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A Systematic Review of Computer Science Solutions for Addressing Violence Against Women in Educational Institutions

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Abstract: Approximately one in three women worldwide experience physical, mental, or sexual violence, making violence against women (VAW) a serious public health emergency. One of the main issues in educational institutions is violence against women. With the introduction of smart campuses and smart technologies, educational institutions are doing everything within their power to avert these kinds of incidents. Recent developments in computer science, such as artificial intelligence (AI), Internet of Things (IoT), and pattern recognition, have been essential in creating solutions meant to stop and react to VAW. This study presents a thorough systematic review from academic digital libraries from 2010-2023 of some of the initiatives that have been used to address the issue of violence against women. The state-of-the-art for these contributions is currently described in this document along with trends, architectures, technologies, and open problems. It highlights how these technological interventions are utilized for early detection, prevention, and response to incidents of VAW. The findings suggest a growing reliance on technology to create safer educational environments, but also emphasize the need for continued research, particularly in developing inclusive, ethical, and effective technological solutions. This review aims to inform stakeholders in the education and technology sectors about the current state of computer science applications in the fight against VAW, providing insights into best practices and areas for future development.
Keywords: Artificial intelligence; Machine learning; Violence against women, pattern recognition, IoT

1. INTRODUCTION

As defined by the Violence Prevention Alliance of the World Health Organization (VPA), violence is "the intentional use of physical force or power, threatened or actual, against oneself, another person, or against a group or community, that either result in or has a high likelihood of resulting in injury, death, psychological harm, maldevelopment, or deprivation." Although anyone can become a victim of violence, some people are more susceptible than others, such as women. Globally, about 30% of women have experienced non-partner sexual assault or intimate partner violence (IPV) at some point in their life [1].

According to the United Nations [2], violence against women is a global issue that affects higher education institutions (HEIs), the public and private sectors, and both. According to the UN, this kind of violence can happen in homes, in public spaces like schools, or both [3]. In light of these concerning facts and the widespread prevalence of violence against women, it is critical to investigate and put into practice practical solutions—using technology in particular—to stop and deal with this problem in all spheres of society, including the educational sector.

Tolerating violence against women in schools is a major sort of discriminatory behavior that endangers the learning environment and the educational prospects for girls. According to [4], girls are disproportionately the targets of sexual and physical violence in schools. In addition, male peers and occasionally instructors harass, rape, and abuse girls sexually. Addressing violence against women (VAW), a significant public health concern in educational institutions requires any form of intervention.

Numerous studies indicate that violence against women in college and university settings is on the rise [5], for instance, iscovered that 32.4% of 295 female students at Ebonyi State

University in Nigeria reported having been sexually assaulted. At the University of Kano in Northern Nigeria, out of 300 female students, 22.8% said they had experienced emotional, sexual, or physical abuse [5]. In a poll conducted by the University of Port Harcourt, 46.7 percent of 400 female undergraduates said they had been victims of sexual abuse. Of those 46.7%, 33.7% said they had experienced fondling or having their privates grabbed [6].

In Goa, [7] reported that 33 percent of the students, male and female alike, had experienced sexual abuse. Other studies show that 98% of students reported having experienced physical abuse, while 67% of girls in Botswana and Uganda, respectively, reported being mocked and harassed by their instructors [8]. These figures demonstrate the extent of violence suffered and witnessed by women, which in turn affects pupils. Gender coexistence is impeded by violence from occurring respectfully and peacefully. Furthermore, VAW management is necessary for gender equality.

VAW happens in universities, even though it is rarely discussed in public. However, there are a few reported cases where students organized a peaceful protest against VAW and presented the Vice Chancellor with an 18-point petition, such as at the University of Namibia [9]. The petition included a request to action against people who misused their position of authority by trading marks for sex, as well as those who disseminated pornography of their sex experiences online, on

Facebook, or through mobile devices. According to [9] research, university students in Kenya saw that there was a definite exchange of sex for basic needs like food, transportation, hygiene supplies, and forgettable marks. These VAW difficulties have a major impact on human growth, especially in the twenty-first century when cultures and groups are actively working together to accomplish faster and more significant global advances.

Girls who experience violence in schools have a lower chance of staying in school, doing well academically, and participating in class. According to [10], this issue occurs not just in the homes where children are meant to feel protected but also in the schools where children are supervised by some of the same teachers who also physically and sexually abuse them. VAW does indeed have serious consequences. Therefore, it is imperative to educate women and the wider public that any form of violence is abhorrent. In addition, Women must also have protection and support.

The latest technological developments offer a singular chance to create creative tactics that surpass conventional methods. Artificial intelligence (AI) can be used, for example, to create predictive models that identify risk indicators and initiate early interventions. Similar to this, real-time monitoring and alert IoT-powered systems can be leveraged to improve campus security. Cloud and mobile computing can make it easier to provide easily available platforms for incident reporting and support requests, preventing victims from being alone and enabling them to get help quickly. Educational institutions can take proactive measures to avoid VAW and promote a culture of safety and respect by utilizing the power of these technologies.

By combining these cutting-edge technologies, violence against women at educational institutions is being addressed in a way that is more proactive and data-driven than traditional approaches. The goal of this study is to employ computer science solutions to not only respond to VAW situations but also to avoid them in the first place. This will make the learning environment safer and more encouraging for all students. The goal of this project is to investigate the entire range of computer science solutions, with an emphasis on their application in the real world and their potential to reduce violence against women in educational settings.

This study is crucial to addressing the rising issue of violence against women in educational settings. It investigates how computer science methods and technology could improve security and safety in these kinds of environments. Through the identification and assessment of technology-based interventions, this research provides novel approaches to address an ongoing issue. It is anticipated that the results will offer actionable advice on how to stop and deal with this kind of violence, assisting legislators, educators, and tech developers in their endeavors to make spaces safer. This study further advances the conversation around gender-based violence by offering a technological viewpoint to supplement conventional tactics. The research's significance ultimately rests in its capacity to significantly alter how women are protected from assault in educational environments.

The harm that violence against women in schools does to their physical, emotional, and intellectual well-being is still a major worldwide problem. In order to come up with creative ways to identify, stop, and deal with this kind of violence, computer science has become a crucial discipline. These solutions have a wide range of uses, including safety apps, online harassment detection algorithms, and educational initiatives meant to alter social norms and behavior. Despite these developments, there are still a lot of unanswered questions in the field, especially when it comes to the efficiency, usability, and user acceptance of these technologies.

How CS and associated technologies can potentially treat VAW have been illustrated in earlier paragraphs. This article describes contemporary efforts in many domains to prevent VAW and searches for new designs, patterns, technologies, and unsolved problems This paper aims to fill this vacuum in the literature and offer recommendations to researchers who wish to tackle VAW from an engineering and CS standpoint. This project seeks to explore and assess effective technology solutions for this important issue.

The paper is formatted as follows. Section 2 discusses the technique used for the review. In Section 3, the procedure for data extraction is explained. Section 3 offers a comprehensive review of the literature, including theoretical frameworks, empirical studies, and noteworthy findings. Section 4 summarizes the review's analysis, recommendations, and conclusions and concludes Section 5.

1.2 Research Objectives

i) To identify and analyze Information Technology solutions developed and implemented to address violence against women (VAW) in educational institutions across various Information Technology (IT) problem domains.

1.3 Research Questions

i) What Information Technology solutions have been developed and implemented to address violence against women (VAW) in educational institutions, and how are they applied across various Information Technology (IT) problem domains?

2. METHODOLOGY

This section presents the methodology used to conduct this extensive literature review. Among the phases covered are a description of the study topics, a search strategy, selection criteria, and a plan for data extraction and synthesis. The only research question that guided this investigation was:

RQ1. What Information Technology solutions have been developed and implemented to address violence against women (VAW) in educational institutions, and how are they applied across various Information Technology (IT) problem domains?

2.1 Search Strategy

To find the materials for this study, a thorough search was carried out using academic digital libraries and search engines for the years 2010–2023. A wide range of scientific and

technological topics are covered by the digital libraries and search engines indicated in Table 1, some of which are specifically relevant to the goal of this paper and were chosen for study extraction.

Table 1: Information sources for studies

Source	URL
IEEE Digital Library	https://ieeexplore.ieee.org
The ACM Digital Library	https://dl.acm.org
PubMed Digital Library	https://pubmed.gov
Springer Digital Library	https://link.springer.com
Science Direct Digital Library	https://www.sciencedirect.com

Next, the search method sought possibly relevant primary research from each of Table 1's information sources. The two keyword sets in Table 2 were based on the study questions. Computer science and related technologies are in Group 1, whereas virtual and analog worlds are in Group 2. Boolean ANDs and ORs were used to combine Group 1 and Group 2 terms into search strings.

Table 2: Search Items

Group 1	**Group 2**
Computer science, the Internet of Things, IoT, Artificial Intelligence, AI, Machine Learning, Deep Learning, DL, ubiquitous computing,	**Women's abuse, gender-based violence against women, violence against women, violence against women, verbal abuse directed against women, intimate partner violence, adolescent violence, peer violence, abuse of women, and domestic violence. Schools, universities, tertiary institutions, colleges.**

Following a comprehensive examination, it was determined to include the paper if it met the subsequent quality standards:

• The article's title and abstract were perused. The abstract was disregarded if it did not refer to VAW-like concepts or the application of CS or related technologies.
• The paper takes a computer science approach to the VAW problems.
• The architecture or design used to implement the proposed paradigm is described in depth in the article;
• The suggested model was inspired by similar projects, which are explained in the paper.
After that, we went through the articles we had gathered, examining the manuscripts to make sure they met the inclusion criteria that had been previously set as well as for exclusion.

• Research that doesn't particularly discuss how to use technology to stop violence against women.
• Research examining violence against women outside of academic institutions.
• Unrelated to study aims;
• Grey literature, opinion pieces, and non-peer-reviewed publications, as they might not have a rigorous research technique and peer validation.

2.2 Selection Criteria

Only research meeting the following requirements was considered possibly relevant:

1. Articles published in proceedings from conferences or workshops, publications, or peer-reviewed journals.
2. English-language written works.
3. Works released, all-inclusive, between 2010 and 2023. The potential relevance of the research was assessed using the following inclusion criteria to ascertain their true relevance:
4. The paper's title and abstract were read. The abstract was disregarded if it included no reference to VAW, ideas that are similar to it, or the use of CS or related technologies.
5. Study Design: Empirical research that demonstrates the efficacy of technological interventions will be prioritized. This covers study designs that are both quantitative and qualitative, such as experimental.
6. Research Question Relevance: Studies must particularly discuss how computer science tools and technology are used to stop violence against women in educational settings. Research on the creation, application, and assessment of technology solutions falls under this category.
7. Context: The research needs to be carried out in educational settings, including colleges, universities, or schools, where the goal is to stop or address violence against women.

2.3 Data Extraction and Synthesis

The previous section's methods are used to collect study data in this phase. Information sources in Table 1 received queries using terms or phrases from Table 2 using the previously specified search strategy. The initial search focused on study titles and abstracts.

Table 3: Data extraction form for every study

Retrieved from	Data Description
Study title	Title of the study
Year	Publication year
Authors of the study	Names of people who contributed to writing the study
Authors' Countries	Countries authors came from
Origin	The digital library or search engine where the study was found
Contribution of the study's problem	The solution to the problem the authors are addressing in their study
Approach	Specific technologies used to address the problem
Category	Online / offline detection etc.
Type	journal, Conference, book chapter.

When duplicates were found on several platforms, one publication was selected. The quality assessment mentioned in the section above was then applied to the studies. Should there be any improbable disagreements about eligibility at this juncture, the writer participated in conversations to resolve the issue. In the end, 62 studies were chosen to be examined further.

2.3.1 Data synthesis

The findings will be grouped into four primary areas depending on their relevance to the research objectives during data synthesis. Each category—online detection (I), offline detection (II), safety devices (III), and education (IV)—will be analyzed separately to identify trends, commonalities, and differences in computer science solutions to address violence against women (VAW) in educational institutions.

For each category, the key research findings will be summarized, highlighting the specific computer science tools and technologies used, such as artificial intelligence (AI), the Internet of Things (IoT), mobile computing, and pattern recognition. The advantages, disadvantages, and limitations of each approach will be discussed to provide a comprehensive understanding of their effectiveness in addressing VAW.

Furthermore, the synthesis will focus on addressing the research questions by identifying how Information Technology solutions have been developed and implemented to address VAW in educational institutions across various IT problem domains. By analyzing the findings in this manner, the study aims to provide actionable insights and recommendations for policymakers, educators, and technologists to improve safety and security in educational settings.

Overall, the data synthesis will provide a detailed analysis of the current state of research on computer science solutions for addressing VAW in educational institutions, highlighting gaps and challenges in the existing literature and suggesting best practices for future research and implementation.

3.0 LITERATURE REVIEW

Based on the goal of their solution to determine the primary VAW application domains that are covered by CS technologies, the primary research was split into four groups. Not the quantity of linked concepts, but the application domain's importance today and in the future, determines this classification. Among the categories are education (IV), offline detection (II), online detection (I), and safety (III).

3.1 Online Detection

Several researchers have used machine learning (ML) and artificial intelligence (AI) approaches to identify potentially harmful or disparaging online material regarding women. These researchers employed machine learning (ML) algorithms to automatically label them as violent or non-abusive toward women based on photos, videos, text, or a mix. This type of ML use could quickly differentiate a sizable fraction of abusive and non-abusive content on the Internet. If carried out by hand, this procedure could be emotionally or physically exhausting. A selection of noteworthy examples from the internet detection category are listed below.

VAW must be recognized and eliminated by addressing explicit violence and its risk factors. Sexual and physical abuse, domestic violence (DV), and other types of violence against women and girls must be addressed [11]. Studies that fall under this category pertain to explicit online forms of VAW and the associated risk factors. According to [11]. these risk factors can manifest in a variety of ways in the online setting, such as exposure to harmful content, cyberbullying, online harassment, and the perpetuation of negative stereotypes or attitudes about women and girls.

[12] looked into the potential applications of AI technology to address various social issues, with a focus on cyber violence. The application of AI to detect and put an end to online harassment, cyberbullying, and other forms of online violence is discussed in the article. The authors describe several artificial intelligence (AI) techniques, such as computer vision, natural language processing, and machine learning algorithms, that can be used to assess online interactions and data to identify abusive behavior patterns. This report also

discusses the challenges of implementing AI technologies to address online violence. These challenges include the need for precise and context-aware algorithms, ethical concerns surrounding privacy and data protection, and the importance of interdisciplinary collaboration in the creation of successful and responsible AI systems. While the paper discusses the challenges of implementing AI systems, it does not offer detailed guidance on how to overcome these challenges or successfully integrate AI solutions into existing efforts to address online violence. The paper primarily focuses on theoretical aspects and does not provide empirical evidence or case studies to demonstrate the real-world effectiveness of AI solutions in combating online violence.

[13] used using neural networks to identify instances of cyberbullying and bullying in messages shared on social media. The study focuses on analyzing textual data from social media sites using neural network designs and other deep learning approaches to look for patterns that may indicate bullying behavior. By training the neural networks on labeled datasets that comprise samples of both bullying and non-bullying content, the models can distinguish between abusive and non-abusive language. The study shows that neural networks are capable of accurately detecting instances of bullying and cyberbullying, which might make them a valuable tool for keeping an eye on online interactions and shielding users from objectionable content. The study also touches on the significance of creating strong and trustworthy models that can change to reflect the way that online communication is evolving as well as the different ways that bullying takes place on social media. While their findings demonstrate the potential of these models to enhance online safety, addressing the challenges of data dependency, interpretability, and adaptability is essential for the successful implementation of neural network-based detection systems. Future research should focus on improving the robustness and transparency of these models, as well as exploring strategies for keeping them up-to-date with changing online behaviors.

Machine learning models have been taught with textual patterns and emotions that might point to online harassment, cyberbullying, or grooming behaviors. Machine learning algorithms have shown promise for automated cyberbullying identification in recognizing harmful online interactions, according to [14] . This study demonstrates how machine learning techniques can be used to detect language patterns linked to cyberbullying. This approach's primary drawback is its inability to reliably interpret the context in which specific words or phrases are employed. Jokes, sarcasm, and cultural differences can cause false positives, which happen when harmless conversations are wrongly reported as cyberbullying.

Natural language processing (NLP) techniques are applied to social media postings, comments, and messages to search for signs of misogyny, sexism, or threats against women. Similarly, computer vision algorithms are used to identify explicit or violent images and videos that depict violence against women or meet the criteria for being classified as sexual abuse material (SAM). [15] employed natural language processing (NLP) to examine social media content and detect hostility and bullying. The study shows how well natural language processing (NLP) manages massive amounts of textual data, but it also draws attention to the challenges associated with accurately identifying cultural allusions, irony, and sarcasm. False positives or negatives in detection could be the outcome of these issues.

To counter misogyny hate speech directed at women on social media, [16] , developed machine learning models that can recognize and categorize sexist tweets in Italian, Spanish, and English. The scientists used several datasets, features, and classifiers to determine tweet goals, divide misogynistic content into five behaviors, and distinguish between misogynistic and non-misogynistic tweets. They also looked at how misogyny is identified across languages and how it relates to other types of abuse. With an accuracy of 91.32%, the top-performing English model employed a support vector machine (SVM) classifier with a radial basis function (RBF) kernel. An SVM classifier with a linear kernel performed best for Spanish, with an accuracy of 81.47%. The Italian design made use of a BERT-based. The study by [17], showcases the application of machine learning models, such as SVM and BERT, in effectively identifying and categorizing misogynistic tweets in multiple languages. The high accuracy rates achieved indicate the models' potential in addressing misogyny on social media. However, the models' performance may be influenced by linguistic diversity and the dynamic nature of online discourse. Continuous refinement and broader contextual analysis are essential for maintaining the models' relevance and effectiveness in combating online misogyny.

[18] created machine learning techniques to help with the larger objective of identifying sexist content by automatically identifying sexist humor on the internet. Jokes with both text and visuals that were uploaded online were gathered by the scientists from social media. Subsequently, they created algorithms to determine whether or not the jokes were sexist. SVM classifiers achieved a maximum precision of 76.2% for image-based identification; for text-based detection, a precision of 75.2% was achieved by combining k-nearest neighbors (K-NN) with a bag of words (BoW). SVM was used in a bimodal technique that used text and picture features to achieve a precision of 75.9% [19]. Although these findings show that ML may be used to detect sexist content, there is still an opportunity for improvement based on the precision rates. Additional investigation.

To help teachers, address online peer hostility, [20] looked into the usage of machine learning algorithms to identify bullying in Greek virtual learning communities of K–12 pupils. The authors employed a range of text pre-processing techniques, n-grams as features, and multiple classifiers. At 95.4%, the deep learning classifier had a remarkable recall rate. Although the study tackles the important problem of

cyberbullying and yields encouraging results, it may not be as generalizable as it may be due to its reliance on n-grams as characteristics and focus on a particular cultural context, which can obscure intricate linguistic patterns. More investigation is required to evaluate the model's effectiveness in various metrics and scenarios as well as to investigate more sophisticated features and methods.

These AI-powered online detection systems offer several advantages, including the ability to process and assess vast volumes of data, provide real-time monitoring, and reduce reliance on emotionally unstable or biased human moderators. By automatically identifying harmful information and behavior, these tools can support victims, enable rapid responses, and contribute to the creation of safer online environments for women and children.

Nevertheless, the application of AI to internet detection also raises concerns about accuracy, privacy, and ethics. The development and application of these technologies will make it increasingly challenging to reconcile proactive detection with the defense of individual rights.

3.2 Offline Detection

Computer science developments recently provided interesting approaches to offline VAW identification. To find patterns of violence or risk factors linked to violence against women (VAW), techniques like data mining, machine learning, and pattern recognition are being applied to historical data sets more and more.

Machine learning (ML) is used in offline detection research to identify non-online data to identify potential abuse or violence victims. Self-figure drawings that patients gave to their therapists [21] and health statistics from public health institutions [22] are two examples of this data. The creation of resources that will help educators, social workers, nurses, and other professionals who deal directly with individuals who may be abused is the aim of these studies. Practitioners may find it useful to adopt techniques that assist them in identifying abuse situations that would not otherwise be reported, given the low rate of victim reporting [23] Healthcare staff are not trained to identify and address reported abuse incidents [24]. These tools may encourage professionals to assist more women get the support and services they need to prevent assault.

[25] examined strategies for the offline identification of P3 waves in EEG recordings, showing how signal-processing methods might be modified to identify physiological reactions linked to stress or anxiety in individuals who had experienced violence. Similarly, [26], demonstrated the possible use of such frameworks for the detection of covert patterns of violence against women in gathered data sets by introducing a deep offline-to-online transfer learning paradigm for pipeline leakage detection.

To find violence in schools, some studies employ machine learning. These studies represent the early phases of Internet of Things (IoT) reaction systems to school violence. These technologies are designed to automatically notify school officials for intervention when they identify violence using machine learning techniques. This research only addressed the aspect of using ML to identify violence.

Two methods are presented in the study by [27] to distinguish between verbal and physical bullying in schools. Students' emotional expressions could be captured on record by writers. Studies on offline detection are divided into smaller sections. indication of maltreatment. They involved shouting and sobbing. Using Mel Frequency Cepstral Coefficients (MFCC) to extract sound features, the authors then applied a k-NN algorithm to determine whether or not these recordings involved verbal bullying. The model that identified verbal aggression with the highest accuracy rate, at 70.4%, was found. Moreover, k-NN was the most effective classifier for recognizing physical bullying. The authors used the movement sensors of the students to collect acceleration and three-dimensional gyros data during simulations of violent and peaceful activities. The most dependable model was able to recognize instances of physical bullying with an accuracy rate of 52.8%.

The authors developed WiVi to identify school violence using commercial Wi-Fi infrastructure[28] . Based on their research of how human conduct affects Channel State Information streams from Wi-Fi devices, the scientists constructed an ML model that can detect bullying signal changes. The model's classifier, least square SVM (LSSVM), was tested in offices, dorm rooms, and labs. The average recall was 93.4%.

Several studies have attempted to automatically identify women who may be victims of intimate relationship violence (IPV), which affects 35% of women [29]. [30] automatically identify face injuries from physical IPV using DL architecture and class activation maps. Better than others, the proposed model was 80% correct.

3.3 Safety Devices

The research in the safety category concentrated on leveraging IoT technology to develop products that will give women security in circumstances where they might be alone or in danger. Solutions in this area enable girls and women to be watched over and to receive assistance if they find themselves in a violent situation through the use of the Internet and other communication technologies [31]. Every day, 137 women are killed by family members [33]. According to [32], about 120 million women and girls under the age of twenty have experienced non-consensual sexual assault. These studies thus emphasize the significance of responding promptly to prevent violent incidents and offer aid. These studies aim to expedite victims' timely access to care. [34] provides an example of a safety system that includes a smart band and a mobile application. Below is a summary of the representative samples for each subcategory.

A few studies support the development of smartphone apps that provide women with security. The study mentioned [35] suggests a smartphone app with a safety focus. The smartphone software tracks the wearer's whereabouts via GPS, a gravity sensor, and geofencing. If the wearer leaves their parents' geofence, the device sends an SMS or Wi-Fi signal to authorized contacts with their whereabouts. To look for any signs of abuse or mistreatment, the smartphone will also begin recording voice conversations, which it will subsequently send as an SMS. Additionally, the wearer can shake their smartphone to activate the previously mentioned alarm in an emergency.

The creators of the smartphone app WeDoCare prioritized the safety of women [36]. To assess if the user is in danger, WeDoCare uses GPS position monitoring, gesture detection, and speech recognition. With this program, the user can activate the alarm in three different ways: by pressing a button on the home screen, by chopping something with the phone, or by yelling "Help." If this option is chosen, the application will notify the authorities by SMS of the user's whereabouts.

Research in this area has suggested wearable or portable gadgets that protect moms and kids. According to a study [37], it may be simpler for a woman to ask for help in an emergency if she is wearing an Internet of Things smart bracelet that is Bluetooth-connected to a smartphone app. The website features an emergency button, a map showing safe havens users can use in an emergency, details on laws specific to women, and self-defense tutorials. Volunteers can protect at-risk women or help those who have used the emergency feature of the app. Pressing an app button or smart band emergency switch activates the system's emergency mechanism. The smartphone will send an emergency SMS with the user's GPS location to her pre-programmed contacts, volunteers, and the nearby police station when activated.

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The authors of [38] examined circumstances in which a woman is in danger but is unable to yell emergency phrases or press a help button using a different methodology. The authors suggest an Internet of Things wearable that uses variations in a woman's body temperature and pulse rate to determine how dangerous she is. The gadget features sensors that measure pulse and body temperature. In the event of an Internet outage, the sensors can transfer data ZigBee mesh networks connect to the cloud over the Internet. If the user is in risk, data is assessed by a cloud-based LR model. The technology will instantly contact emergency contacts in a situation like this.

A gadget for women's security who reside in rural areas or places with erratic Internet and cell connectivity was proposed by [39]. The safety solution makes use of the Internet of Things concept. If in trouble, she can press it like a beacon to call for aid. Each beacon has a unique code for identification. Bluetooth links beacons to specially erected street poles and solar-powered central stations. When pressed, the help button causes a distress signal to be sent, traveling via the street pole network and ending up at a central station. A server there handles the assistance request, enabling the user to get assistance.

Among the wearable safety solutions designed exclusively for women are self-defense functions. A wearable device and a mobile app were integrated into a proposed Internet of Things system [40] that uses fingerprint scanning to activate. The device may send brief messages to emergency contacts and police stations when on. The device contains a self-defense alert and shock generator. Alerts raise attention and scare off perpetrators. The victim can defend herself by using the shock wave generator if the offender approaches too closely. Additional wearable alternatives comprise self-defense functionalities [31].

A state-of-the-art smartphone application for bystander intervention was developed by [41] to put an end to gender-based violence against college students. The Circle of 6 smartphone apps, designed to protect college students against gender-based harassment, are evaluated in this study. The program lets users transmit preformatted messages or location data to six trustworthy contacts instantaneously in an emergency.

The Safecity app, which gathers user-submitted reports of sexual abuse and harassment in public spaces, was the subject of an investigation by [42]. To encourage awareness and community action, the app maps out sites that are both safe and risky. [31] reviewed the bSafe smartphone app, which provides safety features including GPS tracking, SOS texting, and audio recording. The app's goal is to make women feel more secure by enabling quick communication between emergency contacts and law enforcement. Since its 2012 start, Safecity has reached over 1 million people directly and has gathered over 40,000 stories from both India and elsewhere.

A state-of-the-art smartphone app was developed by [43] to collect data on women's safety in Indian cities. This study covers the development and deployment of the My Safetipin app, which collects data on women's safety in Indian cities. Users of the app can rate the safety of other websites according to a range of criteria and share their own experiences with it. These apps can also be used in educational institutions to protect women.

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The creation of [44] A mobile application to boost the perception of safety. The Watch Over Me app, which helps users feel safer by providing real-time location tracking, emergency contact options, and safety tips, is evaluated in this study. The program is meant to increase users' confidence when they are exploring new cities.

[45] looked into ways to use the React Mobile app to integrate social media and increase women's safety. Users can use the app to share their location and alert particular friends and social media networks about emergencies. To increase campus safety, [46] developed and implemented a mobile application. This essay discusses the development of a smartphone app designed to increase campus safety. Features of the app include emergency contact details, campus maps with safety locations, and real-time warnings.

[41] looked at the React Mobile app, which uses social media to increase women's safety. With the app, users may notify certain friends and social media networks about emergencies based on their location. The development and release of a mobile app to increase school security. This essay discusses the development of a smartphone app to increase safety on college campuses. The app has features like emergency contact details, school maps with safety zones, and real-time notifications.

3.4 Education

Research in the education area aims to teach medical professionals and educate children about VAW. The suggestions are predicated on digital serious games (SG) that impart VAW knowledge. As was previously reported, nearly 33% of intentional deaths of women in 2017 were related to IPV [47]. In the year before they passed away at the hands of an intimate spouse, many American women sought medical attention [48]. Concerns regarding medical students' inexperience in identifying child abuse victims and their lack of knowledge on what to do in such cases have also been raised [49].

As a result, medical personnel need to be properly trained to recognize abuse and know how to support women and children who are its victims. Digital serious games (SG) have demonstrated potential in STEM education, particularly in the area of arithmetic [50]. It has also been effectively used in the medical industry. If they played SG and learned about chemotherapy side effects, cancer patients were more inclined to follow their treatment plan [51].

These results suggest that SG could help provide medical staff with the training and information they need. Furthermore, SG can assist in reducing the price of conventional training [52]. The use of SG in educational settings may have benefits. To stop violence against women and girls, the entertainment industry in Singapore must teach youth about the attitudes and societal conventions that encourage them to act violently toward their peers [53]. notably because it investigates the connection between IPV and abuse of children

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The school bullying subtype of peer violence was studied by SG. Designers assessed the point-and-click game. SG Stop the Mob! for tablets and PCs combats lower secondary school bullying. Students witnessed their friend Bob get tortured as onlookers. Students might choose whether to support Bob or bully him. Through the SG, students may observe how their bullying reactions affect Bob both positively and negatively. Stop the Mob! teaches youngsters that bullying decisions have consequences by playing the game in a classroom with a teacher to help them reflect.

The authors examine and contrast two SG for PC prototypes to improve high school pupils' comprehension of bullying. Prototypes of simulation games, such as Stop the Mob! are meant to educate players about bullying's harms. One prototype is a fantasy game where participants can walk freely in a virtual world, and the other is a cartoon-style game that follows pupils through scenarios. The prototypes were evaluated by the authors in a classroom full of children, ages twelve to fifteen [54]. The goal of the writers' comparison and contrast of the two SG for PC versions is to increase high school students' awareness of bullying. As prototypes, Stop the Mob! created simulation games to teach about bullying's impacts. Using a cartoon-style game, one of the prototypes walks pupils through many scenarios, setting it apart from the other. However, the other fantasy game lets players freely explore the online realm. The writers examined the prototypes in a classroom full of 12–15-year-olds. After completing the post-game surveys, 23 of 26 students preferred the fantasy game over the one with instructions because it gave the characters more flexibility to move.

The purpose of the PC game Green Acres High, created [55], is to educate kids about interpersonal violence. Through a series of lectures structured after simulations and presented in a classroom setting, the SG is to enhance the education of high school students on good and unhealthy relationships. Real students reviewed the game and gave the developers constructive and critical feedback. Students stated that they learned the content directly from the source thanks to the simulation-style SG. It was quite tempting to think that learning might be done through an online game. Technical problems, such the game not loading and unclear instructions, were the main concerns.

[56] addressed the demands of medical professionals in their work. The authors advise medical practitioners to sign up for a free online course that teaches them how to recognize and treat patients with domestic abuse allegations. Response to DV in Clinical Settings has 17 modules that are broken down into three sections: an assessment, a simulation where participants apply the skills and knowledge they acquired in the previous section, and instructions on how to recognize and manage IPV cases while being supervised by a trained professional. The purpose of the study was to get insights from medical professionals who played the game. Players commended the game for being entertaining, realistic, fascinating, and simple to learn.

[57] evaluated the impact of an online course at a UK business school on gender sensitization. The results show that gender-based violence can be prevented and students'

awareness of gender issues can be effectively raised by using online teaching modules.

Examining the many application domains where computer science and engineering (CS) may be applied to lessen violence against women (VAW) is the aim of the research subjects in this literature review. In light of the conclusions from the literature study, the discussion that follows makes an effort to answer these questions.

4.0 DISCUSSION

The systematic examination identifies safety, education, offline detection, and online detection as the four main domains of computer science solutions. It demonstrates how artificial intelligence (AI) is used to identify potentially hostile situations or content and how machine learning systems often detect online and offline violence. Safety solutions generally use wearable devices and other Internet of Things (IoT) technology to offer potential victims real-time assistance. In educational interventions, victims and the general public are educated about violence prevention through the use of digital serious games.

The study shows that machine learning techniques are used to identify offensive content offline and online. highlighting the critical function of artificial intelligence in spotting and averting potentially hostile circumstances. But the focus on sites like Twitter highlights a significant lack of investigation into other, equally popular teenager's social media venues like YouTube and Instagram. This restriction points to the urgent need to broaden the platforms being examined to cover a wider range of digital interactions.

The review reveals a significant lack of linguistic diversity in the datasets used, with an emphasis mostly on English-language material. This restriction raises doubts about the replies given by CS, given the prevalence of violence against women and children worldwide. To ensure that these technologies function effectively across a range of linguistic and cultural contexts, more inclusive language approaches must be used in future studies.

The emergency feature on the majority of safety gadgets needs to be manually activated by the user. This may be impossible in an emergency. if they are too afraid, pressed for time, or experiencing an attack. Therefore, there should be a greater focus on automating the safety device's emergency mechanism activation. Some wearable safety gadgets were hefty or required constant holding. This is neither practical for daily use, nor is it discreet. Therefore, to reduce disturbance to consumers, wearable technology needs to be both ubiquitous and non-intrusive.

The conversation also highlights how some wearable safety devices are unworkable because of their ostentatious looks, arguing in favor of more understated and approachable alternatives. Moreover, there are serious privacy problems raised by the widespread usage of location and visual surveillance technologies, which may allow for abuse by criminals. This conundrum highlights the need for designers to carefully weigh privacy safeguards against safety features to make sure these technologies don't unintentionally encourage abuse.

Some anti-abuse interventions promote abuse. Every safety device uses technology for either location or vision monitoring. Thanks to gadgets made to shield kids from harm, anyone with access to the system can keep an eye on kids at all times. With this kind of system, abusers can always keep an eye on their victims, which is one way that technology can facilitate abuse. Individuals who develop technology aimed at safeguarding women and children must ensure that their creations are truly safe and cannot be abused. Moreover, all safety devices' visual and location tracking capabilities could suggest that users' right to privacy must be given up to be safe.

Safety devices warn authorities or pre-arranged contacts when a user is in danger. The user can vocally signal for help with some devices. Thus, if someone answers the victim's plea for aid will determine these gadgets' effectiveness. . Effectiveness is also impacted by their arrival time at the crime scene. Safety device makers may find it useful to perform simulations that illustrate the length of time victims must wait for assistance to account for these factors. Researchers examining safety devices need to consider this information to minimize any false sense of security from using these devices and to create reasonable expectations for how much these devices can help victims.

Males commit acts of sexual violence and IPV more frequently than females. Few SG related to education specifically addressed VAW issues directed at men or boys. Conventions and ideas that sustain VAW must be challenged to end it. A social group that teaches males about the attitudes and ideas that lead them to commit violent crimes against women could be helpful. Some social organizations focus on educating about peer aggression.

To support players' development of critical thinking abilities regarding the game's material, an educator or medical practitioner was required to be present at any SG that covered VAW. Concurrently, the main purpose of offline detection research is to build instruments that will allow experts to identify VAW. They are not interested in taking on the role of the experts who handle these duties. Technology can lessen aggression, but it should be used as a tool, not a cure for violent adulthood.

VAW are sensitive topics. Sadly, biases in AI systems exist and may jeopardize their efficacy. Bias may cause someone to disregard violent acts or treat someone unfairly as a criminal.

Consideration should be given to the emerging topic of AI fairness research in AI concepts that tackle VAW.

5.0 CONCLUSION

This systematic literature review examines how computer science (CS) and related technologies decrease violence against women (VAW) and children. In recognizing and responding to VAW in both online and offline situations, the paper emphasizes the substantial potential of machine learning (ML), artificial intelligence (AI), the Internet of Things (IoT), and serious gaming (SG). These technologies provide creative ways to improve safety, increase consciousness, and inform people about VAW.

To fully exploit the potential of CS technologies in preventing VAW, several important research gaps and hurdles are also identified in the review. These include the necessity of thorough assessments in a range of settings, the incorporation of computer-supported collaborative interventions with conventional interventions, ethical issues in data gathering, and the significance of digital literacy and accessibility. Furthermore, the review proposes that to improve the efficacy of detection systems in various cultural and social contexts, future research should investigate a more comprehensive incorporation of social media platforms and language diversity.

To bridge these gaps, future research should focus on developing more automated, inclusive, and ethically acceptable computer science solutions. Encouraging multidisciplinary collaboration and ensuring that technological solutions are accessible, easy to use, and mindful of privacy and ethical concerns are essential. Computer science may be used to create innovative, durable, and effective solutions that assist global efforts to eradicate violence against women and girls, eventually resulting in a more safe and equitable society for women and children.

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