Tittle:

An Amharic News Text classification

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1.0 Introduction

Nowadays NLP activity that is frequently utilized to address business issues in a variety of sectors is text classification. Identifying or predicting a class of unobserved text documents is the aim of text classification, which is frequently accomplished with the aid of supervised machine learning. A supervised machine learning model is trained on labeled data, which includes both the raw text and the target. Once a model is trained, it is then used in production to obtain a category (label) on the new and unseen data. Text classification is the assignment of classes to text documents. There are more electronic documents that need automatic classification when Amharic is taken into account. This study shows how easily available Amharic news items can be properly categorized using automatic categorization. The project uses text documents to represent newspaper articles in Amharic, with classes representing the news items' sources. Amharic is the second most spoken Semitic language. It is the official working language of 100 million people that reside in the Federal Democratic Republic of Ethiopia. The language uses its unique alphabet called Fidel. Amharic alphabet consists of punctuation and numbers in addition to its 231 primary letters [1]. Amharic is considered as a low resource language [1]This is not due to the lack of raw data, rather it is due to the scarcity of labeled data. Most of the time researchers prepare data for their use but fail to make the dataset available Text classification or text categorization is a task of assigning a sentence, paragraphs or documents into one of n classes we have on our dataset. This task is one of the core NLP tasks that needs manually annotated data as an input [6]. Tasks like Sentiment analysis, News categorization, Topic Analysis and more are prominent application of classification task [2]we usually use languages like English for NLP tasks especially in academia for education and we don't study the effect of different algorithms in languages which have different structure than English. This does not consider characteristics of low resource languages while developing new algorithms. In NLP, text classification is one of the primary problems we try to solve and its uses in language analyses are indisputable. The lack of labeled training data made it harder to do these tasks in low resource languages like Amharic. The task of collecting, labeling, annotating, and making valuable this kind of data will encourage junior researchers, schools, and machine learning practitioners to implement existing classification models in their language. In this short paper, we aim to introduce the Amharic text classification dataset that consists of more than 50k news articles that were categorized into 6 classes. This dataset is made available with easy base-line performances to encourage studies and better performance experiments.

2.0 Problem

Automatic text classification datasets are used to categorize natural language texts according to content. Classifying texts based on the content of article is difficult for Amharic language because Amharic is morphological reach langue and corpus shortage. However, building models for Amharic text classification is mandatory for language detection, organizing customer feedback, and fraud detection. while this process is time-consuming when done manually, it can be automated with machine learning models. Category classification, for news, is a multilabel text classification problem.

3.0 Objective

Text classification is a common NLP task used to solve business problems in various fields. The goal of text classification is to categorize or predict a class of unseen text documents, often with the help of supervised machine learning . automated classification of texts has been flourishing in the last decade or so due to incredible increase in electronic documents on the Internet; this renewed the need for automated text classification. When Amharic is considered, electronic documents are increasing that needs automatic classification. This project describes how to organize massively available Amharic news items into meaningful way by undergoing automatic classification. Therefore, the main objective of this project is to classify Amharic document in predefined class based on bag of words.

4.0 Previous works

Text classification task is one of the core NLPtasks that needs manually annotated data as an input [2]there are some works done by [3] [4] [5] [6] and others. We have found that all of them have used a very small dataset which ranges from 200 - 15,000 articles from a single data source. Some researches also talk about lack of standard Amharic text classifi- cation corpus [4].

5.0 Methodology.

For doing this project we use anaconda, Anaconda is a distribution of the Python and R programming languages for scientific computing, that aims to simplify package management and deployment.We perform some fundamental exploratory data analysis to examine and evaluate data sets, such as determining whether any values are missing and summarizing their key features, frequently using data visualization techniques. Then preprocessing tasks like

normalization (changing varying Amharic characters with a similar sound to one common form, changing punctuation marks to space), and tokenization are done. In any natural language processing endeavor, preprocessing text data is crucial.

From the training dataset, a model (classifier) is constructed. The classifier is built using GaussianNaive, Random Forest, Linear Regression, Support Vector Machine K-nearest, and Decision Treealgorithms. The system is then evaluated based on the outcomes produced by accuracy. The testing outcome is the assignment of classes for news items that are not encountered during training.

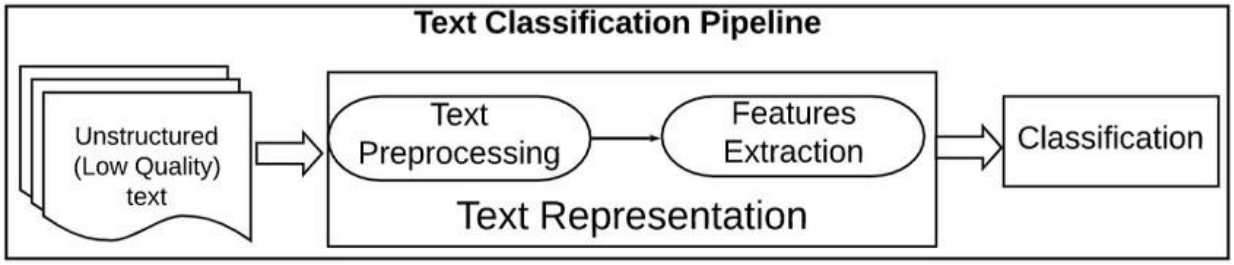

Figure 1:Text Classification Pipeline

5.1 Data Cleaning and Data Preprocessing

Data preprocessing is the process of transforming raw data into an understandable format. Lowercasing the data, Removing Punctuations, Removing Numbers, Removing extra space, Replacing the repetitions of punctations, Removing Emojis, Removing emoticons and Removing Contractions. The quality of the data should be checked before applying machine learning or data mining algorithms.

headline	category	article	link	Source
የኦሊምፒክ ማጣሪያ ተሳታፊዎች የ	ስፖርት	ብርሃን ፈይሳየኢትዮጵያ ቦክስ ፌዴሬሽን በየዓመቱ	https://www.press.et/Ama/?p	Ethiopian Press Agency
አዲስ ዘመን ድሮ /የኢትዮጵያ ፕሬስ	መዝናኛ	የአዲስ ዘመን ጋዜጣ ቀደምት ዘገባዎች በእጅጉ ተነ	https://www.press.et/Ama/?p	Ethiopian Press Agency
የአረንጓዴ ጎርፍ በጎ አድራጎት አምባሳ	ስፖርት	ቦጋለ አበበየአዲስ አበባ ከተማ አስተዳደር ስፖርት ኮ	https://www.press.et/Ama/?p	Ethiopian Press Agency
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Table 1: sample collected Amharic news CSV data

5.2 Analysis Text

Text classification is one of the important tasks in supervised machine learning (ML). It is a process of assigning tags/categories to documents helping us to automatically & quickly structure and analyze text in a cost-effective manner. It is one of the fundamental tasks in Natural Language Processing with broad applications such as sentiment-analysis, spam-detection, topic-labeling, intent-detection etc. However, it not easy to do unless the texts are well structured and standard forms some common problem in Amharic text needs to be standard are :

- ✓ Problem of Amharic Writing System: there are a number of problems associated with Amharic writing system which are challenging natural language processing of Amharic documents. Redundancy of some characters sometimes more than one character is used for similar sound in Amharic For example, the word **‘ጸሀይ’ (‘sun’)** can be represented in Amharic as **ጸሀይ, ጸሐይ, ጸኀይ, ፀሀይ, ፀሐይ, ፀኀይ, sport(ስፖርት) ሥፖርት .** etc
- ✓ Amharic Punctuation Marks: like ‘Hulet Neteb’ (‘:’)-word separator and ‘Arat Neteb’ (‘::’)- sentence separator are the major punctuation marks. But space is mostly used instead of Hulet Neteb (‘:’) specially in computer writing system.

- ✓ Amharic Number System: some time the news may be written with Geez numbering. Therefore, before doing classification, it is mandatory to normalize such type of nonstandard writings.

5.3 Classification Dataset

Our dataset consists of 6 classes. This class information was found by the tag we get from websites and we manually verify the case and removed noises in the process. Table 3 shows the detailed description of the web pages we collected our dataset from. The web pages are local and international news sites. We have collected the datasets from different sources to increase the variety of the text. We included several details that might be useful for different purposes. It includes information like the web page the article is found from, Views it had, the title of the article, and the date it was posted at. However, the 'category' and 'article' metadata are very important while the other metadata might be still useful for different use-cases.In this data local news and international news refers to topics that are not included in the rest and are categorized as international or regional issue.

Class Name	**items**
ሀገር አቀፍ ዜና / local news	20666
ስፖርት / sport	10309
ፖለቲካ / politics	9325
ዓለም አቀፍ ዜና / international news	6543
ቢዝነስ / business	3894
መዝናኛ / entertainment	635
Total	51372

Table 2: Different class distrbution in the dataset

The source of corpus used in our project is from various Amharic news which was published in various time. present work aimed at compiling an Amharic corpus from the Web and automatically categorizing the texts. Amharic is the second most spoken Semitic language in the World (after Arabic) and used for countrywide communication in Ethiopia. It is highly inflectional and quite dialectally diversified. We discuss the issues of compiling and annotating a corpus of Amharic news articles from the Web. This corpus was then used in three sets of text classification experiment .

News site	Number of news item	url
Soccer Ethiopia	9091	www.soccerethiopia.net
Walta	8785	www.waltainfo.com/am/
FBC	7784	www.fanabc.com
VOA	6981	www.amharic.voanews.com
Reporter	6280	www.ethiopianreporter.com
Ethiopian Press Agency	5598	www.press.et/Ama/
AMMA	2442	www.amharaweb.com/
Addis Admass	1847	www.addisadmassnews.com
Al-Ain	887	https://am.al-ain.com
Addis Maleda	861	www.addisma eda.com
BBC	816	www.bbc.com/amharic/
Total	**51372**	

Table 3:Dataset Source distribution

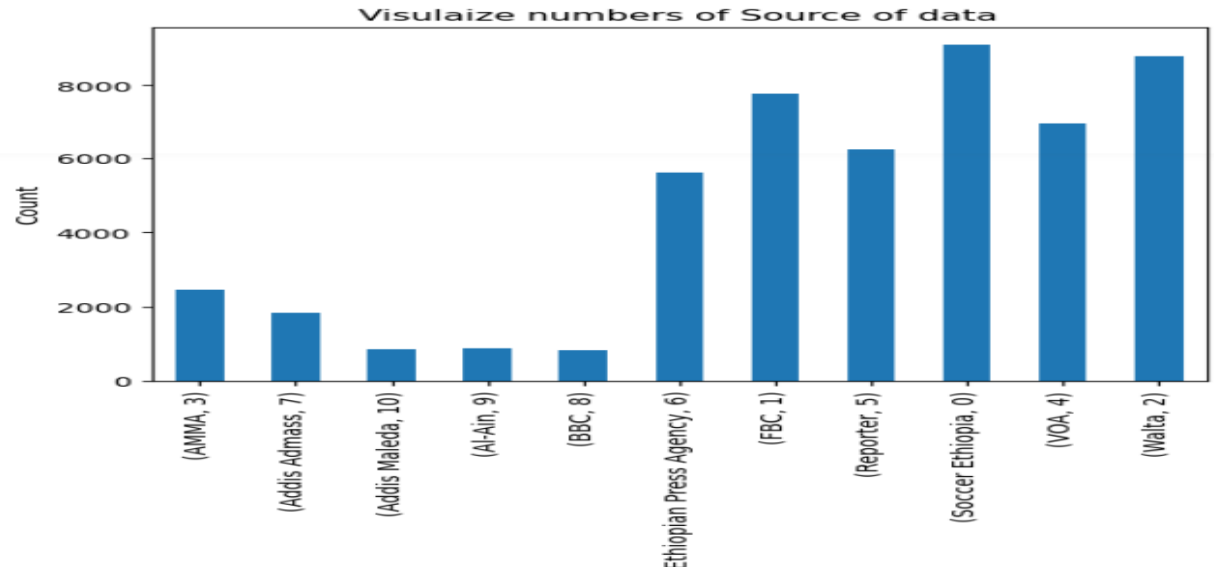

Figure 2:Dataset Source visualization

6.Result evaluation

For implementing this model, we use 51343 data records from those Trained data (41074) T est data (10269) so different alternative algorithm are conducted to select best model .Result s are obtained from Gaussian Naive Bayes, Random Forest, Logistic Regression, K-nearestnei ghbors, Decision Tree, and Support Vector Machine classification algorithms which gave an a ccuracy of as stated in table 4 below using both count vectorizer and Term Frequency-Inverse Document Frequency(TF-IDF) feature extraction techniques, and show that Logistic Regressi on was able to provide higher accuracy in comparison to the other five methods using count vec

torizerand in case of TF-IDF, Support Vector Machine (SVM) is the higher accuracy. This co mparison is shown in Table4 .

Algorithm	Accuracy
Gaussian Naive Bayes	69.66%
Random Forest	84.18%
Logistic Regression	84.77%
K-nearest neighbors	45.08%
Decision Tree	70.12%
Support Vector Machine	82.86%

Table 4:Baseline classification accuracy performance for each algorithm

Future works in this dataset include trying to improve the performance of the models using advanced word embedding and trans- former models. From the table 4, you can see our dataset is imbalanced so we are thinking of using text augmentation techniques to increase dataset size. Different approaches to imbalance class problems should be explored on this dataset too. There are a lot of approaches that we know and use for data imbalance and exploring those approaches on this dataset can show us the effectiveness of the methods in Amharic language data.

7. Conclusion

In this work, we release the Amharic text classification dataset. This work contributes to the low amount of Amharic text classification dataset and aims to be a good starting point for future Amharic text classification works. The classification algorithm indicted that Logistic Regression, Random Forest logical and Support Vector Machine has best in prediction accuracy of **84.77%, 84.18% ,82.86%** respectively.

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