultural interaction. The social significance of such an attempt derives mainly from an attempted critique of such patterns of difference that are intricately shaped by the power mechanisms of society. This aspect is clearly indicated in the observation made by Cixous (1988) that gendered patterns based on 'essences' like femininity and masculinity function on the basis of "different requirements and constraints, which when socialized and metaphorized, produce signs, relationships of power, relationships of production and of reproduction, an entire immense system of cultural inscription readable as masculine or feminine (p.289). The fragmentary spaces of the diaspora

grapple with such interrelationships existing between questions of power, culture and gender, probing the inherent contradictions that complicate any understanding of an essentialist identity and seeking to produce meanings that challenge absolutes. Lahiri also attempts to upset constructions of gender by reflecting on the different ways in which women endeavour to reposition themselves and their role drawing upon the diasporic potential for cultural transformation and revision. Her works *Interpreter of Maladies* and *The Namesake* present women characters who experience such processes of identity formation enacted within spaces of indeterminacy and transition. Suggestions about a disruption of fixed subjectivities are woven into the textual content, primarily relating them to contexts of cultural confrontation. However, representations that indicate a re-examination of the gendered attributes of femininity, not necessarily in relation to diasporic contexts, also figure in the former, pointing to a generalised scepticism of established gendered patterns, irrespective of a background of cultural conflict.

Lahiri's Pulitzer-winning debut collection of short-stories, *Interpreter of Maladies*, presents before us a bunch of skillfully crafted tales that subtly hint at the dilemmas and tribulations faced by individuals who experience estrangement, both inwardly and outwardly. By combining the elements of pathos and delight with a vibrant imagination, her characters evolve into beings who are real and alive. "Jhumpa's acute sense of situation, of experience, of mood and of pathos enables her to create stories which are remarkably original and in some respects unique. The various layers of experience she describes sublimate into a persuasive and disturbing vision of life" (Parvathy, 2000, p.115). Though she is primarily concerned with the effect of exile on individuals who labour to sort out a confusing existence in an uncertain and fluidic space between the immigrant and the native, she is equally interested in highlighting the variable nature of this experience, as can be seen in her stories that are set in India. Moreover, these characters, by the very nature of their emotional/physical dislocation, represent a challenge to fixed notions of identities and subjectivities. In fact, they occupy a space that is transient, dynamic, flexible and experimental. These fractured selves are emblematic of their rootlessness not just in terms of their physical landscape but also in terms of a much larger feeling of disruption that has a powerful cultural significance as well, especially with regard to questions about gender.

The present paper intends to analyse a few representative instances from the collection *Interpreter of Maladies* and the novel *The Namesake* wherein Lahiri attempts to demonstrate the different dimensions of female awakening, critiquing accepted ideas about gendered behaviour. The purpose here would only be to identify such strands of thought that can be delineated within these texts, pointing to their inherent capability for representing the female voice as

the dominant and powerful. What is emphasised is the manner in which diasporic female selves contrive to transform the ambiguities and uncertainties of their identities into a means for acknowledging the arbitrariness and fluctuation embedded within their own gendered selves. A few selected instances from *Interpreter of Maladies* and *The Namesake* would be read in the light of such an argument with a view to emphasise the capacity of diasporic narratives to offer alternate conceptions about gender and power.

Interpreter of Maladies

In the first story of the collection, "A Temporary Matter", which deals with the predicament of a young couple, who endure the pangs of a failing marriage, the woman is represented as being eager to explore the silenced spaces of her own self and to seek an existence outside the realms of conventionality. Her voice is one that is capable of subduing the male in terms of his social status and identity as he remains at the margins and is often made to feel weak and vulnerable in his interactions with her. The loss of her first baby, which is the cause of her sense of detachment, fills her with such feelings of frustration and loss that it triggers a process of rethinking wherein she modifies the attributes of her own self. The reversal in gender roles, executed in terms of representing Shoba as occupying the public spaces with her work commitments and Shukumar as the student at home, engaged in domestic chores, perfectly aids the textual aim to revert relationships forged around hierarchical notions. There is also a veiled hint given in the story about how Shukumar is also made to feel responsible and guilty for the loss of their baby, offering a perspective that differs from the traditional association of birthing and the assorted responsibilities of motherhood primarily with the woman.

It is evident in Shoba's final declaration of moving out of the relationship, much to the dismay of her husband, that she is keen on discovering herself anew, negotiating with the new circumstances and eager to disown any form of coherence attributed to herself. This can perhaps be related to her occupation of a decentred, transitional space of indeterminacy, necessitated by her position as a diasporic individual. In her conversations with Shukumar, she frequently refers to her Indian past, through anecdotes, trying to make sense of her own individuality and its different ramifications. This fluidic perspective that she cultivates assists her in re-defining herself, as she is reluctant to confine herself to her 'womanly' duties and asserts her agency and initiative through a conscious process of self-awakening. This becomes clear once contrasted with Shukumar for whom, his Indian identity is the 'Other' that has remained an oppositional space that signifies a vacuum. This is visible in his statement that unlike Shoba, he could never associate himself with that unexplored 'Other' within his own self. This is evident in the following sentences from the novel

"He wished now that he had his own childhood story of India" as it "wasn't until after his father died...that the country began to interest him, and he studied its history from course books as if it were any other subject" (Lahiri, 1999, p.12). For him, the fixed binary between the Self and the Other negates the presence of an openness and provisionality that would engender an understanding beyond fixities. This appears to be the reason why he is shocked and unable to comprehend the suddenness of Shoba's decision. Thus the story deftly brings together a subtle element of role reversal and attempts to stress upon the possibilities that exist beyond the finalities of gendered existence.

In "Mrs.Sen's", the titular character desperately tries to accommodate herself with the space of her adoptive land America, by clinging on to symbols and memories attached to her homeland. She derives sustenance as an outsider within an incomprehensible new world by keeping alive the mood of Indians that is integral to her identity as a woman. The aspects of cooking and driving, the former often conceived to be invariably feminine, and the latter as masculine, assume symbolic overtones that transcend such limited conceptions perceived in relation to gender. The diasporic space gives a new meaning to her gendered self, by enabling her to revisit such attributes in a manner that puts them into a state of flux. She longs for the smell of fresh fish which is an inseparable element of her identity as a native Bengali woman and it becomes a means through which she desperately tires to make herself feel rooted, if not physically. (Lahiri, 1999, p.123). "Mrs. Sen said she had grown up eating fish twice a day" (Lahiri, 1999, p.123) is another statement that indicates the significance it has for her. As a traditional woman in India, she would have dutifully adhered to the cultural demands made on her by remaining within the domestic space and by manifesting her skills in cooking. But within the starkly different Western locale in which she finds herself, the supposedly female task becomes endowed with new meanings as she sets out into the public space desperate to assert herself and to realise her wish. She inadvertently emphasises her independence in her relentless pursuit to grab fresh fish from the market as she does not give up her wish even in the absence of her husband. So here, the gendered spatial association with the 'female' is disrupted as for Mrs. Sen the contentment derived from the act of cooking fish is subordinated to the resurgence experienced in the very act of procuring fish.

Thus, for Mrs.Sen, cooking ceases to remain a facet of her mundane existence as a domesticated wife but acquires added connotations drawing upon a context of cultural conflict and revival. Her driving practice also equally affirms such a dismantling of stereotypical gendered values, as he struggles to re-write the gendered inscriptions written on her body and attempts to master a skill that she is quite wary of. Mrs.Sen shows how gender and the diasporic experience inform each other, facilitating women's understanding of their

selves, thereby also offering them new strategies for renewal and identity formation.

The story "Sexy" which centres on an extra-marital affair between the American Miranda and the Indian Dev highlights yet another facet of the woman's condition, though from a different perspective. The woman enters this relationship primarily as a means of escape from an isolated existence. This has partly to do with her fetishisation of the Indian man, which again is used fully to his advantage by her Indian lover. For him, she is the stereotypical 'sexy' white woman who can be manipulated to gratify his lust. It is only accidentally that she introspects on the meaning and significance of the world 'sexy' that Dev had used to describe her. Her attempt to identify herself completely with an Indianness that she envisages through the persona of Dev also becomes a journey of self-realisation as she gradually comes to terms with the need to re-fashion her identity and to affirm an individuality that is outside of the structure built of preconceived notions. She realises that her identity, for the Indian male exists primarily in terms of a highly sexualised conception of the body in a manner that subdues her voice and agency. She, in the end, decides to prioritise her 'self' instead of giving in to a highly misplaced exoticisation of her body, engendered by a situation of cultural conflict. She refuses to be the 'Other' subjugated by the dominant 'Subject' of the male who tends to define her in terms of a masculinised conception of the enticing Western woman. When Miranda fails to find any sanctity in their relationship and is determined to end it, the hitherto passive, stereotyped female self acquires a voice that confronts the artificiality and obscurity embodied within acts of 'Othering', especially in relation to gender. This constitutes a varied picture of the ways in which cultural interrelations can impact upon gendered renewal as well.

The character Twinkle in "The Blessed House" intentionally/unintentionally moves beyond the notions of wifehood as she seeks to derive pleasure and contentment in her own pursuits and interests disregarding norms of cultural behaviour. The story gives us a glimpse into the life of a young Indian couple who have just moved into a new house in America. Very soon she discovers a treasure of Christian paraphernalia left behind by the previous tenants, causing much apprehension to her devout husband who is sceptical about her passion for a different religion. His dislike is expressed thus: "He was further puzzled that Twinkle, who normally displayed good taste, was so charmed. These objects meant something to Twinkle, but they meant nothing to him. They irritated him" (Lahiri, 1999, p.138). However, Twinkle goes around the house, unearthing artefacts, considering every such exploration as adventurous and thrilling. Her excitement in such endeavours contrasts sharply with her lack of enthusiasm in performing the role of a 'homemaker' as expected by her husband. There are also clear indications about how she

effortlessly downplays the status quo expected within a marital bond privileging the male as the centre of power and the female relegated to a position of powerlessness. Her girlish charm and delight that are supposedly viewed as cultural markers of 'womanliness' are interestingly used here to evoke a contrary picture of the dominating female voice that can displace the male from a privileged position. For Sanjeev, religion is an integral part of his cultural identity and he expects his wife to reproduce the values enshrined within it and to adhere to its norms. However, the diasporic context and the cultural fusion that it entails provides the woman with an opportunity for reformation through processes of contestation.

"The Treatment of Bibi Haldar" which distinguishes itself from the tales discussed above with its Indian setting, examines the problematic relationship that exists between a woman's sexuality and societal compulsions. Her character does not in any way ascribe to the traditional expectations about feminine charm in terms of her social position, her age and her body. A strange ailment, which has been declared as apparently incurable, subordinates her body to a kind of invisibility that renders her totally powerless and voiceless. Deemed as unattractive and reprehensible and a misfit in society, she is doomed to lead an existence as the marginalised, denied of any meaning in life. Her desire for a man and for conjugal life is voiced in her outbursts of frustration as she encounters other women who represent different stages of womanhood. It is noteworthy that her sexuality is subject to societal scrutiny as a wayward expression of her loneliness and angst. This kind of a distorted version of women's sexuality is also related to a certain kind of conditioning that is initiated by culture. As Germaine Greer (1993) opines in *The Female Eunuch*, "female sexuality has always been a fascinating topic..." and it has very often been "masked and deformed by most observers..." (p.17). She adds that women's sexuality "is both denied and misrepresented by being identified as passivity" (p.17). This, in fact, shows how cultural standards of propriety generate a skewed understanding of the woman's body and construct an identity that is pre-determined and enforced, negating the choice of the woman.

The body of Bibi thus becomes imbued with gendered values nurtured in terms of what is culturally viewed as appropriate. It is only when a doctor declares marriage as a possible cure for her strange disease that her sexuality is acknowledged by others. "For the first time we imagined the contours below her housecoat, and attempted to appraise the pleasures she could offer a man. For the first time we noted the clarity of her complexion, the length and languor of her eyelashes, the undeniably elegant armature of her hands" (Lahiri, 1999, p.162). When other women attempt to groom her in preparation for a new identity as wife, they knowingly/unknowingly try to regulate her desire through a process of normalisation that would firmly place her within the

secured confines of societal respectability. It again shows how cultural standards attempt to define female sexuality in terms of accepted norms and institutionalised structures. However, Bibi, crosses such boundaries by exercising her autonomy and by acting in accordance with her needs. When she becomes pregnant and fulfills her desire to become a mother, disregarding the norms of society, she becomes an agent who determines her own destiny. The free expression of her sexuality, countering normative inscriptions framed around motherhood, indicates her determined effort to strive towards a more liberated existence. The sense of fulfillment that she derives owes much to the highly individualised manner in which she tries to talk back against established precepts. It is equally pertinent that she interrogates her identity as a woman within contexts of cultural suppression and appropriation.

Indeed, such narratives highlight the incompatibility inherent within gendered categorisations and attempt to counter hegemonic perception governing individual lives. Equally relevant is the manner in which diasporic writing that tends to unfold against a backdrop of attempted cultural recuperation and reworking of identity allows for the evolution of different perspectives for analysing the interplay of gender realities and relationships. In fact, the dynamism offered by the diasporic experience facilitates the continuous construction of gendered patterns as already seen in the portrayal of gender relations in the stories already discussed earlier.

The Namesake

Lahiri's *The Namesake* once again affirms the potential of the cultural spaces of the diaspora to re-form gendered selves. Here, the dilemma of attempting to fabricate fixity of meaning and purpose with respect to her gendered existence, draws the protagonist Ashima to find means for incorporating a renewed understanding of her own predicament. The alternate possibilities of the diaspora, evolving in the context of cultural exchange, also initiates processes of resurgence prompting the woman to a thoughtful revision of the constituents of her identity. It can again be seen that the insider/outsider perspective signifies a conundrum that problematises culturally sanctioned codes of gender and point to the increasing inability to contain individual subjectivities within finite frames of reference, attributing fixed essences to determine their cultural behaviour. It is also significant that a total distrust of centred systems of thought, including that of gender, becomes more powerfully articulated in connection with aspects about diasporic instability and uprootedness. Ashima exemplifies the fluctuating nature of gender formulations in such contexts and emphasises the need to revisit them critically.

Along with marriage, motherhood becomes an act that is deeply rooted in culture and has been inextricably linked with an acute gender consciousness. However, quite interestingly, Ashima's motherhood could be seen to evolve as a site that provides for such a re-examination. Her initial suspicions about mothering in a foreign land are rendered insignificant as she gradually transforms motherhood into a means for empowering herself. Her motherly concern translates itself into a means for re-defining herself within a new cultural landscape as she tries to identify herself with the transitionality that seems to characterise her situation. Thus a gender-culture specific notion of motherhood assumes new significations in alliance with the dilution of rigid demarcations between cultures. For Ashima, the birth of a son provides the much needed strength of mind to venture into an unfamiliar world. The act of placing her son in a pram and pushing him through the streets of Cambridge for the first time, is for her, something more than a mere motherly responsibility. It is rather a moment of self-discovery as well. "She begins to pride herself on doing it alone, in devising a routine. Like Ashoke, busy with his teaching and research and dissertation seven days a week, she, too, now has something to occupy her fully, to demand her utmost devotion, her last ounce of strength" (Lahiri, 2007, p.34-35). Ashima's life acquires a visible pattern, an aspect that had been so far lacking, and she experiences a new found independence that goes a long way in enhancing a firm mind. Child-rearing, traditionally relegating the woman to the confines of the home is in her case, not a reason for staying away from the public sphere. This shows how within the culturally pluralist spheres of immigrant life the meanings of gender tend to be reworked continuously, providing a heightened sense of power to the female.

Lahiri also resorts to subtle reversals of gender roles much as in *Interpreter of Maladies*, particularly in terms of the gendered connotations ascribed to the domestic space. Ashima is shown to derive a sense of contentment when she is free of wifely duties and learns to privilege her needs and interests above demands culturally imposed upon her. She takes up a job at the local library and even ends up making American friends, something that had earlier been only a distant prospect. This happens when her husband Ashoke is temporarily separated from her while engaged in his academic pursuits. However, even the experience of widowhood does not entail Ashima to a life of seclusion and also does not signify the end of life for her as she is determined to make decisions and carry out tasks that stem from her own choice. She thus represents the attitudinal and behavioral changes that women are subjected to as diasporas, thereby opening them to new paths of relocation through gender re-definition.

The Gogol-Moushumi relationship in *The Namesake* provides instances that reiterate the illogicality of maintaining strict gender divisions. Gogol has

only a subordinated role here, being considered a substitute for something lost. Fidelity with marriage and devotion to its ideals forms part of the cultural and historical construction of an Indian wife. But Moushumi, who is a second generation immigrant nurtured by the experience of varied cultures, has always been sceptical of the claims for cultural originality and loyalty. More inclined towards the conscious process of re-inventing herself, Moushumi is firm about her intentions and is ready to discard her marital ties for her first love. Her life and self-definition is more oriented towards herself and this explains her negation of gender differences as well. Her character again explicates an attempt made to transcend the process of gendering, eager to exploit the liberal spaces of a different culture and thus drifting away from a blind adherence to norms fixed for her life. She does not want to be considered as a transmitter of cultural roles and value-systems and tries to show how the social formulations of gender can be more emphatically critiqued by recognising the fragmentation within one's own identity. The movement of Ashima from cultural insularity to a more accommodative existence that would incorporate possibilities for variance and negotiation, is also a subtle way of indicating the devaluing of binaries constituted as gender stereotypes.

Gender as a category, therefore, becomes problematised at length in diasporic discourses. The notions of fixity and stability envisaged in the cultural construction of individual subjectivities, derives mainly from ideas about difference, gender, being one such. But the cultural tension and uncertainties engendered by diasporic situations also necessitate the collapse of oppositions, thereby projecting the interchangeability and vulnerability of fixities on gender. For as Chodorow (1994) says:

We can only understand gender difference, and human distinctness and separation, relationally and situationally. They are part of a system of asymmetrical social relationships embedded in inequalities of power, in which we grow up as selves, and as women and men. Our experience and perception of gender are processual; they are produced developmentally and in our daily social and cultural lives. (p.48)

The two works discussed in the course of the paper offer significant instances that point to the interrelationships that exist between cultural dislocation and processes of gender reformulation. In fact, Judith Butler (1999) too challenged the notion of a fixed female identity with essential qualities, as a pre-requisite for any understanding of the category of the 'woman'. She observes in *Gender Trouble*: "The very subject of women is no longer understood in stable or abiding terms. There is a great deal of material that not only questions the viability of 'the subject' as the ultimate candidate for

representation or, indeed, liberation, but there is very little agreement after all on what it is that constitutes, or ought to constitute, the category of women" (p.4). She proposes that gender should be seen as a series of repetitive acts that contribute towards the process of identity-making. She states that gender is 'performative', ie masculinity or femininity is the result of a patriarchal performance or role by the individual, which is accepted and validated by the society:

That gender reality is created through sustained social performances means that the very notions of an essential sex and a true or abiding masculinity or femininity are also constituted as part of the strategy that conceals gender's performative character and the performative possibilities for proliferating gender configurations outside the restricting frames of masculinist domination and compulsory heterosexuality. (p.180)

She thus considers gender as a continuous performance that varies in accordance with different social and cultural contexts as is evidenced by some of the texts discussed. Even in the story that does not involve any suggestion of cultural conflict with its native setting, there arises a visible strand of emotional dislocation and fractured identity that seeks to question established categorisations. Lahiri attempts to centralise this 'performative' potential inherent within spatial reconfigurations and the multiple ways in which it contributes towards improvising the cultural codes of gender. There can also be seen an element of distrust of mutually exclusive gender divisions and a rather strong emphasis laid on the permeability characterising strict bifurcations, as exemplified by theorists like Butler. The encounter with explicit markers of cultural difference provides a fertile ground for the forging of new selves and for inaugurating a corresponding process of re-invention.

Conclusion

The works, *Interpreter of Maladies* and *The Namesake*, are indicative of how diasporic women's writing transforms itself into a culturally relevant space for contestation, where power relations in terms of gender tend to be subverted and possibilities for renewal emerge. New meanings and identities evolve in such contexts of flexibility entailed by the diaspora. "Diaspora is both a physical condition of dislocation and a postmodern intellectual notion expressing an existential loss. Important to diaspora is the way in which gender identities are formed, with women negotiating traditional expectations and contemporary realities of the adopted land by blurring external borders through a systematic blurring of physical bodies, to carve out a new identity of their own (Kaur, 2015, p.68). A counter-essentialist strategy that disrupts the seemingly

natural 'givens' about gender, strengthens the transformation of these texts into sites where power hierarchies tend to be threatened and binaries structured in terms of the Self/Other are deconstructed providing space and visibility to the woman's voice. Diasporic positionings imbued with a sense of plurality and multiplicity thus productively engage with gender, signaling newer perspectives and discourses that are liberatory and transformative.

A recognition of the alternate world-views offered by the diasporic status ably assists the repositioning of gendered loyalties without being oblivious about the conflictual processes through which a reframing is brought about. The multicultural setting is aptly designed to configure a different space in which the history of relationships between the culture of origin and adoption play a role. The encounter with explicit markers of cultural difference provides a fertile ground for the forging of new selves and for the corresponding perpetrations of reinvention. Diasporic women's writing transforms itself into a favourable site, wherein new meanings and identities evolve in the course of a de-emphasisation of already expressed standpoints and combinations. What gets acknowledged is a non-oppositionality that emerges from the intricate invasions of cultural contact. The pluralisation thus implied mobilises migratory spaces with strength enough to disrupt narrow, isolating perspectives that hinder a free flight for the self.

References

- [1] Butler, J. (1999). *Gender Trouble: Feminism and the Subversion of Identity*. Routledge.
- [2] Cixous, Helene, & Liddle, A. (1988). Sorties. In D. Lodge (Ed.), *Modern Criticism and Theory: A Reader* (pp. 287–293). essay, Longman.
- [3] Chodorow, N. J. (1994). Gender, Relation and Difference in Psychoanalytic Perspective. In A. Giddens (Ed.), *The Polity Reader in Gender Studies* (pp. 41–49). essay, Polity P.
- [4] Greer, G. (1993). *The Female Eunuch*. Flamingo-Harper Collins.
- [5] Hall, S. (1990). Cultural Identity and Diaspora. In J. Rutherford (Ed.), *Identity, Community, Culture, Difference* (pp. 222–237). essay, Lawrence&Wishart.
- [6] Kaur, M. (2015a). Blurring Borders/Blurring Bodies: Diaspora and Womanhood. In S. R. Mehta (Ed.), *Exploring Gender in the Literature of the Indian Diaspora* (pp. 68–88). essay, Cambridge Scholars.
- [7] Lahiri, J. (1999). *Interpreter of Maladies*. Harper Collins.
- [8] Lahiri, J. (2007). *The Namesake*. Harper Collins.
- [9] Parvathy, S. (2000). "The Fictional World of Jhumpa Lahiri." *Journal of Literature and Aesthetics*, 8(2).