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Suicidal Behavior Detection in Self-Service Chatbots Offering Emotional Support to Victims of Gender-Based Violence

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ABSTRACT: Detection of intention to cause self-harm or commit suicide from self-service Chatbots that offer emotional support to victims of Gender Based Violence is a critical need that is posing a greater need for intense research and development. Most victims of Gender based Violence (GBV) are hesitant to report GBV cases nor to seek emotional/psychosocial support from real person counsellors as they fear further harassment, being blamed or being further stigmatized. The emergency of online self-service Chatbots has shown that many victims prefer online self services as compared to in-person psychosocial support services as they hesitate to expose their confidential (relationship/family/marriage) challenges to people . Many researches have revealed that many survivors of Gender Based Violence reveal intentions to commit suicide during counselling sessions. The most challenging task is to detect intentions of self-harm during counselling sessions with victims of Gender based violence. The challenge is more complex in counselling sessions that are automated by Chatbots. The detection of suicidal behavior can be attained by automatically detecting suicidal ideation, behavioral and textual features from speech/text through Natural language Processing techniques in Chatbot conversations. These features can be passed to a designed framework to detect suicidal behaviors in GBV victim to Chatbot conversations that are pointers of intents to commit suicide. Detection of suicidal behavior can be attained by using machine learning classification techniques.
This work develops a framework to achieve this by employing machine learning classification techniques to detect such suicidal behaviors from the user to Chatbot conversations.
This project proposes to develop a model that incorporates machine learning classification techniques to examine conversations between emotional support Chat-bots and Gender Based Violence (GBV) victims to detect any intentions to commit suicide or to cause self-harm.

KEYWORDS: Chatbot; Machine learning; Suicidal detection; Naïve Bayes Algorithm; Natural language Processing.

I. INTRODUCTION

Generally, women and girls in Zimbabwe are at risk of Gender Based Violence with statistics indicating that 1 in 3 women experience physical violence whilst 1 in 4 experience sexual violence. Many of these women commit suicide as they fear reporting or seek help assuming it would expose them to further abuse harassment or blame. According to a WHO report as cited by (Ji, Shaoxiong,.. at al 2018) in the journal Supervised Learning for Suicidal Ideation Detection in Online User Content about 788,000 people estimated world wide committed suicide in a year. As alarming as the statistics are, abuse of women is also used as a weapon to intimidate and settle scores. In Zimbabwe Gender Based violence is rarely prevented and timely responded to. This absence of a prevention and response mechanism has serious consequences resulting in traumatized communities. Most Incidents of Gender based violence are not receiving timely/ emergence response in terms of psychosocial/emotional support and in most cases victims commit suicide.

More importantly, there is no automated emergency response system for survivors of Gender Based violence to promptly offer them direct humanitarian services such as medical advice, legal advice and counselling advice with particular attention on detecting intentions to commit suicide.

Thus, there is need for the development of an automated intelligent system that timely respond to incidents of GBV in order for victims of Gender Based Violence to get prompt psychosocial support with particular attention on detecting suicidal intent.

II. RELATED WORK

ALICE or ELIZA Chatbots

Various organizations adopt the model of communication of Chatbots like ALICE or ELIZA and replace them for humans where it is applicable.

ALICE make use of Artificial Intelligence Mark-up Language (AIML) to store information and implements text matching techniques. It was realized by Richard Wallace in 1995. AIML is classified into three types: atomic, default and recursive

ELIZA was the first chatbot to be created. Joseph Weizenbaum created it using a keyword matching method. The concept was to read the user input, look for specific keywords, and then extract the answer if one was discovered. In the absence of a keyword, ELIZA would make an effort to continue the discussion by asking the user for more details in accordance with predetermined rules.

III. METHODOLOGY

Django framework for web development

The Development work employs a web interface that allows GBV victims to conduct a conversation with a human Counsellor simulating system in Natural Language format.

Natural language Processing Tool kit. Textblob

It implements a Python based library for processing textual data to provide a simple API for diving into common natural language processing (NLP) tasks such as part-of-speech tagging, noun phrase extraction, sentiment analysis, classification, translation, and more. (NLP) is a suite of libraries and programs for symbolic and statistical natural language processing. It was developed by Steven Bird and Edward Loper in the Department of Computer and Information Science at the University of Pennsylvania. NLTK includes graphical demonstrations and sample data. It is accompanied by a book that explains the underlying concepts behind the language processing tasks supported by the toolkit, plus a cookbook.

Chatbot

The system employs a program that simulates a human conversation and makes a conversation with a human. It will make use of artificial intelligence technologies to read and respond to a human victim of GBV through an interface for input and output. Chatbot systems use techniques which include but are not limited to keyword matching, feature extraction, string similarity or natural language processing tools. Chatbots can learn from the input by user. Trending Chatbots are mainly web-based applications that assist with help or information to users.

The development work employs a **knowledge base** where relevant information resources such as questions, answers, key words, log and feed back are stored.

Python programming language

The system implements PyCharm as an Integrated Development Environment (IDE) for programming in Python. It provides code analysis, a graphical debugger, an integrated unit tester, integration with version control systems (VCSes), and supports web development with Django. PyCharm is developed by the Czech company JetBrains. It is cross-platform working on Windows, Mac OS X and Linux.

Naïve bayes algorithm

Implement the Naive Bayes algorithm as a classification technique based on Bayes' Theorem with an assumption of independence among predictors. A Naive Bayes classifier assumes that the presence of a particular feature in a class is unrelated to the presence of any other feature. To implement a classifying and associating algorithm which analyses text in order to classify into respective categories of suicidal behavior and to generate psychological advice/care plan. Naive Bayes classifiers are highly scalable, requiring a number of parameters linear in the number of variables (features/predictors) in a learning problem. Maximum-likelihood training can be done by evaluating a closed-form expression, which takes linear time, rather than by expensive iterative approximation as used for many other types of classifiers.

Machine Learning Methods

The development implements machine learning methods to extract and understand suicidal emotions from text. Feature Extraction – The keyword-matching algorithm should be used. The keyword matching will start identifying keywords and retrieve the answer that has the most keywords. In the case that the same number of keywords is found in more than one answer.

IV. PROPOSED SOLUTION

This article takes the task to develop a tool that employs machine learning techniques to detect suicidal behavior from conversations facilitated by Chatbots offering psychosocial support to victims of Gender-based violence.

• To develop an Artificial Intelligence Chatbot that facilitates a Natural Language conversation with a victim of GBV

• To classify a chatbot conversation dataset into respective classes i.e Suicidal and Non-Suicidal

• To present via chatbot output a respective advice/recommendation with respect to the classification category i.e Suicidal and Non- Suicidal

V. PROJECT RATIONALE

In response to the absence of an effective automated Chatbot system offering emotional /psychosocial support to victims of Gender Based Violence with particular detection of intentions to commit suicide or cause self-harm in Zimbabwe, There is therefore a greater need for the development of a tool that detect suicidal ideation from conversation between victims of GBV and Chatbots offering mental health support. This will facilitate for effective GBV response services in the form of emotional psychosocial support as well as a reduction of risk of committing suicide by victims of GBV.

Most victims of Gender based Violence (GBV) are hesitant to report GBV cases nor to seek emotional/psychosocial support from real person counsellors as they fear further harassment, being blamed or being further stigmatized. The emergency of online self-service Chatbots has boosted confidence to access GBV response services with safety and confidentiality without hesitation to expose confidential issues or intimate challenges to real people.

Detection of intention to cause self-harm or commit suicide from self-service GBV Chatbots conversations is therefore critical to reduce the rate of people committing suicide.
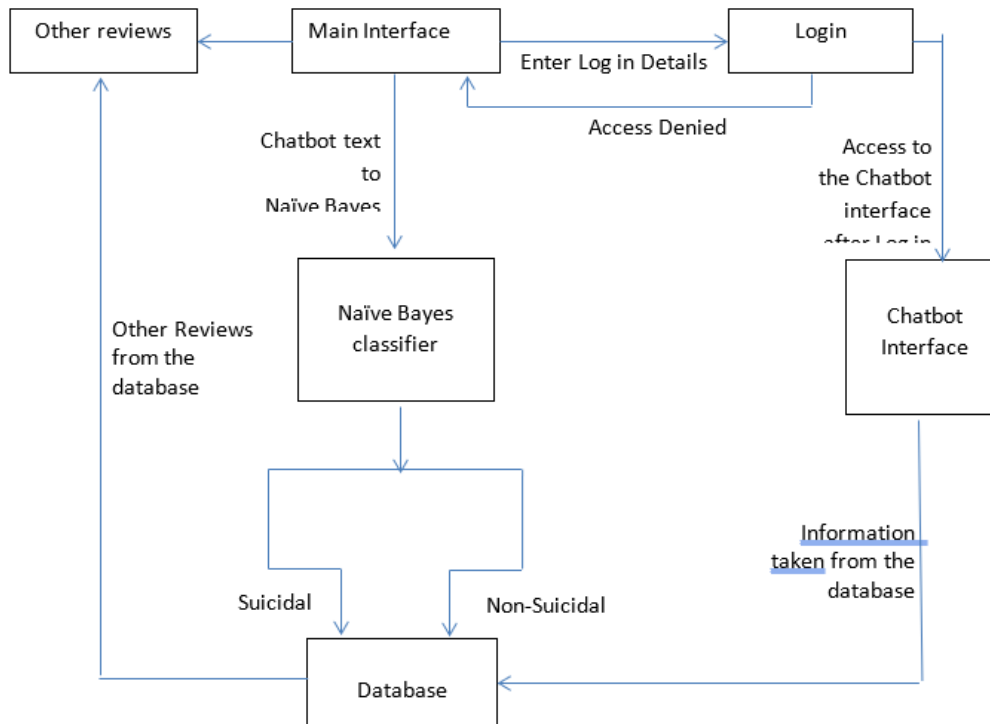
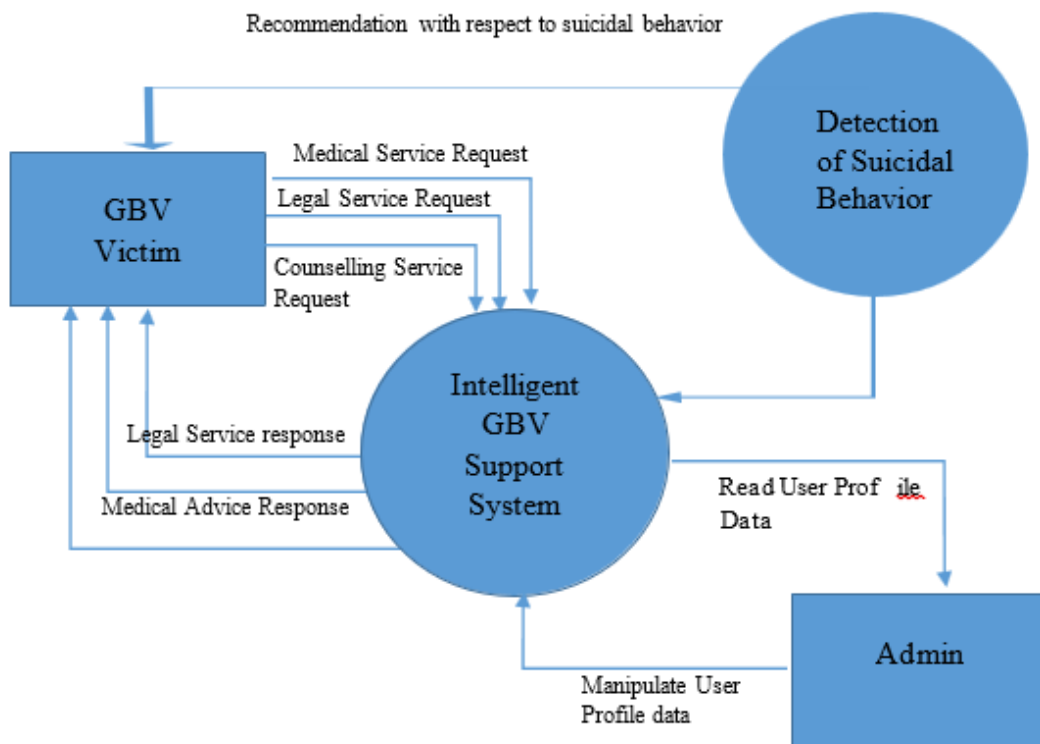## VI. SYSTEM ARCHITECTURES

Fig.1. Solution Architecture

Fig. 2. Context Level presentation of the system

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BIOGRAPHY

Twalumba Baila: Attained his B-Tech degree in Information Technology at the Harare Institute of Technology Zimbabwe in 2019. He is currently studying for a Master of Technology in Information Technology at the Harare institute of Technology Zimbabwe. His research interests are in machine learning in the interest of emotion detection from automated mental health support systems.

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