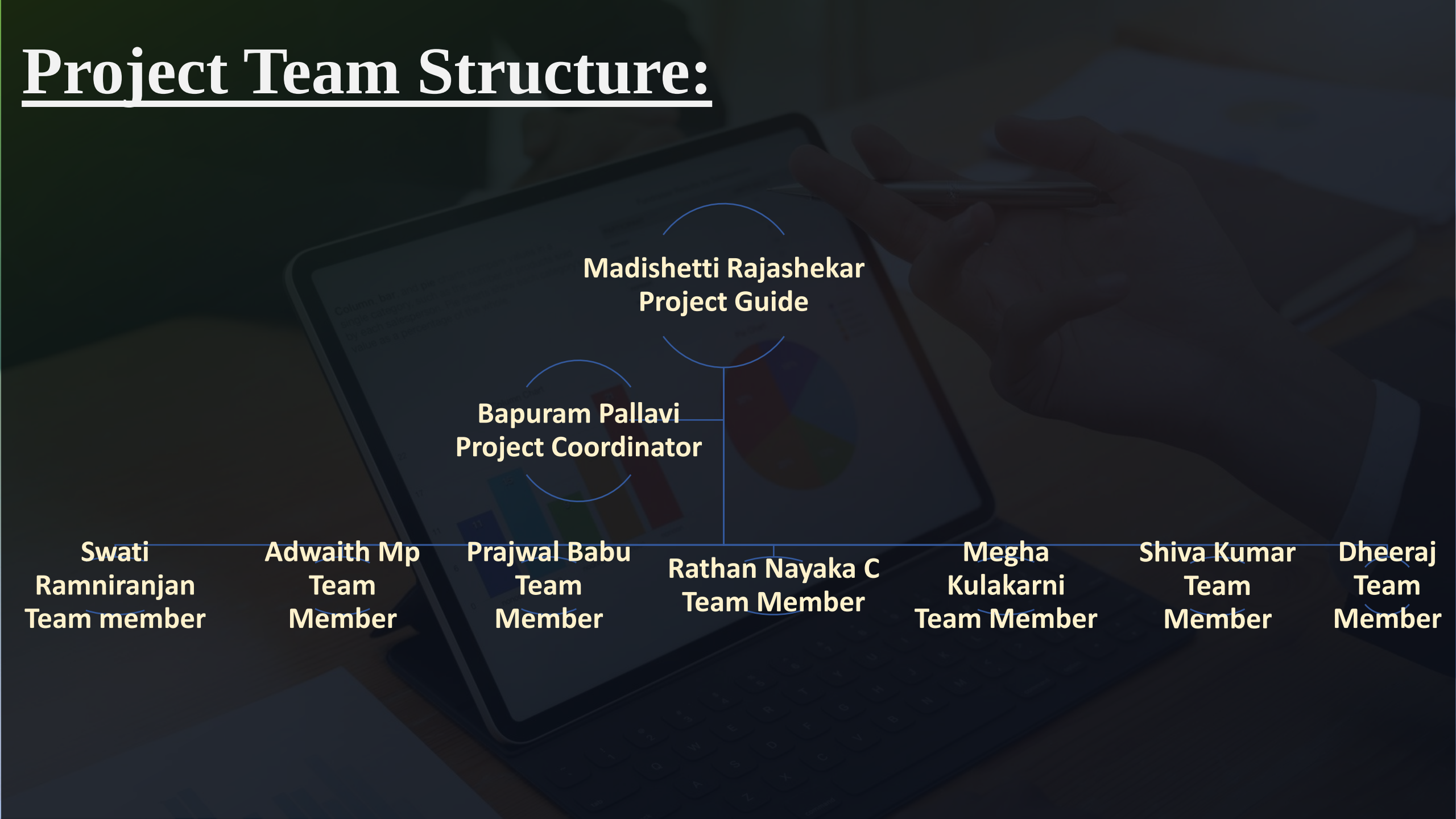
PROJECT PRESENTATION

NLP Emails

Project Team Structure:



Business Objective:

❑- Inappropriate emails would demotivates and spoil the positive environment that would lead to more attrition rate and low productivity and Inappropriate emails could be on form of bullying, racism, sexual favoritism and hate in the gender or culture, in today’s world so dominated by email no organization is immune to these hate emails.

❑-The goal of the project is to identify such emails in the given day based on the above inappropriate content.

Roadmap to Complete the Project

Collect the data and understand the data

Data cleaning or Text preprocessing

Exploratory data analysis

Vectorization & Model Building

Evaluation of all models and Feedback

Prediction on new data by deployment

Final presentation

Action plan:

Sl. No	Stage	Description	Responsibility	Target date	Status	Remarks
1	Frame the problem or understand the business objective	What problem are we trying to solve with NLP? What are the business objectives for using NLP?	All	25th Oct	Closed	
2	Collect the data and understand the data	What data do we need to solve the problem? Where can we get this data? How can we understand the data?	All	27th Oct	Closed	
3	Exploratory data analysis	What are the main characteristics of the data? What are the trends and patterns in the data?	All	31st Nov	Closed	
4	Data cleaning or Text preprocessing	Clean the data to remove noise and inconsistencies. Preprocess the data to put it in a format that can be used by the NLP model.	All	31st Nov	Closed	
5	Vectorization & Model Building	Select the appropriate NLP model for the task. Train the model on the preprocessed data.	All	3rd Nov	Closed	
6	Evaluation of all models and Feedback	Evaluate the performance of the model on a held-out test set. Select the best model based on the evaluation results.	All	14th Nov	Closed	
7	Prediction on new data by deployment	Deploy the model to production and use it to make predictions on new data.	All	14th Nov	Closed	
8	Final presentation	Present the findings and recommendations to the stakeholders.	All	18th Nov	Closed	

Data Collection & Overview

Name of the data set : emails.csv

Shape of the Data set
(48076, 5)

Duplicates Values
0

Null Values/missing values
0

Shape of the Data set
(48076, 5)

Data types & Unique Values			
Subject:#	**Column Name**	**D type**	**U Values**
0	Unnamed: 0	int64	48076
1	filename	object	48076
2	Message-ID	object	48076
3	content	object	23420
4	Class	object	2

Dataset Cleaning

Removed Unwanted columns/Features

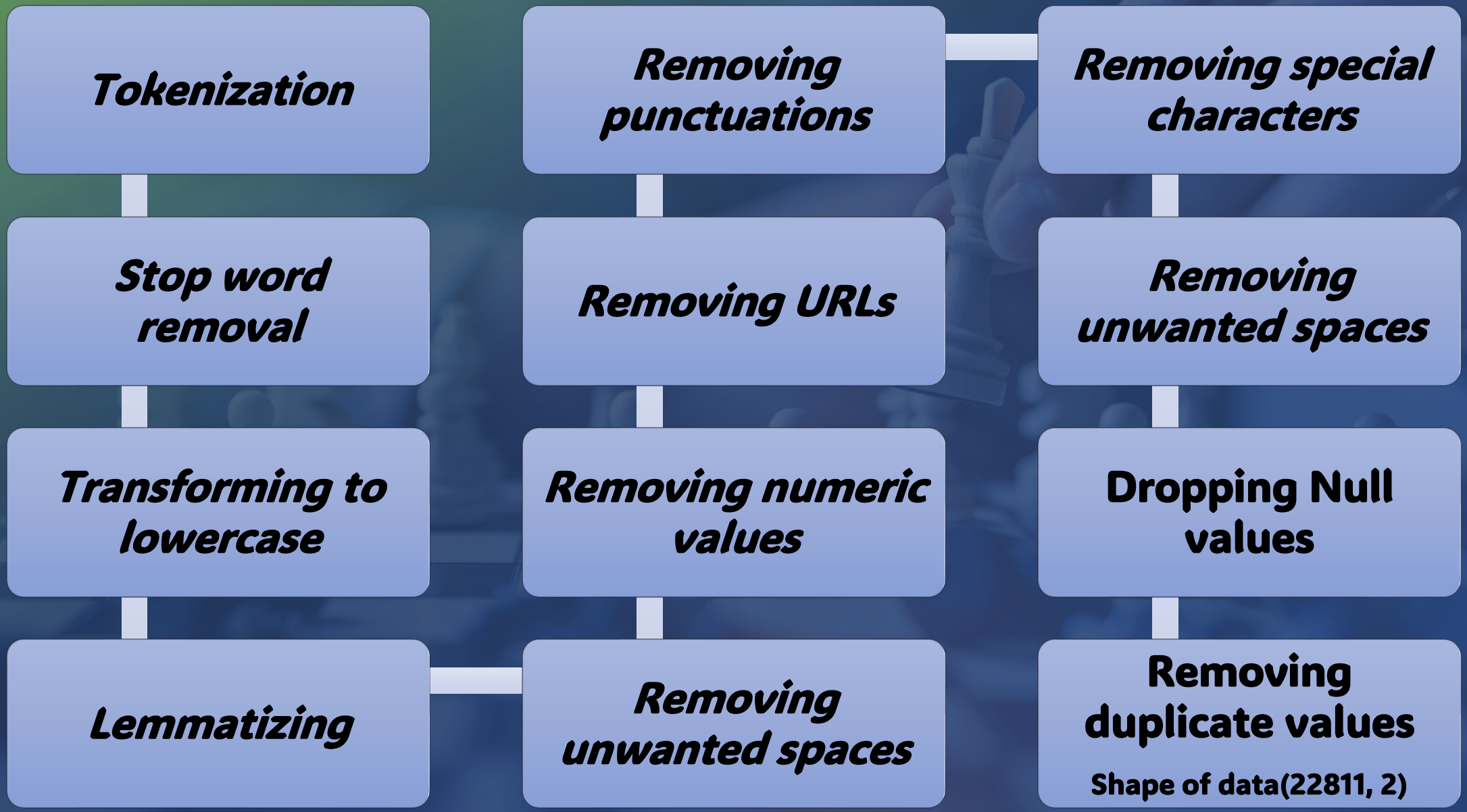
Removed columns:
Index_No, File_name, Messiage_id)

Removed Duplicates

Shape of the data before
(48076, 2)
Shape of the data After
(24656, 2)

Final Data set		
Column	D type	U Values
content	object	23420
Class	object	2

Text Preprocessing



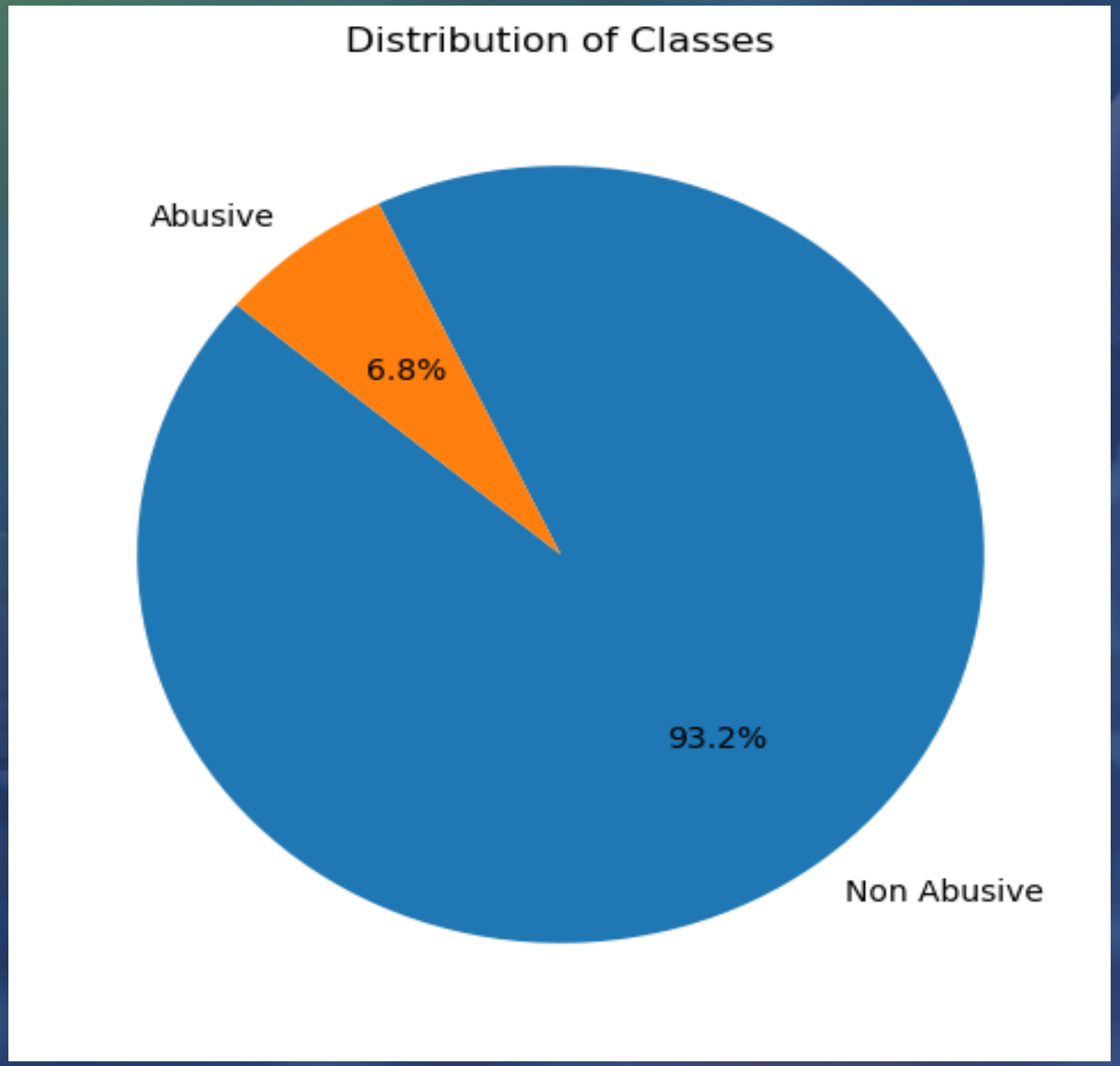
EDA - Calculated statistics

Average sentence length
1182.187

Number of unique words

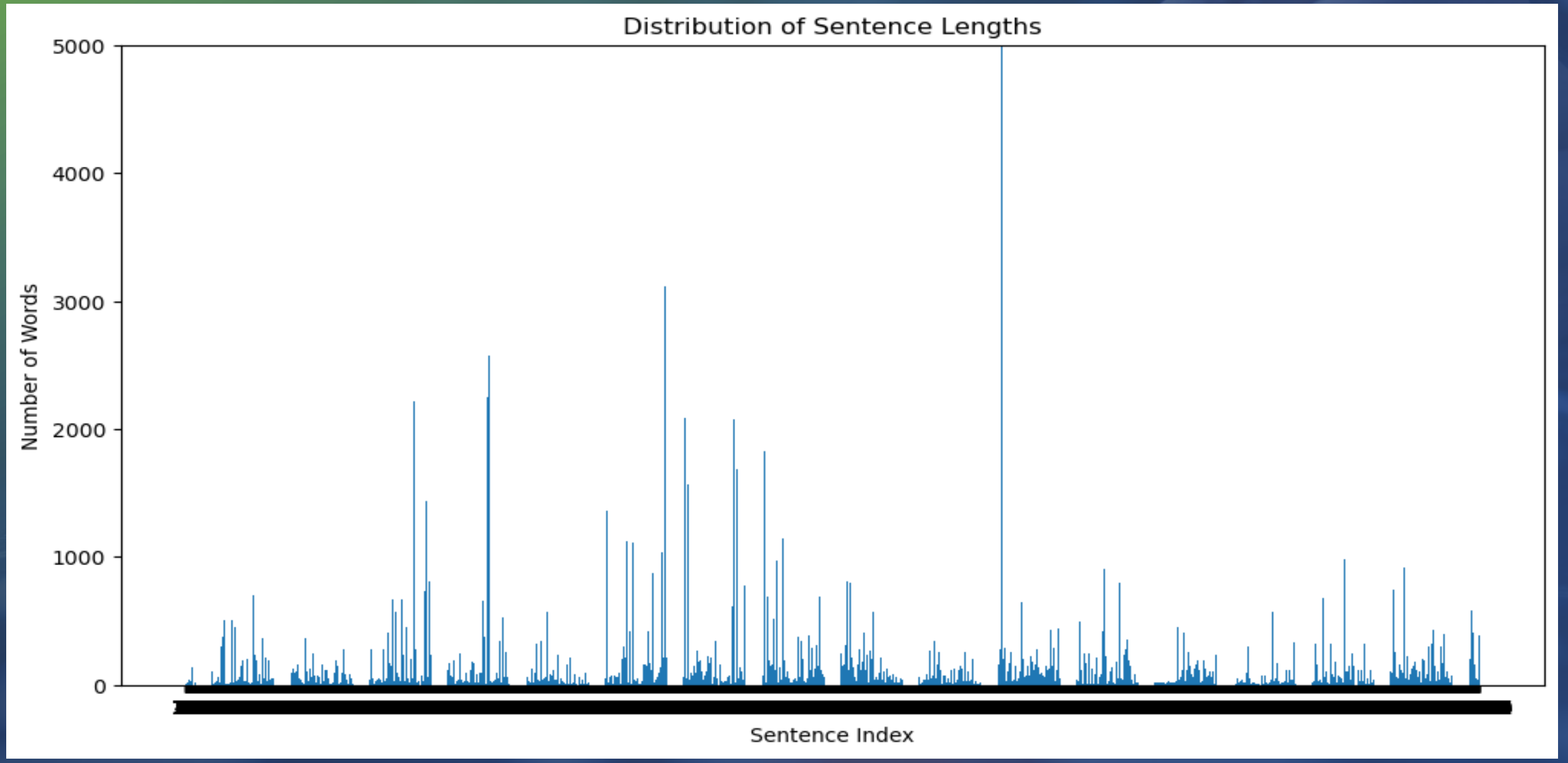
Most frequent words

EDA - Data Visualization- Class distribution



EDA - Data Visualization- World Cloud

EDA - Data Visualization- Mail wise No.of words



EDA

Sentiment Analysis

- Assign a sentiment score to each email.

Topic Modelling

- Identify key topics within the emails.

Part-of-Speech (POS) Tagging

- Categorize words into their respective parts of speech.

Vectorization

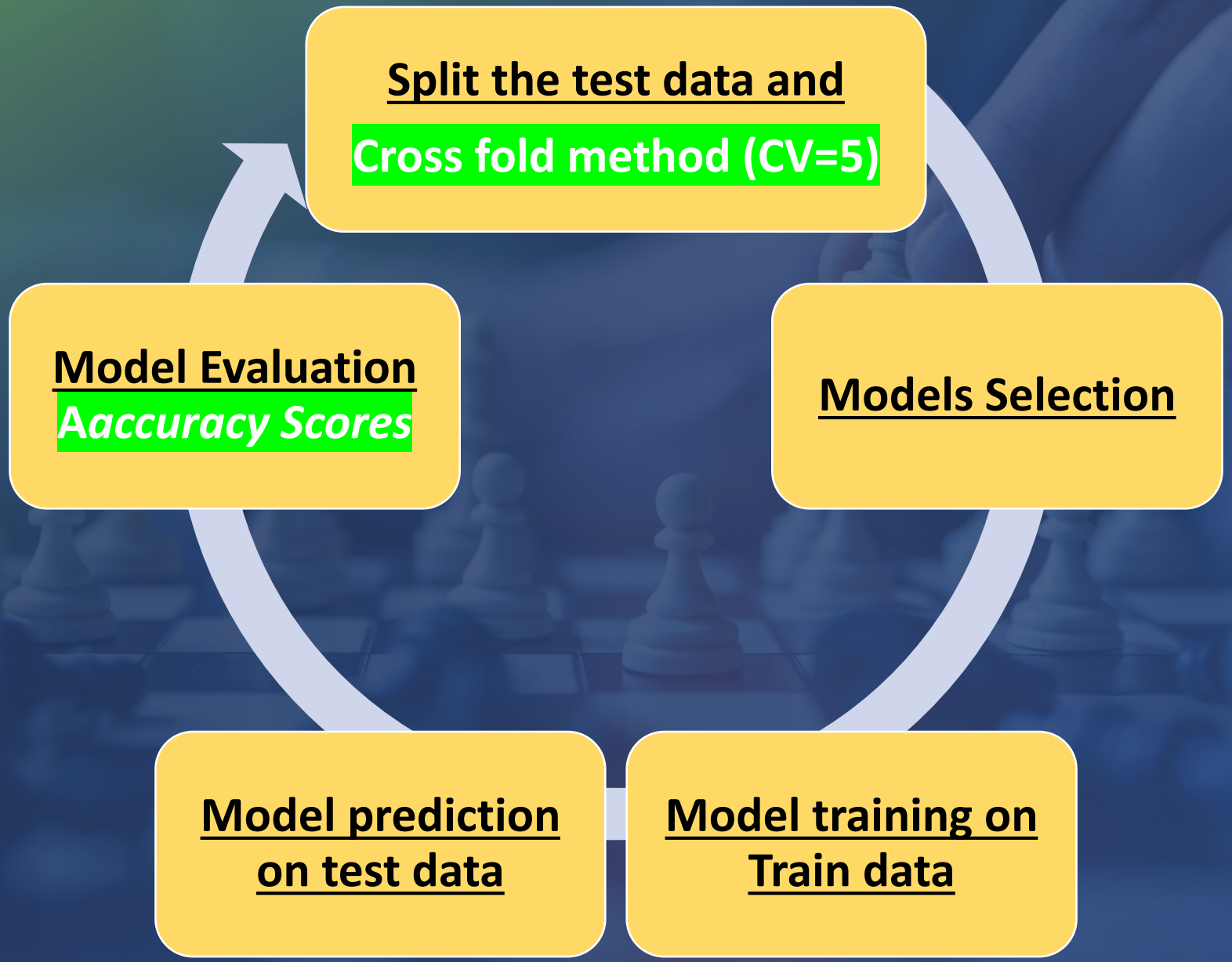
Independent variable

- TF-IDF (term frequency-inverse document frequency) vectorization to convert final text tokens data into numerical features
- Shape of the data after vectorization **(22811, 117893)**

Dependent variable

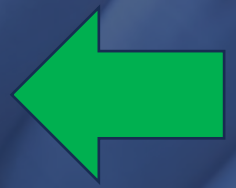
- Encoded the target variable(classes) using label encoding
- Abusive – 0
- Non-abusive - 1

Model Building & Evaluation



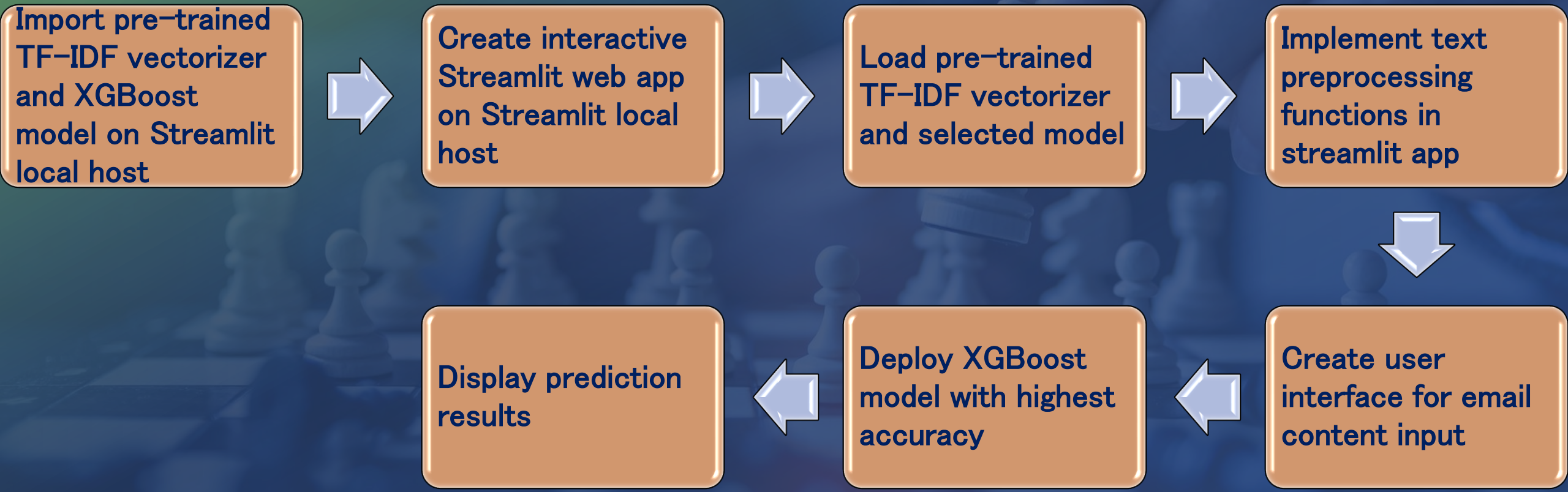
Model Building & Evaluation

S.No	Model Name	Accuracy Score
1	**XG Boost Classifier**	**96.40%**
2	Gradient Boosting Classifier	95.93%
3	Support vector Classifier	95.80%
4	Logistic regression	95.44%
5	AdaBoost Classifier	95.29%
6	Random Forest Classifier	95.10%
7	Decision Tree Classifier	95.08%
8	K-Nearest neighbours	93.91%
9	Multinomial NB	93.24%



- Presented accuracy scores for each model.
- XG Boost Classifier is the best-performing model for deployment.

Model Deployment with Streamlit



Model Deployment with Streamlit

Non-Abusive

Abusive

Sample prediction results snapshots from localhost

Challenges faced during a project:

- **The dataset may be imbalanced, with a significantly higher number of normal emails compared to inappropriate ones.**

- **Faced challenges in text preprocessing to effectively capture and represent inappropriate language nuances.**

- **Faced computational resource challenges, particularly with larger datasets and resource-intensive models like Random Forest or Gradient Boosting.**


Thank you