CLASSIFICATION OF POLITICAL OPINIONS : AN EXPLAINABLE AI APPROACH FOR SINHALA SENTIMENT ANALYSIS ON SOCIAL MEDIA

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1 Introduction

1.1 Background of the Study

Modern-day people spend most of their leisure time on social media platforms such as Facebook, Twitter, Instagram, etc. More often they express their feelings, opinions and suggestions openly when they are behind the keyboard and particularly anonymous. As a result, they tend to express their political opinions on social media platforms without even considering the privacy limits as they are heroes behind the keyboard and often times people express their opinions truthfully when their identity is anonymous(Gunasiri, 2022).

It is recorded that over 800 million people visit YouTube every month and watch more than three billion hours of video material. Hence, YouTube is one of the largest platforms for user-generated content in the world. This research will be mostly focused on politically related social media comments made on platforms such as YouTube and Twitter. Due to the lack of tools like coding libraries, and WordNet type tools for the Sinhala language, it has become very challenging to analyze the sentiments of the language(Gunasiri, 2022). Despite the challenges that arise, the Sinhala language is more ideal for classifying political opinions in Sri Lanka since the ideas can more efficiently communicated in the native language. However, existing work on analyzing Sinhala content in social media is extremely limited(Jayasuriya et al., 2020).

In a previous study, they present a novel deep learning technique called sentence state long short-term memory network for Sinhala sentiment classification(Demotte, Senevirathne, Karunanayake, Munasinghe, & Ranathunga, 2020).

According to the findings of another previous study(Ranathunga & Liyanage, 2021) authors were able to prove the effectiveness of the word embedding features and performance of Support Vector Machine (SVM) and Recurrent Neural Networks (RNN) in general text classification tasks. Additionally, they have provided a dataset to the community, which can be utilized for additional Sinhala text analysis purposes.

This research aims to contribute to the field of Natural Language Processing (NLP) by especially focusing on the Sinhala language to fill the gap in the literature with lack of tools and resources for sentiment analysis in its domain (De Silva, 2019). Even though sentiment analysis has become a trending area, most of the researchers are focused mostly in common languages. (Jenarthanan, Senarath, & Thayasivam, 2019). In this study, we mainly focused on explaining the political results using an explainable AI-based model. Furthermore, to build a prediction model to predict election outcomes.

Explainable AI

Explainable AI (XAI) is a field that is focused on developing techniques to make AI models understandable by humans. In this research, XAI will play a crucial role in interpreting the results of the sentiment analysis model for political views on social media. Machine learning models remain mostly black boxes. However, understanding the reasons behind predictions is quite important in assessing trust, which is fundamental if the prediction model is expected to be used in meaningful manner for strategic planning, and also to decide whether more precise model can be built.(Ribeiro, Singh, & Guestrin, 2016).

XAI techniques will help to understand why the model classifies a particular social media comment as expressing a positive, negative or neutral view towards a political figure or policy. This transparency will build trust in the findings. XAI can help to go beyond just classifying sentiment. By understanding which words and phrases in the social media comments trigger specific classifications, we can gain valuable insights into the reasoning behind the expressed political views. By explaining how the model arrives at its conclusions, we can address concerns about the black-box nature of AI models.

1.2 Justification of the Problem

Sinhala is a morphologically rich language which belongs to the Indo-Aryan branch of Indo-European languages. More than 16 million people(74% of the population) use the Sinhala language for communicating and more than 7 million people (32.1% of the population) use the internet in Sri Lanka(Chathuranga, Lorensuhewa, & Kalyani, 2019). However, social media platforms have become a primary platform for political discourse, offering valuable insights into public opinion. The lack of tools for analyzing Sinhala political sentiment on these platforms is a significant challenge.

Moreover, by understanding public opinion, policymakers can make more informed decisions that align with the needs and concerns of the people. Political campaigns are constantly trying to connect with voters, but understanding a large crowd's opinions can be tough. Sentiment analysis acts like a listening device, allowing politicians to hear what different segments of the population care about and how they react to campaign messages. This lets them tailor their communication strategies to resonate with specific groups, ensuring their message hits the right notes with the right people.

Thus, this can lead to more effective and inclusive political campaigns. Sentiment analysis can serve as an early warning system for potential political unrest or dissatisfaction. By identifying emerging trends in public opinion, authorities can take proactive measures to address concerns and maintain social stability. Hence understanding the requirement in addressing the gap in Sinhala political sentiment analysis and its significant value for Sri Lanka's democracy, this research is expected to serve by developing a sentiment analysis model and incorporating XAI techniques, that leads to contribute to a more transparent and informed political landscape, ultimately empowering the Sri Lankan public.

1.3 Objectives of the Study

- The main objective of the research is to contribute to the field of Natural Language Processing (NLP) by developing a sentiment analysis model specifically for the Sinhala

language in the domain of politics providing insights into political opinions expressed on social media.

- Contribute a dataset for the community which can be used for further Sinhala text analysis regarding the recent presidential election 2019 and parliamentary elections 2020.

- Leverage Explainable AI (XAI) techniques to interpret the political sentiment analysis model.

1.4 Description of the Dataset

Sinhala comments which are related to the Sri Lankan presidential election 2019 and parliamentary election 2020 will be scrapped from YouTube API. Figure 1 shows a part of the dataset scrapped from YouTube. For this approach, famous political talks, breaking news, YouTube shorts and other politics related video playlists were selected from various famous news channels in Sri Lanka.

The original dataset contains 7 columns including comment ID, video ID, text, timestamp, author, author email and reply to (reference for comment) column. Figure 2 illustrates the channel statistics for the news channels that were used for scrapping comments.

Furthermore, election results can be accessed from this official website. `https://elections.gov.lk/en/elections/results_pre_E.html` Hence, the aim is to combine all the available data sources to build an explainable AI approach for election results.

comment_id	video_id	video_title	text	timestamp	author
Ugw7OPfSzzRgrDkz4VV4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	Very sad, why people doing this kind of things, 😳	2022-07-11T10:22:46Z	@ranjanihernetkoski2932
Ugw4MjfV0AFwOeBlmRN4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	රනිල් කියන්නෙ හොඳ ▮▮▮ තමන්ගෙ ගෙට ගිනි...	2022-07-11T10:22:20Z	@dhanushkaprasad4342
UgyXQpMldLBQOoOMFpd4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	හරි හරි ඔය ▮▮▮ කතා වැඩක් නෑ මන්ස්සු ▮ එ...	2022-07-11T10:22:02Z	@kanishkagamage6628
Ugzs04SCAYmHEAvhinl4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	යාපනය පුස්තකාලය	2022-07-11T10:21:49Z	@appachchidoniyai5731
Ugy80ml8AfnkCnh6Dlh4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	මුලින් අයින් වෙලා යන්ඩ, ita පස්සේ pitatha ඉන්න...	2022-07-11T10:21:20Z	@roseperera2669
UgznYs37zBYnh1dnoOV4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	මේ කරන්නෙ මොකක්ද ඔයා....	2022-07-11T10:20:32Z	@abelashabhanu1767
UgxLlqiZh1ccBAuiDRJ4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	කවුද ▮▮▮ ආර්ථිකය කඩා වැට්ටුවේ අපි ද ▮ ද 😆	2022-07-11T10:20:25Z	@kanishkagamage6628
UgznsxzTFZDKmG4H9sl4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	අනේ යන්න මෙයා යන්න....ඔයා ගැනත් අපි දන්නවා....	2022-07-11T10:20:17Z	@chrishanthieperera2500
UgyNEk_GkjVcqoliiwZ4AaABAg	PCTYPWpdhu0	අගමැතිගෙන් විශේෂ ප්‍රකාශයක්...	Hari boru meya kiynne	2022-07-11T10:20:05Z	@memeking7415

Figure 1: Part of the YouTube dataset

	Channel_name	Subscribers	Views	Total_videos
0	Ada Derana	2630000	1509868810	119231
1	Hiru News	2460000	1583058809	80532
2	Newsfirst Sri Lanka	2360000	1229009589	292269
3	Siyatha News	285000	62007182	16680
4	Swarnavahini News - Live	111000	20816680	1752

Figure 2: Channel Statistics

2 Methodology

1. Data Collection

   - Identify the suitable timeframe and suitable social media platforms relevant to the election periods by considering the pre-campaign, campaign period and post-election period.

   - Choose the specific YouTube channels or political figures related to the election.

   - Develop a method to extract comments from web scraping techniques.

2. Dataset Preprocessing

   - Implement data cleaning techniques by removing irrelevant comments.

   - The original dataset contains Singlish, English and Sinhala comments.Translate them using translation techniques.

   - Perform the tokenization, remove stop words and perform stemming and lemmatization.

3. Combine Multiple Data Sources.

   - Combine the existing data available in web sources related to the $2019 - 2020$ election.

4. Data Labelling

   - Design an automated labelling approach using the sentiment lexicon or machine learning techniques to classify comments based on sentiment (Positive, Negative, Neutral).

   - Evaluate the accuracy of the automatic labelling approach using a manually labelled subset of the data.

5. Model Building for Election Outcome Prediction

- Choose a suitable machine learning or deep learning algorithms for election outcome prediction.

- Compare the predicted election outcomes from the model with the actual results obtained in the 2020 elections.

- This might involve comparing predicted vote percentages or winning candidates.

6. Explainable AI approach for both models

- Integrate an XAI technique (e.g., Local Interpretable Model-Agnostic Explanations (LIME), SHapley Additive exPlanations (SHAP)) into the sentiment analysis model.
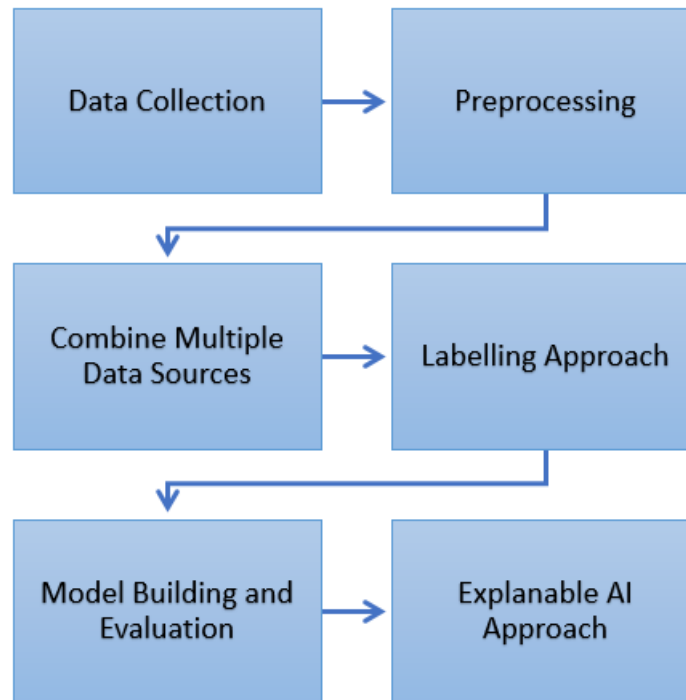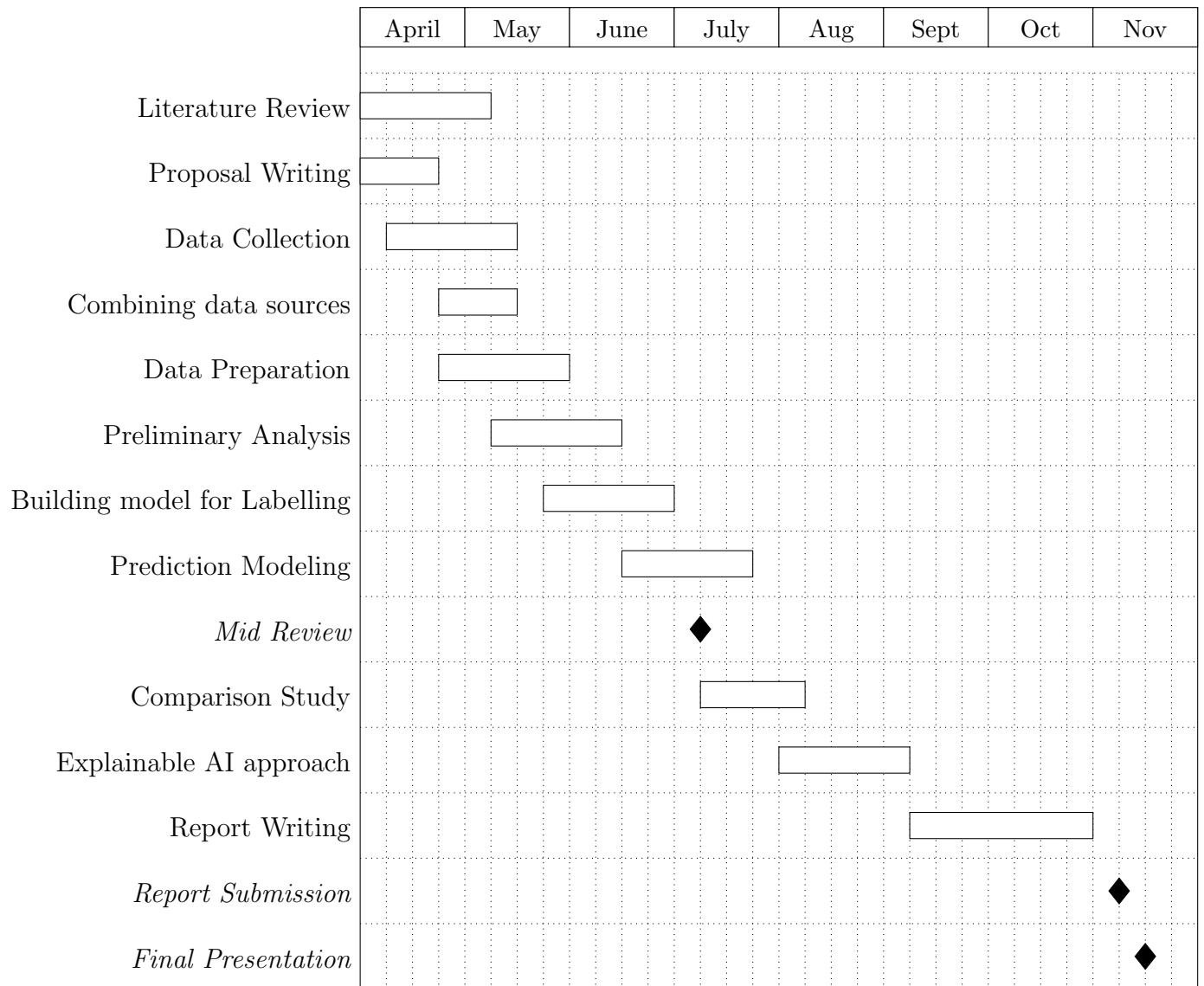

Figure 3: Overview of the methodology

3   Timeline

	April	May	June	July	Aug	Sept	Oct	Nov
Literature Review	▭							
Proposal Writing	▭							
Data Collection	▭							
Combining data sources		▭						
Data Preparation		▭						
Preliminary Analysis			▭					
Building model for Labelling			▭					
Prediction Modeling				▭				
Mid Review				◆				
Comparison Study					▭			
Explainable AI approach					▭			
Report Writing							▭	
Report Submission								◆
Final Presentation								◆

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