

ATENEO DE MANILA UNIVERSITY

**DEVELOPMENT OF A PSYCHOSOCIAL DETECTION CLASSIFIER
AS A WEB SERVICE TO A HUMAN RIGHTS VIOLATION
MONITORING PLATFORM**

A THESIS

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ABSTRACT

Digital Health Interventions (DHIs) is an emerging trend in telecommunication based delivery systems. Given the rising number of human rights violations in the Philippines, a big gap is left in terms of how technology can address such an issue. Through psychosocial interventions, individuals, families, and communities can be assisted to recover from the negative social impacts of a human right violation. Hence, the primary goal of this study is to implement a web service for a psychosocial state classifier to cater to human right victims. The methods in which this is accomplished is through machine learning classification and Natural Language Processing (NLP). The former uses and compares the performance of the Support Vector Machine algorithm and the Random Forest algorithm. The latter will use a number of NLP text representation techniques to suggest a possible psychosocial state that the victim may be experiencing. Afterwards both methods are deployed as a web service to AWS Lambda through Zappa.

The initial run of the study tested the aforementioned algorithms' accuracy when predicting if the data is either a natural disaster narrative or an extrajudicial killing narrative. The dataset used for this is a collection of 493 news articles. It was found that the Random Forest classifier performed slightly better than the Support Vector Machine classifier with the accuracy being 55% and 54% respectively.

TABLE OF CONTENTS

ABSTRACT	iv
CHAPTER	
I INTRODUCTION	1
1.1 Research Questions	3
1.2 Objectives	3
1.3 Scope and Limitations of the Study	4
1.4 Significance of the Study	4
II REVIEW OF RELATED LITERATURE	7
2.1 Traditional Psychosocial Intervention	7
2.2 Digital Psychosocial Intervention	8
2.3 Natural Language Processing Text Classification and its Applications	10
2.4 Natural Language Processing Methods for Detecting Psy- chological Disorders	12
2.5 Information Extraction from Health Records	13
III METHODOLOGY	15
3.1 Bigger Picture	15
3.2 Data Collection	16
3.3 Classifier	17
3.4 Intervention Detection	17
3.5 Behavioral Model	18
IV INITIAL RESULTS	20
REFERENCES	22

CHAPTER I

INTRODUCTION

There has been an increase in human rights abuses in the Philippines. For the past five years, extrajudicial killings (EJKs) done by the police, New People's Army, and unknown individuals have been widespread since the launch of the government's "war on drugs" [1]. The Office of the United Nations High Commissioner on Human Rights (OHCHR) reported that there are at least 8,663 people who have been killed with impunity [9]. Families of victims seek help from parishes, human rights organizations, and non-governmental organizations (NGOs) as they get physically and psychologically affected by the incident [11].

Psychosocial interventions aim to help individuals, families and communities to recover from the negative impacts of a crisis through psychosocial support [20]. Psychosocial factors are a combination of both the psychological aspect and the societal environment of the individual. Thus, psychosocial intervention caters to providing services that aid in the overall well-being of the concerned party within the context of being a functioning member of society [7]. Numerous studies have focused on the effectiveness of psychosocial interventions such as services for violence-exposed children [14], survivors of rape and sexual assault [13], individuals bereaved by homicide [10], among others. Nonetheless, there is still little research on a comprehensive system of psychosocial intervention that can be provided for

victims and/or families of victims of human rights violations, such as EJKs [25]. Moreover, issues that traditional psychosocial intervention poses are complications in distance, timing, scarcity of specialists, cost and stigma [12]. As such, one way to bridge the gap is to employ psychosocial interventions digitally.

Digital Health Interventions (DHIs) are telecommunication-based delivery systems that support traditional healthcare services. This type of distribution leverages electronic information as a means to conduct synchronous and asynchronous supplementary consultations for the user. The technological capabilities of DHIs has acutely developed in recent years and has become a more significant cog in healthcare services [26]. DHIs can come in the form of psychosocial state recommendations which are suggestions that aim to determine the symptoms of a patient.

Applications of DHIs include clinical supplementation [21], patient self-management [22], and prediction of therapeutic outcomes [19]. There are studies extending the DHI's capability through the use of natural language processing (NLP). In this paper, we will apply these extensions and develop a DHI framework that detects possible psychosocial interventions a user may need. Given the lack of societal intervention-related DHIs and by the creation of a psychosocial detection system, we hope to extend the usability of DHIs as a tool that supports wider needs.

1.1 Research Questions

The study proposes a web service implementation for the development of a psychosocial detection classifier given human rights violation narratives. To assess and improve the current methods, the thesis aims to answer the following questions:

1. Using NLP methods, how can we detect the status of a user's psychosocial state?
2. Which text representation technique would render the best model performance in detecting the correct category of a person's psychosocial state?
3. How do we develop an API service for automated classification of the psychosocial state of people based on their narratives?

1.2 Objectives

The goal of this study is to develop a psychosocial state detection model that will be deployed as a web service for a human rights violation monitoring platform. This study seeks to create a lexicon-based psychosocial behavior model that determines the psychosocial state of a person based on the narratives given to the platform. Furthermore, this study aims to develop an API-based web service that incorporates behavior detection model and emotion detection model to determine the psychosocial state.

1.3 Scope and Limitations of the Study

The study revolves around the context of human rights violations and psychosocial interventions. As such, the models that will be utilized will focus on narratives concerning extrajudicial executions, arbitrary detentions, condemnations and the like. Additionally, these narratives will be in English. On the other hand, the API that will be developed will be used for the web only and will mainly target victims of human rights abuses. Furthermore, this thesis is not an improvement of the Support Vector Machine or the Random Forest algorithm. This study focuses on the existing applications of the aforementioned algorithms. Furthermore, the model is a multi-label and supervised classifier. Additionally, given the psychosocial intervention results, a medical professional will be consulted to provide a review and possible diagnosis for the human rights victim.

1.4 Significance of the Study

There are a number of studies that extend the application of digital health interventions using NLP. In particular, most studies focus on the clinical and/or therapeutic outcome of a patient using text classification analysis. For instance, the study [24] aimed to determine whether a Facebook user was depressed using text data gathered from the user's profile. Similarly, in [17] NLP classification was used to detect the suicidality of adolescents with autism. Given the number of detection studies with regard to psychological implications, this thesis aims to extend the current applications

of digital health interventions and apply it in the context of psychosocial interventions.

Victims of human rights violations and their families often suffer from trauma and other psychological issues. According to a study [16], they are vulnerable to secondary victimization and a diminished recovery rate. In particular, the need for social recognition towards the victims is an essential step in producing better therapeutic outcomes. Given that the Philippines is experiencing “widespread human rights violations and persistent impunity,” [9] victims of human rights violations are subjected to constant emotional duress and need to seek some form of justice. One common theme, that is shared among victims, is the reality of loss and the process of living through it [18]. To initiate the latter, proper interventions are needed to identify the unique needs of each individual and families affected by human rights violations.

The goal of this thesis is to develop a psychosocial state detection model that can be used to provide victims with a potential avenue on how to proceed in their recovery. Ideally, this system will also provide support and assistance to respective government agencies, non-governmental organizations, and the like to more properly cater these victims. With an automatic classification system in place, these agencies can accommodate more victims and provide a pre-screening mechanism for their staff. Furthermore, given the bureaucracy of government agencies and NGOs, this classifier would speed up the process for human rights victims to get the interventions they

need. This would ultimately help with the recovery of the victim's psychosocial wellbeing.

CHAPTER II

REVIEW OF RELATED LITERATURE

2.1 Traditional Psychosocial Intervention

The concept of psychosocial intervention materialized in the early 1990s with the intention of shifting the focus from the vulnerability of the concerned party to the emphasis of their resiliency [7]. The steps in the implementation of psychosocial intervention are as follows: (1) Assessment, (2) Planning and Implementation, (3) Training, and (4) Monitoring and Evaluation. The first step covers the identification of the effects of the crisis to the individuals in question. Assessment also includes what types of questions to ask so as to determine the best suited form of intervention. In Planning and Implementation, the selected interventions are then mapped. This includes a list of the concerned parties, such as the affected individuals, volunteers, NGOs, and other partners. Afterwards, the Training step is now performed wherein psychosocial support partners are given training. This allows them to be well-equipped on the knowledge and skills needed for the interventions. The last step is Monitoring and Evaluation. In this stage, the assessment of the psychosocial well-being of the affected person takes place [20].

The effects of psychosocial interventions for children exposed to traumatic events in low-income and middle-income countries are reviewed in a study [29]. The study gathered information from different databases that

focused on the same material and performed an Individual Participant Data (IPD) meta-analysis. The findings suggested that focused psychosocial interventions are effective in reducing “Posttraumatic Stress Disorder (PTSD) and functional impairment.” The study also found that it leads to better mental health and social support.

Similarly, one study conducted in Sweden focused on the early psychological intervention of rape victims within 72 hours of the incident [12]. The participants were given 3 Prolonged Exposure (PE) interventions, and results have shown that the intervention was successful in mitigating PTSD and depressive symptoms after the treatment was conducted. However, there were also limitations in the study, such as the lack of participants. Out of 191 prospective participants, only 10 (5.2%) were effectively included in the study. Reasons that caused this were the time constraints, the unavailability of the victim and/or therapists, the victim was a minor, the victim was male, the victim was not Swedish, among others. Their recommendation was to develop remotely delivered interventions, such as complementary services delivered through other formats that are “easily accessible — irrespective of gender, language barriers, and geographical distances.”

2.2 Digital Psychosocial Intervention

Support services given online have been increasing with the improvement of technology. DHI tools bridge gaps in several barriers that consumers encounter, such as problems in distance, timing, scarcity of specialists, cost

and stigma [27]. Nonetheless, the study on the efficacy of psychosocial interventions delivered digitally is still limited. Various resources focus more on the effects of psychological support more than societal support. In [27], the efficiency of online psychological services, both eHealth self-management tools and therapist-guided psychotherapy via video teleconferencing, have been reviewed. Recommendation states that the field of telehealth offering psychological services is still new and thus, the studies are limited. Further research is needed to determine what kind of modalities are best suited to specific care processes.

Furthermore, digital psychosocial intervention for victims of crime, family members and friends of victims of crime and witnesses of crime has also been implemented through chat support in Queensland, Australia [6]. Psychological and emotional assistance, legal assistance, financial assistance, counseling, and referral to other appropriate services are some of the interventions offered. On a more local setting, the Commission on Filipinos Overseas (CFO) and Philippine Overseas Employment Administration (POEA) offer free online legal counseling issues concerning human trafficking and OFWs, respectively [28] [4]. A mobile application for crime reporting has also been launched by the Philippine National Police [3]. As for victims and/or families of victims of EJKs specifically, there are psychosocial support services provided by NGOs, however, they are not delivered online [2] [5] [8]. As such, there is a lack of a central hub where a human rights violation can be reported, and the corresponding psychosocial

intervention can be administered online.

2.3 Natural Language Processing Text Classification and its Applications

There are several published projects that have been developed applications for text classification modeling. This section provides a brief overview of related studies.

An application of NLP text classification was demonstrated in [15]. In the study, comments were scraped from videos posted on YouTube to create a corpus to train the model. The study used a nonlinear poly-2 kernel version of the SVM to build a label-specific classifier and multiclass classifier to detect sensitive comments from the corpus. The study concluded that a label-specific classifier performs better in cyberbullying detection from comments.

In another study, the Google Translation API was utilized to translate Thai text data scraped from Facebook [24]. The study used this along with the NLTK python library in order to manipulate the texts. In terms of machine learning algorithms, the study used SVM, decision trees, and deep learning to construct the depression classifier model. It was suggested that it is possible to construct a model based on behavioral information from Facebook text data. It was noted however that the study has possible errors because of the translation that was done with the text. Furthermore, the data that was gathered was relatively small to fully cover all of the factors

related to depression.

Another text classification application study focused on predicting Philippine Supreme Court outcomes using NLP and machine learning [31]. The researchers used case files and tagged them, in a semi-automated way, depending on the type of the case. Afterwards, typical preprocessing techniques such as regular expressions were used to remove unnecessary characters, numbers, letters, *et cetera*. The study considered other Filipino words alongside NLTK-provided stop words. Furthermore, the researchers used n-grams and topics extracted from n-gram clusters for feature extraction. The SVM algorithm and Random Forest Classifier algorithm were used as the machine learning models. It was found that SVM yielded an accuracy of 55% and Random Forest gave a 59% accuracy rating. The research concluded that there's promise in the continuation of their study and its application and that future work could improve on dataset size and preparation.

A recent German study developed a NLP framework to predict digital health interventions for eating disorder patients [19]. The data that was used to predict possible therapeutic outcomes were (1) text correspondence of the patient and the practitioner such as email and (2) personal journal entries of the patients. Using these texts, the study determined features that could be used for their model. From this, three NLP models were built. Model C looked at the features of a given text and tried to infer points of interest. Model B predicted the patient's therapeutic outcome using all the

given and current data to check if a user is likely to improve. And Model A tried infer symptom severity over time using the adjacent timeframe text snippets of the patient. The study concluded that the models were able to predict the outcome of a patient's treatment and that NLP frameworks have potential in therapeutic decision-making.

2.4 Natural Language Processing Methods for Detecting Psychological Disorders

One aspect that this study aims to accomplish is to detect the status of the psychological well being of an individual. For many years, numerous studies have been conducted with regard to integrating NLP with the detection of medical related problems. This section gives an overview of the latest studies that tackle this issue.

One of the studies that attempted to formulate an approach in detecting the presence of depression in individuals through an internet forum is [23]. Traditionally, individuals are assessed based on standardized questionnaires such as the CES-D and the WHO-5 Well-Being Index. These are aids used by clinicians in forming their patient's diagnosis. The study seeks, however, to get the questionnaire-related information in advance so that a clinician can prepare for possible red flags. With this, the study suggests that NLP be incorporated into forum data from individuals. The study utilized several questionnaires from which a lexicon of depression symptoms were made. These were subjected to NLP processing which involved prepro-

cessing, boundary detection, phrase matching, detection of pronouns and negation, and score computation. The study reported that the framework that was created has the potential to replace expert manual annotation.

Similarly, in [30], forum posts were analyzed to detect psychological distress indicators and assess the severity of the distress. The study aimed to produce a triage system wherein individuals who are seeking for help are prioritized based on their assessed severity of distress. The study used several NLP methods to explore the features of the text data such as unigrams, pronoun counts, punctuation counts, average sentence length, and word sentiments to name a few. In terms of the classifier used, the study utilized a multi-label classification algorithm. Out of the two main categories of multi-label classification, the study chose to use problem transformation methods wherein each problem is transformed into many single-label classification problems due to the volume of their label set. For each single-label classifier, they used SVM to predict the presence or absence of each label.

2.5 Information Extraction from Health Records

Electronic Medical Records (EMR) contain vital information on diseases, findings, treatments, and outcomes. In [32], a method was proposed to convert the free-form EMR into a structured record. A cross-domain core medical lexicon was constructed by expounding upon an initial core Chinese medical term dictionary. The dictionary includes six types of terms: diseases, symptoms, drugs, body parts, procedures, and clinical tests. Af-

terwards, the terms in the lexicon was iterated to account for variations of said words. A recursive algorithm was then deployed that would recognize and match the terms from a given EMR to said lexicon. This framework was shown to be able to recognize terms from the lexicon with a F1-score of 0.896.

CHAPTER III

METHODOLOGY

3.1 Bigger Picture

This study is part of a larger project by the Global Challenges Research Fund (GCRF) and the World Association for Psychosocial Rehabilitation (WAPR). From Fig. 3.1, it can be seen that the pipeline involves multiple NLP projects that receives input from a victim's narratives. A part of our project involves creating a psychosocial behavioral model that will be used in tandem with a developed psychosocial emotion detection model. This will give out marked narratives that will be used to determine the proper intervention needed for a given narrative.

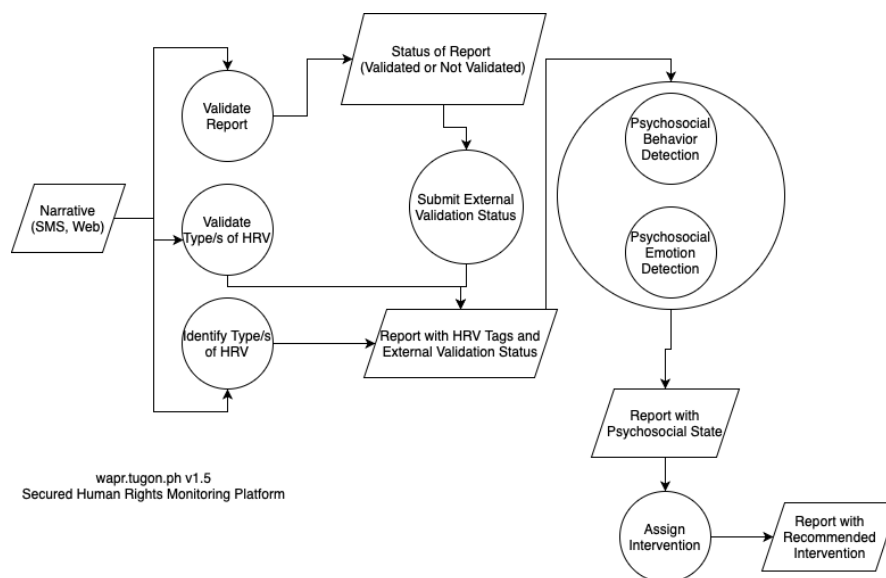


Figure 3.1: GCRF-WAPR Project Pipeline

Table 3.1: Date of Coverage per Human Rights Violation for the Newspaper Dataset.

Violation	Year Range
Extrajudicial Killing	2017 — 2020
Gender Based Violence	2015 — 2020
Illegal Search & Seizure	2016 — 2019
Involuntary Disappearance	2015 — 2020
Hamletting	2015 — 2020
Internal Displacement	2015 — 2020
Torture	2016 — 2019
Arbitrary Arrest & Detention	2015 — 2020
Blockade of Humanitarian Assistance	2017 — 2020
Children Involved in Armed Conflict	2017 — 2018
Violation on principles of protection and limitation	2015 — 2020

3.2 Data Collection

This study uses 285 anonymous human rights violation reports from a human rights platform with the year ranging from 2018 to 2020. Furthermore, the study utilizes 128 reports gathered from online news outlets with the year ranging from 2015 to 2020. For the initial run the study makes use of collected news reports regarding extrajudicial killings and natural disasters. Table 3.1 shows a breakdown of violations from the 128 news reports.

3.3 Classifier

In this study, a multi-label classification approach is implemented. Based on the studies that have been reviewed, both SVM and Random Forest algorithms provide the best performance in classifying text. As such, the two are utilized in this study.

3.4 Intervention Detection

As seen in Fig. 3.2, the text data undergoes three processes. First is tagging which is based on the category of the news report. Second is cleaning wherein punctuation, stop-words, and special characters is removed. Third is vectorization wherein the text data is converted into vectors using the Doc2Vec API. The processed text data is split into testing and training sets. The training sets is then subjected to the machine learning algorithms. Afterwards, the performance of the model is determined.

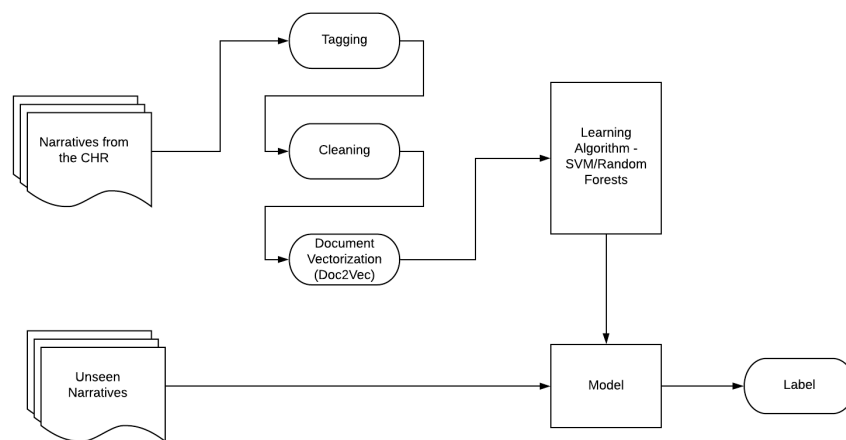


Figure 3.2: Proposed Pipeline for Developing the Classifier

3.5 Behavioral Model

To determine the status of a user's psychological state of well-being, Fig. 3.3 demonstrates the NLP methods that is used in conjunction with the CHR's psychological problem checklist.

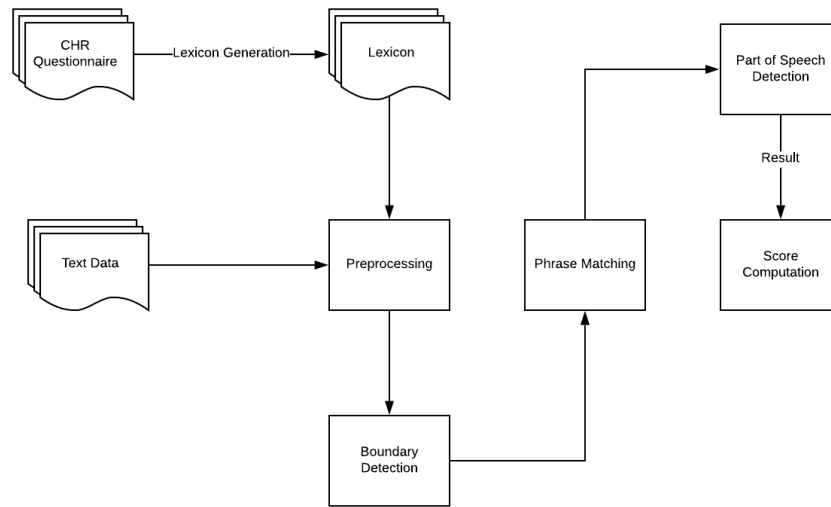


Figure 3.3: Proposed Pipeline for Psychological Detection

Firstly, using the checklist, a lexicon is generated with the generic list of unwell psychological symptoms. Given that the list uses a situational format, the researchers manually selects the appropriate symptoms from each listed situation. The symptoms noun, verb, and adjective form is included in the lexicon to provide more coverage. To extend this, the synonym of each symptom is also added if unambiguous and reasonable.

Furthermore, the narrative undergoes preprocessing to remove unwanted texts such as punctuation. The use of regular expressions is done to achieve this. Afterwards, boundary detection is used to identify the sentences in the text using the Stanford Parser. Matching is then applied to the

narratives based off the lexicon that was created. Using the Part of Speech tags from the Stanford Parser, negations of the symptoms were detected. Lastly, using the matched words and frequency, and negations, a psychological well-being score is calculated.

This psychological detection approach is used along with the general approach to detect all the labels in the label set.

CHAPTER IV

INITIAL RESULTS

We tested our general approach with the collected news articles. The dataset is comprised of 493 rows of content. Below are the results of our first run using the general approach described in the methodology.

From the initial run, it can be seen from Table 4.2 that the Random Forest model was able to predict the labels and outperform the SVM. From the initial run, it is shown that Random Forest classifier had an accuracy of 55% while the SVM had an accuracy of 54%.

Afterwards, we proceeded to create the API implementation for the model using Flask. The API uses the Zappa module to create a server-less Python application. This service deployed the Python Flask application to AWS Lambda and could be called using a POST request to a URL.

Table 4.1: SVM Results

	precision	recall	f1-score	support
disaster	0.58	0.53	0.55	80
ejk	0.50	0.55	0.52	69
accuracy			0.54	149
macro avg	0.54	0.54	0.54	149
weighted avg	0.54	0.54	0.54	149

Table 4.2: Random Forest Results

	Precision	Recall	F1-Score	Support
disaster	0.59	0.54	0.56	80
ejk	0.51	0.57	0.54	69
accuracy			0.55	149
macro avg	0.55	0.55	0.55	149
weighted avg	0.55	0.55	0.55	149

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